

**Environmental Management
Radiological Guidelines
Manual No.
3-21000-OPS-EMRG**



EG&G ROCKY FLATS

**ENVIRONMENTAL MANAGEMENT
RADIOLOGICAL GUIDELINES**

**ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT**

**P.O. Box 464
Golden, CO 80402**

December 1991

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Date 11/7/92

ADMIN RECORD

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ENVIRONMENTAL MANAGEMENT DEPARTMENT

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EMRG 1.0	Organization and Responsibilities	0	12/06/91
EMRG 1.1	Gama Radiation Surveys	0	12/06/91
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EMRG 1.3	Posting of Radiation Protection Requirements	0	12/06/91
EMRG 2.1	Personnel Contamination Monitoring	0	12/06/91
EMRG 2.2	Possible Inhalation Exposure	0	12/06/91
EMRG 2.3	Wounds and Skin Contamination	0	12/06/91
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EMRG 3.5	Handling of Contaminated Dosimetry/Security Badges	0	12/06/91
EMRG 6.1	Performance Test and Operational Checks for Ludlum Model 12-A, Model 12, and Model 31 Survey Instruments	0	12/06/91
EMRG 6.3	Performance Checking and Operation of the Eberline SAC-4 Alpha-Scintillation Smear Counting Instrumentation	0	12/06/91
EMRG 6.4	Performance Testing and Operation of the Eberline BC-4 Beta Smear Counting Instrumentation	0	12/06/91
EMRG 6.5	Use of the Bicron Frisk-Tech with the A-100 and B-50 Detectors	0	12/06/91

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EMRG 6.6	Use of the Bicron Fidler (Field Instrument for the Detection of Low-Energy Radiation)	0	12/06/91
EMRG 9.1	Respiratory Protection Requirements and Posting	0	12/06/91
EMRG 10.1	Radiological Deficiency Reporting Program	0	12/06/91

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**TITLE:
ORGANIZATION AND RESPONSIBILITIES**

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 (Remediation Programs) (Date)
[Signature] 1/16/92
 (Environmental Operations Manager) (Date)

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2.0 PURPOSE

To outline the functional organization of the project and define responsibilities assigned, in order to establish and implement consistent radiological guidance during environmental remediation activities.

3.0 SCOPE

This document describes the EG&G and Subcontractor positions involved in the preparation, administration, execution, and modification of radiological guidance.

4.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

The organizational structure shown in Figure 1.0A, and the listing of responsibilities provided in this section, relates specifically to the establishment, implementation, and continuing refinement of Environmental Management (EM) Radiological Guidance. A complete organizational structure and listing of responsibilities for the Environmental Management Department is provided in the EG&G Rocky Flats Plant Environmental Restoration Site-Wide QA Project Plan (Reference 5.1).

4.1 Responsibilities of the EM Health and Safety Officer (HSO)

4.1.1 EG&G will designate an HSO to complete assigned responsibilities.

4.1.2 The HSO will ensure that the radiological aspects of project-specific documents meet the criteria established in EG&G Rocky Flats Plant Site-Wide Standard Operating Procedures (SOPs).

4.2 Responsibilities of the EM Radiological Engineer (EMRE)

4.2.1 EG&G will designate an EMRE to complete assigned responsibilities.

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4.2.2 The EMRE will:

- Establish qualifications for the Health and Safety Specialist (HSS) position
- Review the credentials of prospective HSSs and, when appropriate, approve individuals to complete tasks reserved for HSSs
- Review and approve subcontractor-prepared training programs that are designed to qualify a subcontractor employee to serve as an HSS
- Prepare Environmental Management Radiological Guidelines (EMRGs) that address subjects such as, but not limited to, survey methods, documentation, frequencies, and locations
- Establish survey and sampling strategies for property that cannot be surveyed in accordance with the standard techniques outlined in existing EMRGs, and ensure that property to be released for unrestricted use does not exceed the limits specified in DOE Order 5400.5 (Reference 5.2)
- Provide guidance on the performance of the procedures and techniques utilized in field operations for surface contamination surveys
- Specify work controls for radiologically controlled areas, or review and approve work controls prepared by Subcontractors
- Review and approve selected radiation survey reports
- Investigate unanticipated survey results such as a lack of radioactivity when radioactivity is known to be present, or radiation levels exceeding anticipated levels

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- Oversee Radiation Work Permit (RWP) program administration
- Oversee Radiological Deficiency Report (RDR) program administration
- Sign, or designate a representative to sign, forms such as property releases
- Perform dose reconstruction for personnel whose dosimeters have been contaminated or are deemed "unreadable"
- Determine the appropriate posting and control of radiologically contaminated sites and approve the deposing of signs
- Evaluate Possible Inhalation Exposures and decide on appropriate actions
- Evaluate possible wound and skin contamination incidents
- Provide support for the evaluation and control of work requiring respiratory protection
- Perform all additional specific procedural duties relating to EM field activities detailed in the Radiological Engineering Procedures Manual, applicable Radiological Engineering documents, and the applicable HSP manual.

4.3 Responsibilities of the EM Project Manager

4.3.1 EG&G will designate an EM Project Manager to complete assigned responsibilities.

4.4 Responsibilities of the Subcontractor Project Manager

4.4.1 The Subcontractor will designate a Project Manager to complete assigned responsibilities.

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4.4.2 The Subcontractor Project Manager will direct the development of a formal training program designed to qualify subcontractor employees to be designated as HSSs by the EMRE. The training program will include classroom sessions and supervised field work, and will be submitted to the EMRE for approval.

4.4.3 Nominate Site Safety Officers (SSOs) and HSSs for EMRE approval.

4.5 Responsibilities of the Subcontractor Site Safety Officer (SSO)

4.5.1 The position of SSO will be filled by an individual that meets the Subcontractor's requirements for that position. In addition, the EMRE must approve the SSO to complete those responsibilities assigned to HSSs.

4.5.2 The SSO will:

- Implement the applicable SSHSP and verify compliance with all applicable health and safety requirements.
- Ensure that updated copies of the Health and Safety Plan (HSP), applicable SSHSP, EMRGs, and all documents referenced by the EMRGs, are available to subcontractor employees.
- Supervise HSSs in the performance of their responsibilities.
- Ensure HSSs and subcontractor employees are advised of the radiological hazards, both expected and suspected, by posting and controlling radiological areas according to EMRG instructions.
- Ensure that HSP 18.19, "Criteria and Actions for Potential Intakes," is adhered to for the duration of the project.

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4.5 Responsibilities of the Subcontractor Site Safety Officer (SSO)

4.5.1 The position of SSO will be filled by an individual that meets the Subcontractor's requirements for that position. In addition, the EMRE must approve the SSO to complete those responsibilities assigned to HSSs.

4.5.2 The SSO will:

- Implement the applicable SSHSP and verify compliance with all applicable health and safety requirements.
- Ensure that updated copies of the Health and Safety Plan (HSP), applicable SSHSP, EMRGs, and all documents referenced by the EMRGs, are available to subcontractor employees.
- Supervise HSSs in the performance of their responsibilities.
- Ensure HSSs and subcontractor employees are advised of the radiological hazards, both expected and suspected, by posting and controlling radiological areas according to EMRG instructions.
- Ensure that the guidelines in HSP 18.19, "Criteria and Actions for Potential Intakes," are adhered to for the duration of the project.
- Verify that performance testing of EG&G and subcontractor-owned instruments has been conducted in accordance with the manufacturer's recommendations. The SSO will also ensure that the test results are recorded daily in a calibration log specific to each instrument.

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- Verify that performance testing of EG&G and subcontractor-owned instruments has been conducted in accordance with the manufacturer's recommendations. The SSO will also ensure that the test results are recorded daily in a calibration log specific to each instrument.
- Review and approve completed survey reports/forms. If an unsatisfactory report/form is received, it will be returned to the appropriate individual(s) for correction. When conducting this review, the SSO will ensure that:
 - the correct report/form is complete
 - the entries are reasonable
 - the required signatures are affixed to the report
- Forward approved survey reports/forms to the EMRE and maintain a file of all completed Radiological Survey Forms. This file will be organized by survey areas, with an index placed in the front of the file.
- Immediately contact the EMRE by phone when survey results indicate radiation levels exceeding 5 millirems/hour (mrem/h). For contaminant radiation levels requiring access controls not already established, or levels exceeding an established action level, the EMRE will also be notified.
- Maintain an Instrumentation Field Log Book which documents the specific equipment used at the work site.

4.6 Responsibilities of the Subcontractor Health and Safety Specialist (HSS)

4.6.1 The HSS will be approved by the EMRE to complete the assigned responsibilities.

4.6.2 The HSS will:

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- Conduct surveys and document the results, as required by the EMRGs, the applicable SSHSP, and the EG&G Rocky Flats Plant Site-Wide SOPs
- Supervise Health and Safety Specialist in-training (HSST) during field activities
- Countersign all reports/forms completed by the HSST
- Forward completed survey reports/forms to the SSO
- Notify the SSO of survey results that indicate radiation levels exceeding 5 mrem/h, levels requiring access controls not already established, or levels exceeding an established action level
- Control access and advise all personnel when radiological precautions are required
- Complete performance and operational checks required for radiation instruments and make entries in the Instrumentation Field Log Book

4.7 Responsibilities of the Subcontractor Health and Safety Specialist In-Training (HSST)

4.7.1 The HSST will:

- Participate in a formal training program designed to qualify subcontractor employees to be designated as Health and Safety Specialists by the EMRE
- Conduct surveys and document the results as required by the EMRGs, the applicable SSHSP, and the EG&G Rocky Flats Plant Site-Side SOPs
- Notify the HSS of unanticipated radiation and contamination levels such as a lack of radioactivity where radioactivity is known to be present, or radiation or contamination levels

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exceeding anticipated levels

- Request HSS countersignatures on all survey reports
- Post required signs according to EMRG instructions

5.0 REFERENCES

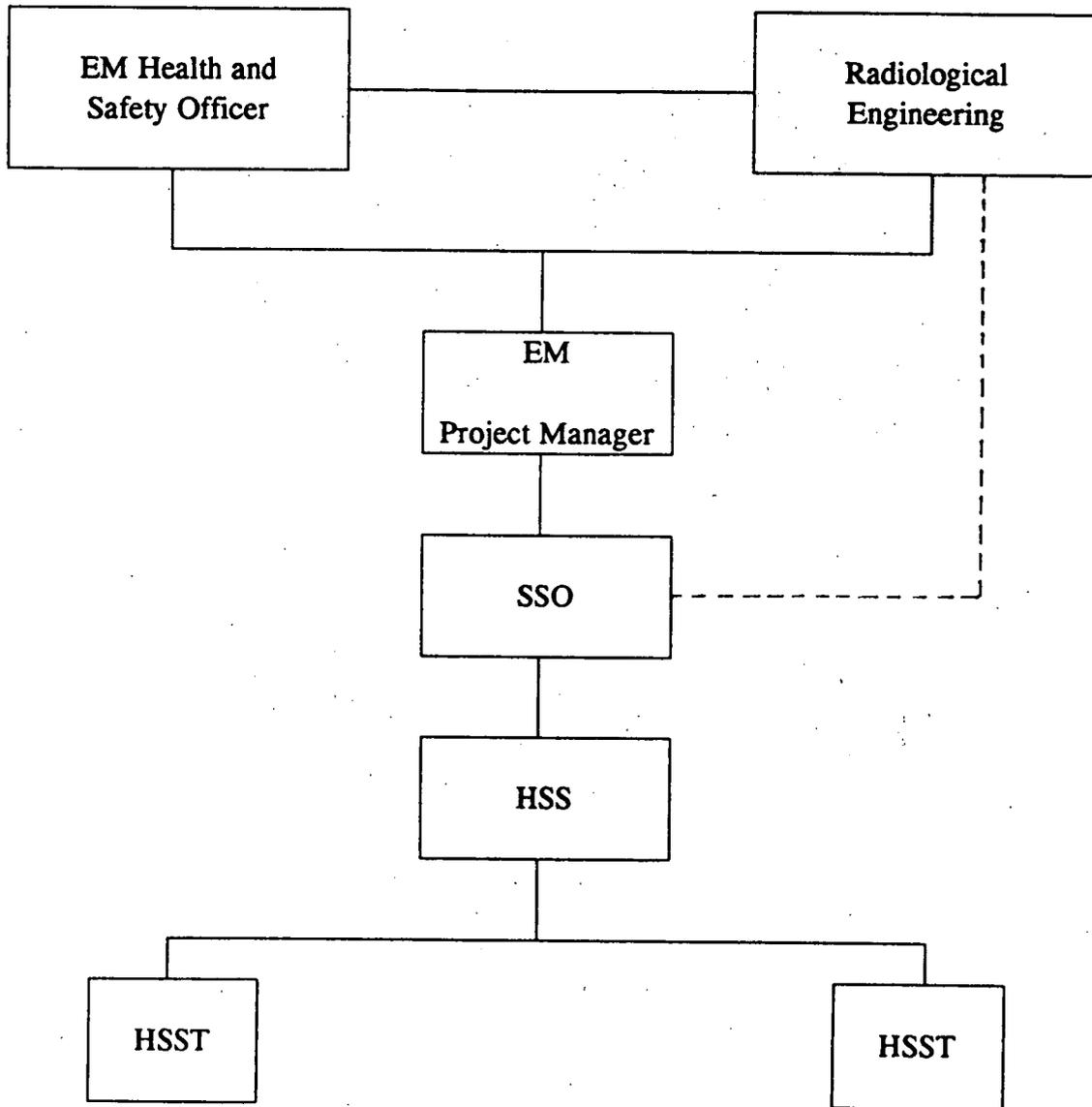
5.1 EG & G Rocky Flats Plant Environmental Restoration Site-Wide QA Project Plan

5.2 DOE Order 5400.5, Radiation Protection of the Public and the Environment

5.3 DOE Order 5480.11, Radiation Protection for Occupational Workers

6.0 FIGURES

**FIGURE 1.0A
ENVIRONMENTAL MANAGEMENT
RADIOLOGICAL GUIDELINES
LINES OF RESPONSIBILITY**



GAMMA RADIATION SURVEYS

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[Signature] 1/6/92
 (Radiological Engineering) For Geraldine (Date)
[Signature] 1/6/92
 (Remediation Programs) (Date)
[Signature] 1/6/92
 (Environmental Operations Manager) (Date)

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2.0 PURPOSE

To provide requirements for performing penetrating radiation surveys.

3.0 SCOPE

This Environmental Management Radiological Guide (EMRG) defines the requirements for performing gamma radiation surveys and documenting survey results as part of the Environmental Management program.

4.0 GENERAL

4.1 Review of Survey Data - Health and Safety's Specialists (HSSs) will be familiar with the radiological conditions present or expected in the area by reviewing the area's current and/or historical survey, making note of:

- The type of contamination
- The range of loose surface and fixed contamination
- Areas of higher or lower contamination
- The range of penetrating radioactivity
- Areas of higher and lower radioactivity
- The wind direction and levels of, or potential for, airborne radioactivity

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- Any other information useful in reducing radiation exposure to the HSS or other workers

4.2 Survey Preparations

- 4.2.1 Pre-stage equipment and material in a low radiation level area, when practical.
- 4.2.2 All radiological surveys required for an area should be performed concurrently to minimize the surveyor's exposure.
- 4.2.3 Use a carrying strap or lanyard to secure the instrument when climbing; or raise and lower the instrument to the appropriate elevation with a length of rope.

4.3 Instrumentation Requirements

- 4.3.1 Select the appropriate type instrument, using the following criteria. (The following list is a guideline for selection and is not intended as a requirement that all the instrumentation listed be maintained by all Contractors).
- Gamma survey instruments must be approved by the Rocky Flats Health Physics Instrumentation Committee. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.
 - Appropriate calibration for the types and energy range of the radiation to be measured.

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- Sufficiently high range to read the highest expected exposure rate.

4.3.1.1 Gamma survey instruments include the following (or their equivalents):

Victoreen 450B - ion chamber; range: 0-50 roentgen per hour (R/h)

Victoreen 450G - ion chamber; range: 0-500 R/h

Teletector - Geiger Mueller; range: 0-1000 R/h

4.3.1.2 Low-energy X-ray survey instruments include the following (or their equivalents):

Ludlum Model 2 - Geiger Mueller; range: 0-50 milliroentgen per hour (mR/h)

Ludlum Model 3 - Geiger Mueller; range: 0-200 mR/h

4.3.2 EG&G instruments will be checked out from and returned to Radiation Instrumentation as required by the project. EG&G instruments may be maintained and stored by the Contractors. The Site Safety Officer (SSO)/HSS will verify that performance testing of EG&G instruments has been recorded by Radiation Instrumentation for the day of use. The SSO/HSS will conduct daily performance testing of subcontractor-owned instruments and record the results in a calibration log for each instrument. Performance tests for subcontractor-owned instruments will be done in accordance with the manufacturer's recommendations.

4.3.3 Survey instruments will have an unexpired "calibration due date" on the calibration label; if not, return the instrument to Radiation Instrumentation. In the case of subcontractor-owned equipment, return the equipment to the manufacturer or a certified calibration facility for instrument calibration.

4.3.4 A battery check will be conducted before each intermittent use of the instrument.

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5.0 INSTRUCTIONS

5.1 Survey of Radiation Areas

5.1.1 Enter the area with the instrument scale selector set to measure the highest expected radiation level. Hold the instrument at waist-level and walk slowly through the area. Through the use of headset or audible response and observation of instrument readings, locate all elevated radiation levels within the area. Adjust the instrument selector downscale, as necessary, to obtain the radiation level reading(s).

5.1.2 Use enough different survey points to adequately assess the radiation status of the area.

5.1.3 Record instrument readings. The instrument reading will be an average of the meter needle fluctuations after instrument response has stabilized or the digital readout if present.

5.2 Survey Records

5.2.1 The HSS will document the survey readings accurately and legibly on a standard preprinted survey form (Form 1.1A) prepared by the Subcontractor. Use sufficient detail to ensure that the meaning and intent of the record is clear. Survey points will be denoted on work area diagrams or sketches and attached to the completed survey form.

5.2.2 Record the radiation survey data as follows:

- Record the radiation measurement of each survey position for each identified survey location and any areas with elevated readings.
- Unless all radiation surveys are performed at the same position (distance from the source) and that position is stated on the survey (e.g., "all radiation measurements at 36 inches from ground level"), specify the position after each measurement as follows:

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H = Head-Level
C = Chest-Level
W = Waist-Level
G = Ground-Level

- Note distances of instrument readings taken at distances other than 30 cm on the survey form
- Record all gamma radiation levels at milliroentgen per hour (mR/h), all neutron radiation levels at milliRem per hour (mrem/h), and total radiation levels at mrem/h
- Identify boundaries of areas posted as a result of the survey with the symbol X--X--X--X

5.2.3 In addition to the radiological information, include the following information on the survey form:

- Site designation and number (or other specific identification)
- Date and time survey initiated
- Survey description: identify the purpose of the survey (e.g., routine, post decon, etc.) and area or item surveyed
- Type(s) of instrument(s) used, their serial number(s), the date calibrated, the date calibration is due, and the date of last performance test
- Signature(s) and employee number or social security number of individual(s) performing the survey

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5.2.4 HSS will submit completed survey forms to the SSO for review. Unacceptable survey forms will be corrected by the HSS and promptly resubmitted.

5.2.5 A SSO will review and countersign all acceptable surveys performed by a HSS.

5.2.6 A copy of the survey should accompany the crew to the field.

5.2.7 The original will be retained in the Subcontractor's field office files. Copies of completed, approved survey forms will be forwarded to the EMRE within three (3) working days of the survey completion unless the SSO considers the survey results to indicate radiation levels exceeding 5 mrem/h. These survey results will be immediately reported by phone and a copy of the survey report delivered to the EMRE within 24 hours.

5.3 Control for Radiation Areas

5.3.1 Notify the SSO as soon as possible when a radiation level exceeding 5 mrem/h is identified and initiate radiation controls as follows.

5.3.1.1 Areas are required to be controlled and posted based on the radiation levels found during initial and subsequent surveys performed by a HSS and as directed by a SSO per Environmental Management Radiological Guideline Number 1.3 (Reference 6.1).

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 1.3, Posting of Radiation Protection Requirements

7.0 FORMS

GAMMA AND NEUTRON SURVEY

Control # _____
Page 1 of _____

Taken by: _____ Emp. # _____
Signature Printed Name

Taken by: _____ Emp. # _____
Signature Printed Name

Taken by: _____ Emp. # _____
Signature Printed Name

Date: _____ Building: _____ Survey Description: _____
 Time: _____ Room #: _____
 Shift: _____ Area: _____
 Diagram/Sketch Attached: Yes No

INSTRUMENTATION USED

Mfg:	_____	_____	_____	_____	_____
Model:	_____	_____	_____	_____	_____
Serial #:	_____	_____	_____	_____	_____
Date Perf. Test:	_____	_____	_____	_____	_____
Date Calib'd:	_____	_____	_____	_____	_____
Cal. Due Date:	_____	_____	_____	_____	_____
Background:	_____	_____	_____	_____	_____

COMMENTS

Status:

Within Limits

Limits Exceeded

Posted

Deposed

SSO Review:

Signature _____ Date _____

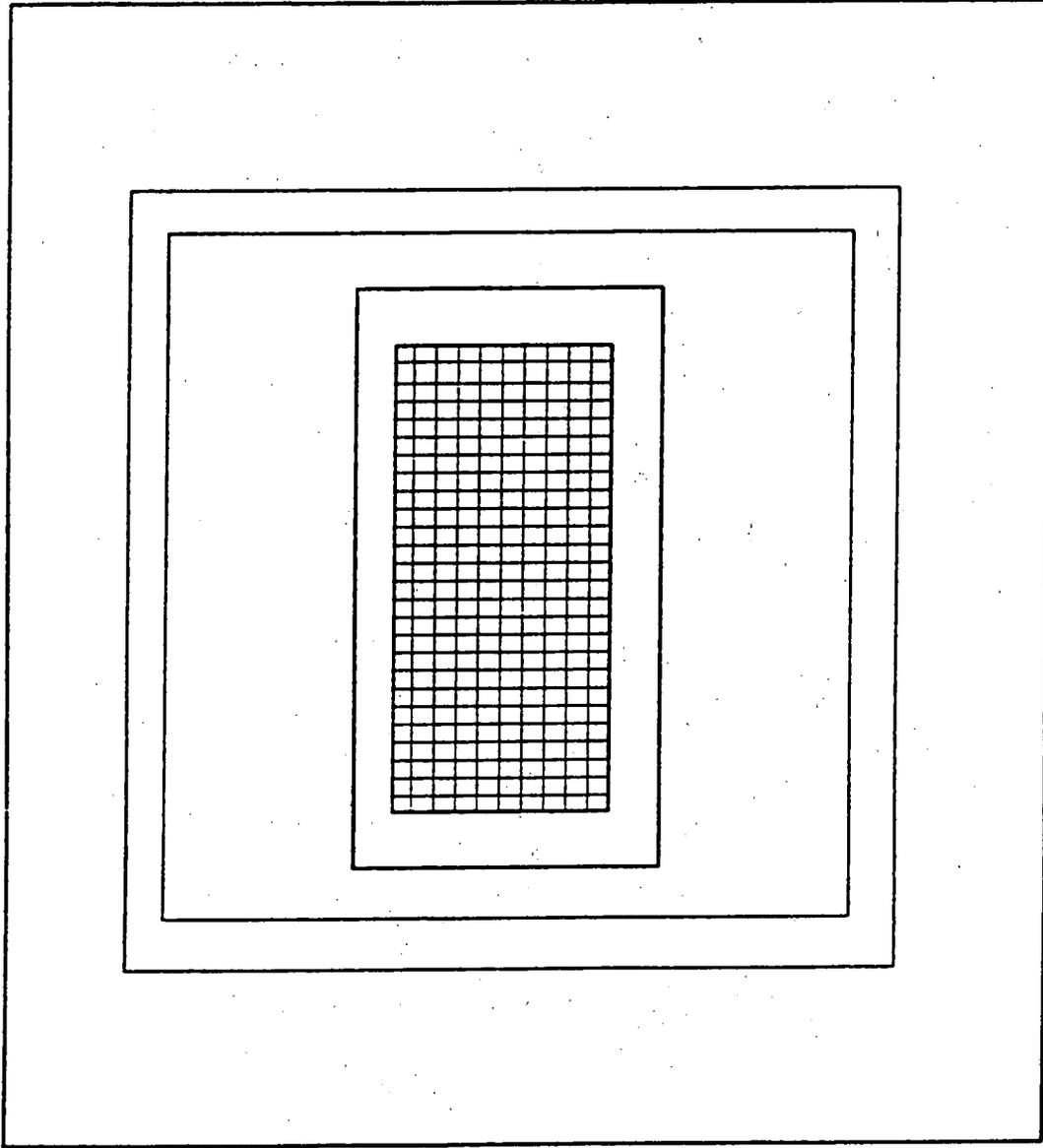
GAMMA AND NEUTRON SURVEY

Control # _____
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RESULTS

<u>mR/h</u>	<u>mrem/h</u>	<u>mrem/h</u>	Area Posted (Y/N)	<u>mR/h</u>	<u>mrem/h</u>	<u>mrem/h</u>	Area Posted (Y/N)
Gamma	Neutron	Total		Gamma	Neutron	Total	
1.				45.			
2.				46.			
3.				47.			
4.				48.			
5.				49.			
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40.				84.			
41.				85.			
42.				86.			
43.				87.			
44.				88.			

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

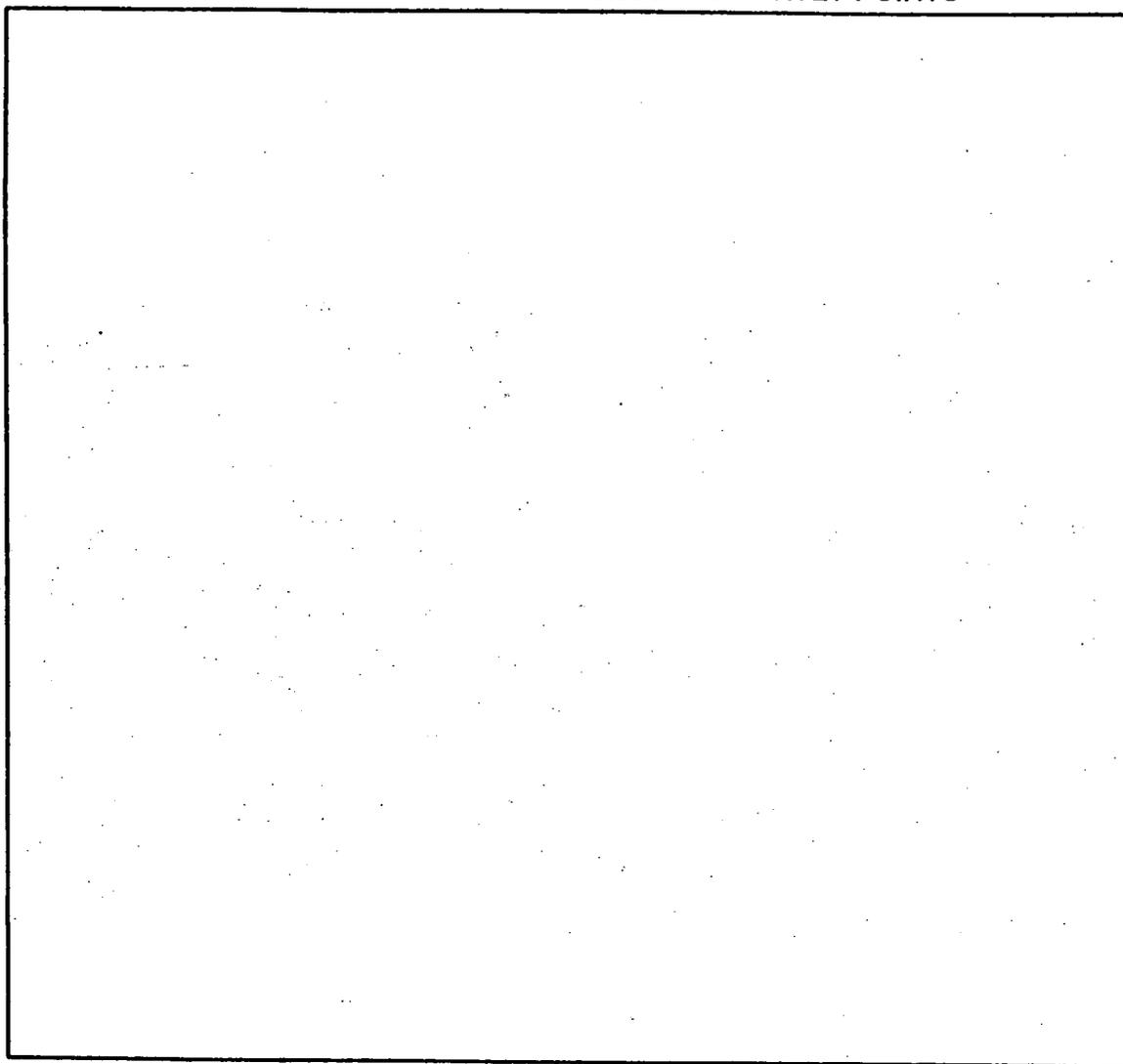
= Direct Frisk Location

= Smear Survey Location

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DATE: _____

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

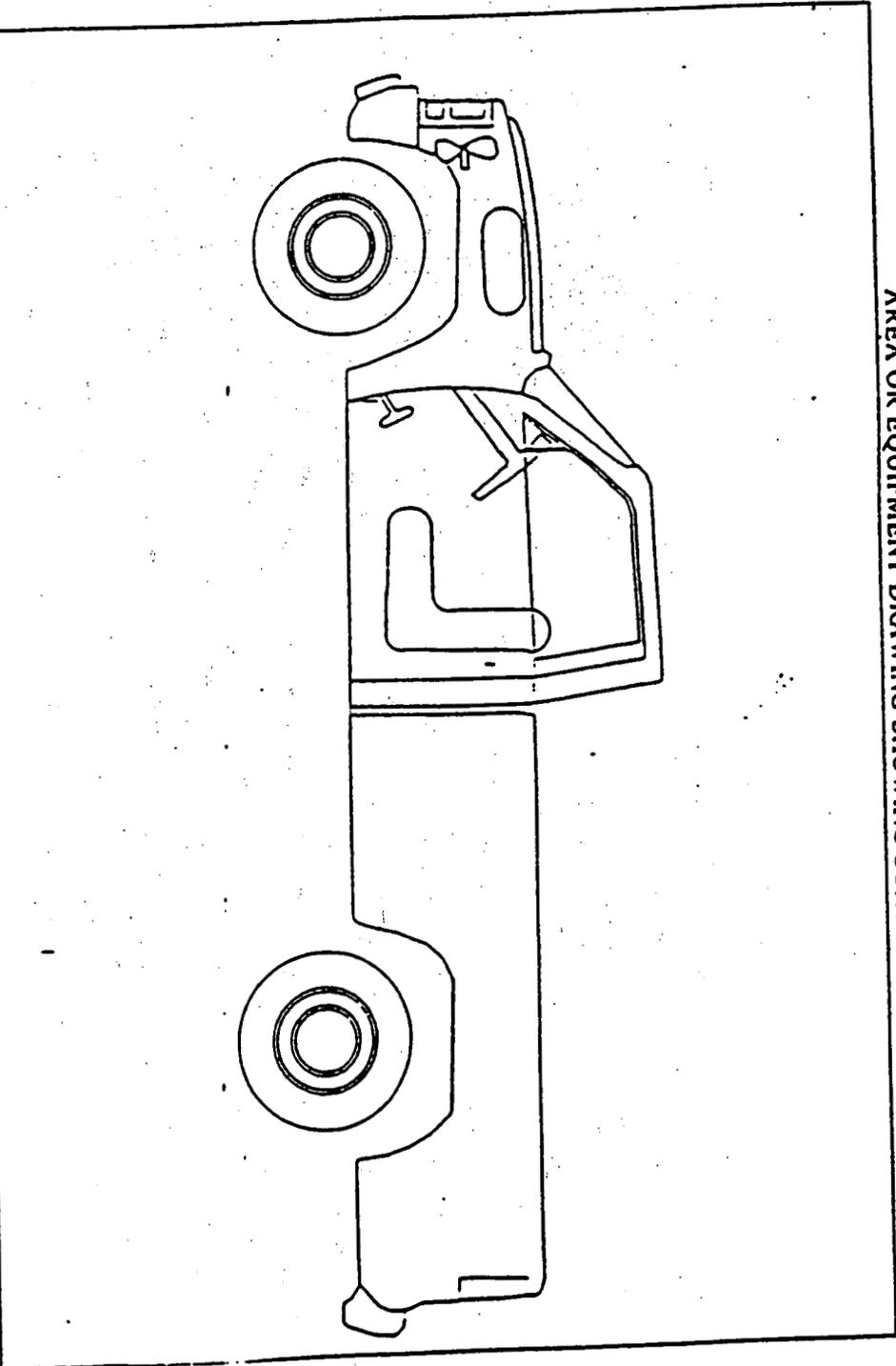
= Direct Frisk Location

= Smear Survey Location

REVIEWED BY: _____

DATE: _____

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Post Area

= Direct Frisk Location

O = Smear Survey Location

REVIEWED BY: _____

DATE _____

COMMENTS

BETA RADIATION SURVEYS

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

Manual: 3-21000-OPS-EMRG
Guideline No.: 1.2, R.0
Page: 1 of 6
Effective Date: December 6, 1991
Organization: Environmental Management

Category 2

TITLE:
BETA RADIATION SURVEYS

Approved By:

CONTROLLED DOCUMENT

EG&G -- ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

[Signature] 11/6/92
 (Radiological Engineering) *[Signature]* (Date)
[Signature] 11/6/92
 (Remediation Programs) (Date)
[Signature] 11/6/92
 (Environmental Operations Manager) (Date)

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By *[Signature]*
 Date 1/7/92

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Category 2

2.0 PURPOSE

To define the requirements for the performance of beta radiation surveys.

3.0 SCOPE

This instruction provides the requirements for the use of instruments, the survey methods for beta radiation, and documentation of survey measurements, as part of the environmental management program.

4.0 GENERAL

4.1 Review of Survey Data - Health and Safety Specialists (HSSs) will be familiar with the radiological conditions present or expected in the area by reviewing the area's current and/or historical survey data, making note of:

- The type of contamination
- The range of loose surface and fixed contamination
- Areas of higher or lower contamination
- The range of penetrating radioactivity
- Areas of higher and lower radioactivity
- The wind direction and levels of or potential for airborne radioactivity
- Any other information useful in reducing radiation exposure to the HSS or other workers

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42 Survey Preparations

42.1 Pre-stage equipment and material in a low radiation area when practical.

42.2 All radiological surveys required for an area should be performed concurrently to minimize the surveyor's exposure.

42.3 Use a carrying strap or lanyard to secure the instrument when climbing; or raise and lower the instrument to the appropriate elevation with a length of rope.

43 Instrumentation Requirements

43.1 Beta radiation surveys will be performed with a Victoreen Model 450B instrument or its equivalent. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

43.2 EG&G instruments will be checked out from and returned to Radiation Instrumentation as required by the project. EG&G instruments may be maintained and stored by the contractors. The Site Safety Officer (SSO)/HSS will verify that performance testing of EG&G instruments has been recorded by Radiation Instrumentation for the day of use. The SSO/HSS will conduct daily performance testing of subcontractor-owned instruments and record the results in a calibration log for each instrument. Performance tests for subcontractor-owned instruments will be done in accordance with the manufacturer's recommendations.

43.3 The date on the calibration label of the instrument to be used will be inspected to ensure it has not expired. A battery check of the instrument prior to its use will also be made. The words LOW BAT

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will be displayed on the Victoreen Model 450B readout to indicate that batteries need to be replaced immediately.

5.0 INSTRUCTIONS

5.1 Beta Radiation Surveys - Beta radiation surveys will be performed at predetermined work locations and during operations where there is a potential for a change in beta radiation levels or where significant levels of beta radiation are suspected, as in the following situations:

- Historical data on the site indicate beta contamination
- During initial entry into a Contaminated Area
- Uranium daughter-product contamination is the most likely source of beta radiation at specific sites

5.2 Survey Points for Beta Radiation - A sufficient number of survey points will be taken to adequately assess the beta radiation level of the area.

5.3 Survey Measurements - All survey measurements will be made at 30 cm (one foot) from the radiation source or from any surfaces through which the radiation penetrates, unless otherwise directed or required.

5.4 Specified Measurements - The level or position of all measurements will be specified. Most measurements will be taken at waist level.

5.5 Instruments - An instrument warmup time of one minute is required before measurements are made. A period of eight (8) seconds is required before readings are taken on the 0-5 milliroentgen (mR) scale and two (2) seconds on all other scales.

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- 5.6 Readings - Readings will be taken with the instrument window facing the radiation source. An open window (OW) reading will be taken by activating the trip lever to let the shield fall from in front of the window. A closed window (CW) reading will be taken after the instrument has been briefly inverted, and the trip lever activated, to allow the shield to fall in front of the window.
- 5.7 Beta Reading - The beta reading will be the difference between a shield open (OW) and a shield closed (CW) reading at the same point of measurement.
- 5.8 Victoreen Model 450B - For the Victoreen Model 450B, the beta exposure rate in milliroentgen per hour (mR/h) will be calculated by multiplying the preceding result by a correction factor of 4. Other instruments may require a different method of calculation.

$$\text{Beta radiation level (mR/h)} = (\text{OW}-\text{CW}) 4$$

- 5.9 Posting of Radiation Areas - Radiation areas will be controlled and posted per Environmental Management Radiological Guideline Number 1.1 (Reference 6.1).
- 5.10 Beta Radiation Surveys - Beta radiation surveys will be documented on the standard preprinted Gamma and Beta Contamination Survey Form (Form 1.1B).
- 5.10.1 The beta radiation level of each point surveyed will be recorded in mR/h.
- 5.10.2 Sufficient detail will be entered on the survey form to ensure that the meaning of the survey record is clear.

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5.10.3 The following information will be provided on the survey form in addition to the radiation data:

- location and date of survey
- purpose of survey
- serial number of instrument used and due date of calibration
- sketch or description of area or component surveyed
- signature and employee number or social security number of HSS conducting the survey

5.10.4 A SSO will review and countersign all acceptable surveys performed by a HSS.

5.10.5 A copy of the survey should accompany the crew to the field.

5.10.6 The original will be retained in the Subcontractor's field office files. Copies of completed, approved survey forms will be forwarded to the Environmental Management Radiological Engineer (EMRE) within three (3) working days of the survey completion unless the survey results indicate radiation levels in excess of 5 millirem per hour (mrem/h). Survey results in excess of 5 mrem/h will be immediately reported by phone and a copy of the survey report delivered to the EMRE within 24 hours.

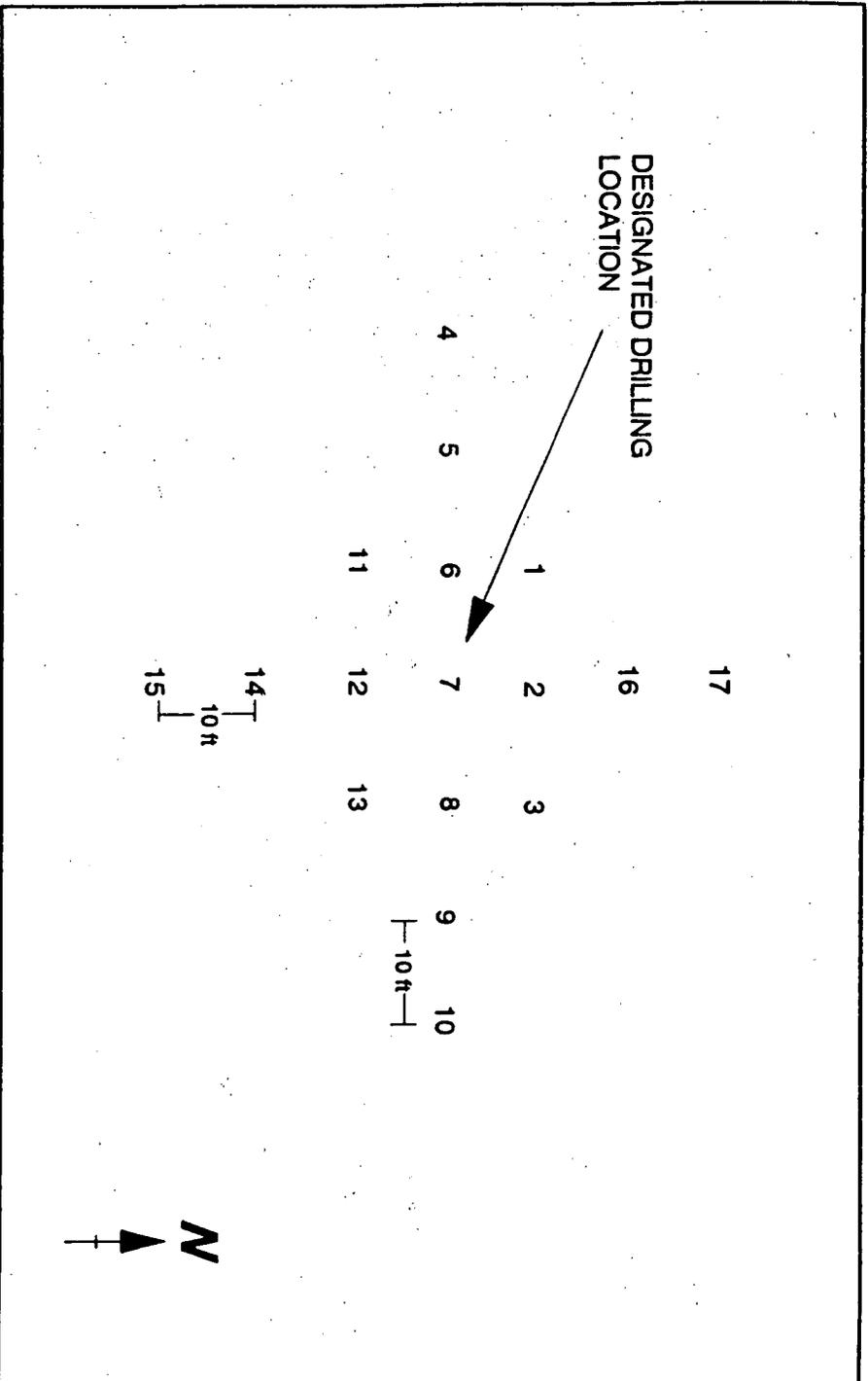
6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 1.1, Radiation Surveys

7.0 FORMS

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS

Back Side of Form 1.1B



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

= Direct Frisk Location

= Smear Survey Location

REVIEWED BY:

DATE:

COMMENTS:

POSTING OF RADIATION PROTECTION REQUIREMENTS

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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**TITLE:
POSTING OF RADIATION PROTECTION
REQUIREMENTS**

Approved By:

[Signature] 1/16/92
(Radiological Engineering) for Gmaldrich (Date)

CONTROLLED DOCUMENT

[Signature] 1/16/92
(Remediation Programs) (Date)

**EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT**

[Signature] 1/16/92
(Environmental Operations Manager) (Date)

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Date 1/2/92

POSTING OF RADIATION PROTECTION REQUIREMENTS

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

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2.0 PURPOSE

To specify the requirements for radiological posting of areas for personnel access control.

3.0 SCOPE

This instruction defines the signs to be used for posting of areas where radiation or radioactive materials may be present and to specify personnel entry control requirements.

4.0 GENERAL

4.1 Marking Area Boundaries - Yellow and magenta striped rope, tape, or other appropriate markings, will be used to establish area boundaries when permanent boundaries do not exist. Signs will be suspended from the rope on all accessible sides.

4.2 Inserts - A multiple insert sign holder will be used for posting when various inserts are required (Figures 1.3I and 1.3J). The inserts may be used in any combination as required for specifying radiological areas and protective controls.

5.0 INSTRUCTIONS

5.1 Postings for Radiation Protection

5.1.1 Post an area as a Radiologically Controlled Area (RCA) where radiation or radioactive materials are present and/or the potential for the release of radioactive materials is present, and to define and control personnel entry and exit points (Figure 1.3A).

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- 5.1.2 Post an area as a Radiation Area where radiation is present at levels of 5 milliRems per hour (mrem/h) or greater, but less than 100 mrem/h at 30 cm from the radiation source or any other surface. See Figure 1.3B.
- 5.1.3 Post an area as Airborne Radioactivity Area where the average concentration of radioactive material in the air is greater than 1/10 of the Derived Air Concentration (DAC) for radiation workers. See Figure 1.3C.
- 5.1.4 Post an area as a Contamination Area where the removable surface contamination exceeds the control limits specified in Tables I and II of Environmental Management Radiological Guideline Number 3.1 (Reference 6.2). See Figure 1.3D.
- 5.1.5 Post an area as a Fixed Contamination Area where the fixed surface contamination exceeds the control limits specified in Tables I and II of Environmental Management Radiological Guideline Number 3.1 (Reference 6.2). See Figure 1.3E.
- 5.1.6 Post an area with PPE required at access points where protective clothing requirements exceed precautionary clothing requirements.
- 5.1.7 Post an area with Respiratory Protection Required at access points where a full-face respirator is required for entry per the criteria specified in Environmental Management Radiological Guideline Number 9.1 (Reference 6.1). See Figures 1.3C and 1.3D.
- 5.1.8 Post an area with Radiation Work Permit Required in RCA's where the RWP program is in effect. See Figure 1.3I.

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- 5.1.9 Post an area with Caution: Contact Site Safety Officer Before Entering at access points in areas where unusual precautionary measures are needed and when standard signs are not provided (e.g., chemical hazard due to spills or leaks). See Figure 1.3F.
- 5.1.10 Post an item with Internal Contamination Label where removable or fixed contamination levels inside closed items or inaccessible areas exceed those specified in Table I and II of Environmental Management Radiological Guideline Number 3.1 (Reference 6.2). See Figure 1.3G.
- 5.1.11 Post an item with Caution - Radioactive Material Label if it is known or suspected to be radioactive. Contain radioactive materials when other postings are not appropriate. See Figure 1.3H.
- 5.1.12 An area should be posted in order to identify applicable requirements using Rocky Flats Plant (RFP) sign inserts. See Figures 1.3I and 1.3J for examples of approved sign inserts.

5.2 Assessment

NOTE: DETERMINATION OF THE CONTROLS NECESSARY TO PERFORM A SPECIFIC TASK WILL BE BASED ON AN ASSESSMENT OF THE HAZARDS INVOLVED WITH THE TASK, AND THE APPLICABLE REGULATORY REQUIREMENTS.

- 5.2.1 Determine the extent of the radiological hazards associated with the proposed task.
- 5.2.2 Select the appropriate control zone as dictated by the Site-Specific Health and Safety Plan.
- 5.2.2.1 Appropriate posting consists of only those signs listed in this guide.

POSTING OF RADIATION PROTECTION REQUIREMENTS

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NOTE: DETERMINATION OF THE CONTROLS NECESSARY TO PERFORM A SPECIFIC TASK WILL BE BASED ON AN ASSESSMENT OF THE HAZARDS INVOLVED WITH THE TASK, AND THE APPLICABLE REGULATORY REQUIREMENTS.

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- 5.2.2 Select the appropriate control zone as dictated by the Site-Specific Health and Safety Plan.
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POSTING OF RADIATION PROTECTION REQUIREMENTS

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5.3 Site Control

5.3.1 Use personnel control methods necessary to control access to the site.

5.3.1.1 Set up a boundary using ribbon and stanchions or ropes etc., to prevent unauthorized access, as described in section 4.1.

5.3.1.2 If physical controls cannot be effectively used to control the zone, full-time surveillance is required.

5.4 Deposting

WARNING: BE CERTAIN THAT ALL APPROPRIATE SIGNS CONTROLLING THE AREA ARE REMOVED.

5.4.1 Perform a post-job survey, per Environmental Management Radiological Guideline Number 3.1 (Reference 6.2).

5.4.2 If the levels for airborne radioactivity, radiation exposure, and surface contamination levels are within limits specified in Environmental Management Radiological Guideline Number 9.1 (Reference 6.1) and Environmental Management Radiological Guideline Number 3.1 (Reference 6.2), and the SSO gives written permission, the area may be deposited. Written permission is to be documented in the SSO's log book and in completed surveys for the area. The SSO will obtain verbal approval from the EMRE before depositing radiologically controlled areas.

5.5 Records

5.5.1 Record all postings and depositions of areas in the HSS's log book.

POSTING OF RADIATION PROTECTION REQUIREMENTS

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5.5.2 Complete all other records required by specific procedures.

5.5.3 Copies of records will be retained in the SSO office for one year or for the duration of the project.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 9.1, Respiratory Protection Requirements and Posting

6.2 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

7.0 FIGURES

FIGURE 1.3A



*RADIOLOGICALLY
CONTROLLED AREA*

*RADIATION WORK
PERMIT REQUIRED*

FIGURE 13B



RADIATION AREA

DOSE RATE RANGES
FROM _____ *mrem/hr* *TO* _____ *mrem/hr*
RPT _____ *DATE* _____

FIGURE 1.3C



*AIRBORNE
RADIOACTIVITY AREA*

*RESPIRATORY
PROTECTION REQUIRED*

*FULL-FACE WITH
HEPA CARTRIDGES*

*RWP REQUIRED
FOR ACCESS*

FIGURE 13D



**CONTAMINATION
AREA**

REMOVABLE CONTAMINATION
MAXIMUM _____ dpm/100cm²
GENERAL AREA _____ dpm/100cm²
SEE AREA MAP FOR DETAILED SURVEY

**RESPIRATORY
PROTECTION REQUIRED**

**FULL-FACE WITH
HEPA CARTRIDGES**

**RWP REQUIRED
FOR ACCESS**



**CONTAMINATION
AREA**

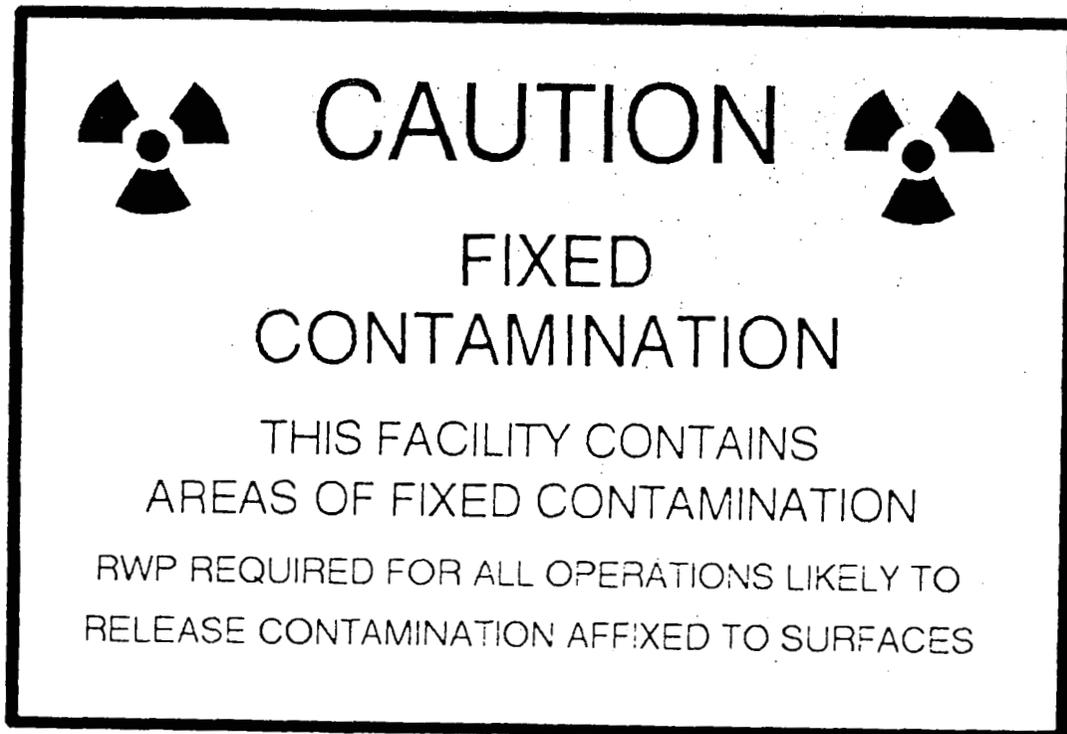
**ENTER ONLY AT
STEP-OFF PAD**

**RESPIRATORY
PROTECTION REQUIRED**

**FULL-FACE WITH
HEPA CARTRIDGES**

**RWP REQUIRED
FOR ACCESS**

FIGURE 13E



**CONTACT
SSO
BEFORE
ENTERING**

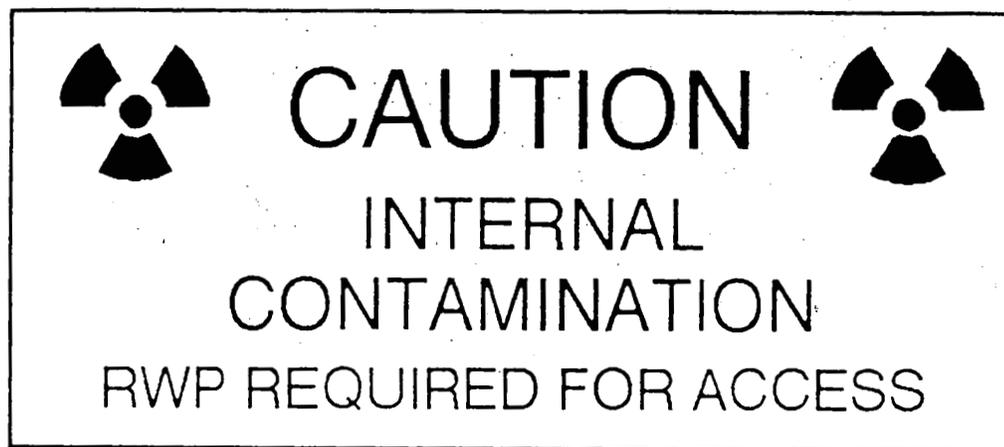


FIGURE 1.3H

CAUTION RADIOACTIVE MATERIAL	
ISOTOPE	
AMOUNT	
DATE	
XOS20885	

	CAUTION	
RADIOACTIVE MATERIAL		

	CAUTION	
RADIOACTIVE MATERIAL OR RADIATION		
RADIOLOGICAL CONTROL TAG		
<i>ITEM DESCRIPTION</i>		
<i>CONTAMINATION LEVELS (HIGHEST)</i>		
<i>FIXED</i>	<i>dpm/100cm²</i>	
<i>REMOVABLE</i>	<i>dpm/100cm²</i>	
<i>RADIATION DOSE RATE (AS APPROPRIATE)</i>		
<i>GAMMA</i>	<i>mr/hr @ 30 cm</i>	
<i>NEUTRON</i>	<i>mrem/hr @ 30 cm</i>	
<i>BETA</i>	<i>mrad/hr @ 30 cm</i>	
<i>RPT</i>	<i>EMPLOYEE</i>	
<i>NAME</i>	<i>NUMBER</i>	
<i>INSTRUCTIONS:</i>		

***FULL-FACE WITH
HEPA CARTRIDGES***

***SUPPLIED
BREATHING AIR***

***SELF-CONTAINED
BREATHING APPARATUS***

***RADIATION WORK
PERMIT REQUIRED***

SHOE COVERS

***NO CONSUMER
PRODUCTS***

DOSIMETER BADGE

PERSONNEL CONTAMINATION MONITORING

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: 3-21000-OPS-EMRG
Guideline No.: 2.1, R.0
Page: 1 of 7
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Organization: Environmental Management**

Category 2

TITLE:
PERSONNEL CONTAMINATION MONITORING

Approved By:

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EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

[Signature] 11/6/92
(Radiological Engineering) (Date)

[Signature] 11/6/92
(Remediation Programs) (Date)

[Signature] 11/6/92
(Environmental Operations Manager) (Date)

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By *[Signature]* (initials)
Date 1/4/92

PERSONNEL CONTAMINATION MONITORING

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

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Category 2

2.0 PURPOSE

To establish personnel monitoring requirements for radioactive contamination.

3.0 SCOPE

This instruction defines the use of instruments for personnel contamination monitoring, criteria for personnel contamination, control of contaminated personnel, and documentation of contamination occurrences.

4.0 GENERAL

4.1 Radiological Occurrence Response Actions - If a radiological occurrence involves a combination of conditions, response actions will be taken in the following priority:

- Critical injury or illness
- Skin contamination
- Noncritical injury or illness
- Possible inhalation of radioactive material

4.2 Emergency Medical Care - Emergency medical care of critically injured or ill personnel will take precedence over radiological actions.

4.3 Transporting Contaminated Personnel - Care will be exercised in transporting contaminated personnel to minimize the spread of contamination in Uncontrolled Areas. A subcontractor-owned or leased

PERSONNEL CONTAMINATION MONITORING

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vehicle will normally be used for transportation. However, a Rocky Flats company-owned vehicle may be used if a critical injury is involved. The transporting vehicle will be controlled until released by the Environmental Management Radiological Engineer (EMRE).

5.0 INSTRUCTIONS

5.1 Monitoring Personnel for Contamination - Monitoring of personnel for contamination will be performed in the following situations, however, other requirements may exist in upper-tier documents (e.g., Environmental Management's Standard Operating Procedures [EM SOPs] or Site-Specific Health and Safety Plans [SSHSPs]) and should also be followed:

- Whenever leaving a Radiologically Controlled Area
- Whenever exiting a Contaminated Area
- During and after work where a potential exists for release of radioactive material
- Whenever passing through the Controlled Area
- Following personnel decontamination
- When required by SSHSPs or EM SOPs

5.1.1 Personnel monitoring will consist of a whole-body survey except for precautionary surveys. The whole-body survey will be conducted front and back, over the following areas or articles:

- head (pause at mouth and nose)
- neck and shoulders

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- arms (pause at each elbow)
- hands (pause at palms and back of hands)
- TLD and security badge
- respirator (exterior, interior, cartridge, and straps)
- chest and abdomen
- back, hips, and seat of pants
- legs (pause at each knee)
- pant cuffs (pause at cuff)
- shoe-cover bottoms
- shoe tops
- shoe bottoms (pause at sole and heel)

5.1.2 Alpha contamination monitoring will be performed as follows:

- The Ludlum Model 12-1A Survey Meter with an air proportional detector (or equivalent) will be used per the requirements of Environmental Management Radiological Guideline Number 6.1 (Reference 6.1). The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.
- The detector will be held within 1/4 inch of the body or clothing surface and moved slowly, (i.e., about 2 inches per second).
- To the extent practical, clothing wrinkles will be smoothed prior to monitoring.

PERSONNEL CONTAMINATION MONITORING

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- The instrument scale selector control will be set to the range appropriate for measuring levels of contamination.
- Visual or audible instrument response will be used to determine the presence of contamination.
- Clothing will be considered contaminated if the detectable radioactivity is greater than 300 dpm/100 cm².
- Skin will be considered contaminated if any level of radioactivity is detected, as outlined in the Site-Specific Health and Safety Plan (SSHSP).

5.1.3 Beta/gamma contamination monitoring will be performed as follows:

- The Ludlum Model 31 Count Rate Meter equipped with a pancake detector will be used per the requirements of Environmental Management Radiological Guideline Number 6.1 (Reference 6.1). Equivalent instrumentation release limits must be established by the Subcontractor, taking into consideration the minimum detectable activity (MDA) of the instrument.
- If the background count rate exceeds 150 counts per minute (cpm), the monitoring station will be shielded.
- The detector will be held within 1/2 inch of the body or clothing surface and moved slowly (i.e., about 2 inches per second).
- Visual or audible instrument response will be used to determine the presence of contamination.

PERSONNEL CONTAMINATION MONITORING

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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- Clothing will be considered contaminated if 100 cpm above background are indicated.
- Skin will be considered contaminated if any level of radioactivity is detected, as outlined in the SSHSP.

5.1.4 When skin contamination is detected, the contamination will be appropriately covered and contained. A Health and Safety Specialist (HSS) will escort the contaminated employee to the decontamination area. Field decontamination may be performed provided adequate decontamination equipment is available.

- For skin or wound contamination, the requirements of Environmental Management Radiological Guideline Number 2.3 (Reference 6.2) will be followed
- For contamination observed around the nose or mouth, the requirement of Environmental Management Radiological Guideline Number 2.2 (Reference 6.3) will be followed

5.1.5 Area controls will be established for personnel contamination occurrences.

- Stop traffic through the area where contamination occurred
- Perform contamination surveys per requirements of Environmental Management Radiological Guideline Number 3.1 (Reference 6.4)
- Isolate the affected area by posting and barricading it
- Identify the travel routes and other personnel that are potentially contaminated

PERSONNEL CONTAMINATION MONITORING

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- Perform area and personnel contamination monitoring as required

5.1.6 Reports required for contamination occurrences will be completed, approved, and transmitted as specified in Environmental Management Radiological Guideline Number 10.1 (Reference 6.5).

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 6.1, Performance Test and Operational Checks for Ludlum Model 12-1A and 31 Survey Instruments

6.2 Environmental Management Radiological Guideline Number 2.3, Wounds and Skin Contamination

6.3 Environmental Management Radiological Guideline Number 2.2, Possible Inhalation Exposure

6.4 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

6.5 Environmental Management Radiological Guideline Number 10.1, Radiological Deficiency Reporting Program

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**TITLE:
POSSIBLE INHALATION EXPOSURE**

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ENVIRONMENTAL MANAGEMENT DEPARTMENT

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Approved By:

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(Radiological Engineering) *[Signature]* (Date)

[Signature] 1/6/92
(Remediation Programs) (Date)

[Signature] 1/6/92
(Environmental Operations Manager) (Date)

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By *[Signature]*
Date 1/7/92

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2.0 PURPOSE

To define the required response actions of Health and Safety personnel for occurrences of possible inhalation of radioactive material.

3.0 SCOPE

This instruction provides the requirements for responding to occurrences involving possible inhalation of radioactive materials, including contamination monitoring and evaluation; collection and transmittal of nasal, air, and representative samples; and documentation of inhalation-related contamination occurrences in accordance with the Radiological Deficiency Reporting Program, Environmental Management Radiological Guideline Number 10.1 (Reference 6.3).

4.0 GENERAL

4.1 Response Actions - If a radiological occurrence involves a combination of conditions, response actions will be taken in the following priority:

- Critical injury or illness
- Skin contamination
- Noncritical injury or illness
- Possible inhalation of radioactive material

4.1.1 Any radiological event which meets the criteria specified in Table I requires sending affected personnel to Internal Dosimetry (ID) for follow-up processing. Any individual with skin contamination will be considered by Radiological Engineering (RE) as a candidate for Possible Inhalation Exposure and be referred to ID for consideration of bioassay. Any clothing contamination may be considered by RE as

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Possible Inhalation Exposure and referred to ID for consideration of bioassay. ID will determine appropriate bioassay of follow-up action according to the circumstances and levels of the event.

TABLE I:* Criteria for Internal Dosimetry Evaluation

SITUATION	ACTION LEVEL 1	ACTION LEVEL 2
Nasal/Mouth Smear	Positive to 200 dpm	≥ 200 dpm
Facial contamination	Positive to 800 dpm	≥ 800 dpm
Head and Neck Contamination	Positive to 8,000 dpm	≥ 8,000 dpm
Hand/Forearm and Clothing Contamination	5000 dpm to 16,000 dpm	≥ 16,000 dpm
Contamination Inside Respirator	N/A	Any detectable removable contamination
Airborne Contamination	40 to 400 DAC-hours	≥ 400 DAC-hours

If discrepancies exist between this table and HSP 18.19-1, HSP 18.19-1 will supersede Table I.

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- 4.2 Emergency Medical Care - Emergency medical care of critically injured or ill personnel will take precedence over radiological actions.
- 4.3 Transportation of Contaminated Personnel - Care will be exercised in transporting contaminated personnel to minimize the spread of contamination in Uncontrolled Areas. A subcontractor-owned or leased vehicle will normally be used for transportation. However, a Rocky Flats company-owned emergency response vehicle may be used if a critical injury is involved. The transporting vehicle will be controlled until released by the Environmental Management Radiological Engineer (EMRE).
- 4.4 Possible Inhalation Kits - Possible Inhalation (PI) kits are located in the Health and Safety offices and will contain cotton-tipped swabs, facial tissue, a sample card, ziploc bags, and contamination-free metal cans.
- 4.5 Protective Clothing Requirements - Please refer to Health and Safety Practices (HSP) 18.02 (Reference 6.5) and Site-Specific Health & Safety Plan (SSHSP) for protective clothing requirements.
- 4.6 DAC - For information on obtaining or verifying Derived Air Concentrations (DAC), refer to Radiological Operations Instructions (ROI) 4.1 (Reference 6.4).
- 4.7 Internal Dosimetry - Employee will be referred to ID per section 5.5 and 4.1.1.
- 4.8 Radiological Surveys - Radiological surveys will be performed using the Ludlum 12-1A or its equivalent. Instrumentation will be used in accordance with Environmental Management Radiological Guideline Number 6.1 (Reference 6.6). The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

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5.0 INSTRUCTIONS

5.1 Monitoring Personnel for Contamination - Monitoring of personnel for contamination will be performed in the following situations, however, other requirements may exist in upper-tier documents (e.g., Environmental Management's Standard Operating Procedures [EM SOPs] or Site-Specific Health and Safety Plans [SSHSPs]) and should also be followed:

- When directed by posting while exiting a Controlled Area
- Whenever exiting a Contaminated Area
- During and after work where a potential exists for release of radioactive material
- Whenever passing through the Controlled Area
- Following decontamination or the removal of potentially contaminated materials, when 20 counts per minute (cpm) or greater were found during personnel contamination-monitoring

5.1.1 Some conditions that may be suspected of exposing individuals to airborne radioactivity are:

- Improper use of respirator
- Contamination release

5.2 Facial Contamination - Facial contamination should trigger nasal smears. Nasal swipes with cotton-tipped swabs and nasal blows with facial tissue will be collected as soon as possible following facial decontamination and prior to the individual's showering. The Health and Safety Specialist (HSS) will hand the swabs and tissues to the affected employee, who will collect the mucus samples. Care must

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be taken during this procedure that the samples do not come in contact with any other source of contamination.

5.2.1 Procedure for obtaining nasal smear:

- Fold a slightly damp 4.7 cm filter paper several times.
- Insert a Q-tip® into the center of the fold.
- Have the exposed individual carefully insert the filter into the nostril and thoroughly wipe the nasal passages. Use a separate filter for each nostril and be careful not to cross-contaminate.
- Drop each smear into a separate ziploc bag and label envelopes, as to left and right nostrils, appropriately.
- Survey the bag with a portable survey meter to check for gross contamination.

5.2.2 When personnel are confirmed as positively contaminated, in accordance with Environmental Management Radiological Guideline Number 2.1 (Reference 6.1), SSHSSs will escort the contaminated individual(s) to decontamination facilities and verify that the decontamination process is performed in accordance with Environmental Management Radiological Guideline Number 2.3 (Reference 6.2) and the SSHSP.

5.2.3 Nasal specimens (nasal blows) must then be collected per Section 5.2.

5.2.4 Nasal blows will be placed in separate ziploc bags and prepared for shipment per Section 5.0.

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- 5.3 Radioisotopic Analysis Smear Samples - A representative smear sample of the material involved must be obtained for radioisotopic analysis using the procedure outlined in Sections 5.3.1 through 5.3.8. If these samples cannot be obtained, contact the EMRE.**
- 5.3.1** With a 5.0 cm smear disk, collect a sample of the actual material involved in the incident.
- 5.3.2** The sample may be taken from clothing or the area of occurrence, as long as it is representative of the material involved.
- 5.3.3** If the material involved is plutonium, the sample taken should ideally have an alpha activity between 5,000 and 2,000 cpm, as measured by an air proportional survey meter. If the sample collected exceeds 2,000 cpm, the smear disk will be cut to a size where the activity is within the above limits, or a smear of the original smear disk may be taken. If the sample is <5,000 cpm, notify the Site Safety Officer (SSO) of a possible problem.
- 5.3.4** If the material involved is uranium, the activity of the sample will be taken from the point of highest contamination. Actual blackening of the smear with uranium particles is desirable.
- 5.3.5** For other radioisotopes, the EMRE will be requested to determine acceptable sample activities on a case-by-case basis.
- 5.3.6** The smears taken are to be of single-thickness only, inserted into a ziploc bag, and the bag opening closed. There will be no material of any sort between the activity on the smear sample and the bag. The ziploc seal should be reinforced with plastic tape.
- 5.3.7** The exterior of the ziploc bag will be checked for contamination. If contamination is found, the sample must be removed and placed in a new bag. Double-bagging is not permitted.

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- 5.3.8 The Representative Sample Card (Form 2.2A) will then be completed and signed by the HSS and affixed to the bag.
- 5.4 Representative Sample Card - The completed Representative Sample Card, and bags containing the nasal and representative smear samples, will be sealed in the smaller metal can.
- 5.4.1 The sealed can will be placed in the second, larger metal can which will also be sealed using 2-inch yellow tape.
- 5.4.2 The outer can will bear a properly completed Radioactive On-Site Shipping Label, a Radioactive Materials Label, and a Material Transfer Tag (Forms 2.2B and 2.2.C). Refer to Survey Requirements for Conditional and Unrestricted Use (Environmental Management Radiological Guideline Number 3.2, Reference 6.8) for information on how to fill out these labels and tags.
- 5.5 Environmental Management Radiological Guideline No. 2.1, Monitoring - Prior to transportation, monitor the person as per Environmental Management Radiological Guideline Number 2.1. The SSO will arrange for transportation of personnel and samples as follows:

During regular working hours, day shift:

- Call Occupational Health, ext. 2594, and Internal Dosimetry, ext. 4172, to arrange for medical treatment and an immediate body count, informing them of the individual's name, social security number, and nature of contamination.
- Care will be exercised in transporting contaminated personnel to minimize the spread of contamination in Uncontrolled Areas. A subcontractor-owned or leased vehicle will normally be used for transportation. However, a Rocky Flats company-owned

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emergency response vehicle may be used if a critical injury is involved. The transporting vehicle will be controlled until released by the EMRE.

During off-shift, weekends, and holidays:

- Contact the Shift Superintendent, ext. 2914, or the Dispatcher, ext. 2444. The Shift Superintendent will contact an on-call dosimetry specialist for the body count.
- Care will be exercised in transporting contaminated personnel to minimize the spread of contamination in Uncontrolled Areas. A subcontractor-owned or leased vehicle will normally be used for transportation. However, a Rocky Flats company-owned emergency response vehicle may be used if a critical injury is involved. The transporting vehicle will be controlled until released by the EMRE.

5.6 HSS - A Health and Safety Specialist (HSS) will accompany the person.

5.7 Inhalation Contamination Reports - Complete and transmit the required reports for inhalation contamination as defined in Environmental Management Radiological Guideline Number 10.1 (Reference 6.3).

5.8 EMRE - The Environmental Management Radiological Engineer (EMRE) will be contacted in any event of Possible Inhalation Exposure.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 2.1, Personnel Contamination Monitoring

6.2 Environmental Management Radiological Guideline Number 2.3, Wounds and Skin Contamination

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- 6.3 Environmental Management Radiological Guideline Number 10.1, Radiological Deficiency Reporting
- 6.4 ROI 4.1, Routine Air Sampling
- 6.5 HSP 18.02, Personnel Contamination Control Requirements for Radiological Controlled Areas
- 6.6 Environmental Management Radiological Guideline Number 6.1, Performance Test and Operational Checks for Ludlum Models 12-1A and 31 Survey Instruments
- 7.0 FORMS

REPRESENTATIVE SAMPLE

NAME _____ SSAN OR EMPLOYEE NO. _____

DATE/TIME _____ BLDG. _____

ROOM _____

LINE OR AREA OF INCIDENT _____

SAMPLE TAKEN FROM HEAD _____ HANDS _____

CLOTHING _____ OTHER _____

HSS _____

TYPICAL

RADIOACTIVE ON-SITE SHIPPING LABEL



CAUTION: RADIOACTIVE MATERIAL

PRODUCT RESIDUE WASTE OTHER _____

DATE PACKAGED: _____ PACKAGED BY: _____ (Signature of)

TO: _____ DEPT.: _____ BLDG.: _____

FROM: _____ DEPT.: _____ BLDG.: _____

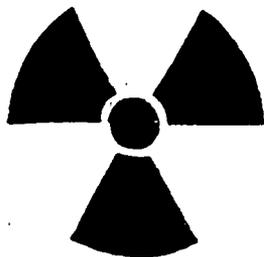
ISOTOPE _____ LD NUMBER _____ CONTENT DESCRIPTION _____ _____ _____	RADIATION LEVELS: _____ MREM/HR SURFACE 30 CM 1 METER
	GAMMA: _____
	NEUTRON: _____
	TOTAL: _____
	HSS'S NAME _____
EMPLO _____	DATE _____



ON SITE USE ONLY

RP-48781 (Rev. 4/80 Destroy Previous Issues)

RADIOACTIVE MATERIALS LABEL



**CAUTION
RADIOACTIVE
MATERIAL**

MATERIAL TRANSFER

CONDITIONAL USE ONLY

Item(S) _____
 Quantity and Description _____
 TRANSFER TO: Name _____
 Organization _____ Building & Room _____ Extension _____
 TRANSFER FROM: Name _____
 Organization _____ Building & Room _____ Extension _____

The above described item(s) was approved for noncontrolled transfer on the Rocky Flats Plant site only, in accordance with HSP 18.10.

Approval Signature of Radiation Protection _____ Employee # _____ Date _____

NOTE: Recipient May Remove Tag Upon Receipt.

The above described item(s) was approved for controlled transfer on the Rocky Flats Plant site only, in accordance with HSP 18.10.

Approval Signature of Radiation Protection _____ Employee # _____ Date _____

RADIOLOGICAL HAZARDS
AND
 RADIOLOGICAL CONTROLS

are listed on the reverse of this tag.

Maintaining Control of the Above Described Item(s) is the Responsibility of the Custodian.

Signature of Custodian _____ Employee # _____ Date _____

RADIOLOGICAL HAZARDS

Survey Record Item No. _____		
Removable Contamination	α _____	dpm/100 cm ²
	β-γ _____	dpm/100 cm ²
Fixed & Removable Contamination	α _____	dpm/100 cm ²
	β-γ _____	dpm/100 cm ²
Gamma Dose Rate @ 30 cm	_____	mR/hr
Neutron Dose Rate @ 30 cm	_____	mrem/hr
RPT	Employee #	Date

RADIOLOGICAL CONTROLS

<input type="checkbox"/> Controlled Use in RCA (HSP 18.10) <ul style="list-style-type: none"> <input type="checkbox"/> Control Procedure Accepted (HSP 18.10) Procedure No. _____ <input type="checkbox"/> Daily Survey Required (ROI 3.02) <input type="checkbox"/> Transfer Between Radiological Areas (HSP 18.10) <input type="checkbox"/> Containment Accepted (HSP 18.10) 			
<input type="checkbox"/> Controlled - Unable to Survey (HSP 18.10) <ul style="list-style-type: none"> <input type="checkbox"/> Containment Accepted (HSP 18.10) <input type="checkbox"/> Control Procedure Accepted (HSP 18.10) Procedure No. _____ <input type="checkbox"/> Daily Survey Required (ROI 3.02) 			
<input type="checkbox"/> Radiological Engineering Concurrence			
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; border-bottom: 1px solid black;">Radiological Engineer Signature</td> <td style="width: 20%; border-bottom: 1px solid black;">Employee #</td> <td style="width: 40%; border-bottom: 1px solid black;">Date</td> </tr> </table>	Radiological Engineer Signature	Employee #	Date
Radiological Engineer Signature	Employee #	Date	

Comments: _____

PROPERTY RELEASE EVALUATION

ITEM NUMBER _____

PART I

(From Record of Property Leaving The RCA)

Description of Property to be Released _____

PART II

A. Property History _____

B. User/Sender: _____ Date: _____
Signature _____ Employee No. _____ Extension: _____
Page No. _____
=====

PART III

A. Radiological Engineering Evaluation _____

B. Survey/Sample Methods to be Used _____

C. Release Criteria _____

D. Evaluated By: _____ Date: _____
Radiological Eng.: Signature _____ Employee No. Extension: _____

WOUNDS AND SKIN CONTAMINATION

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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Category 2

TITLE:
WOUNDS AND SKIN CONTAMINATION

Approved By:

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ENVIRONMENTAL MANAGEMENT DEPARTMENT

This is a RED Stamp

[Signature] 11/6/92
(Radiological Engineering) for GMA Idrich (Date)

[Signature] 11/6/92
(Remediation Programs) (Date)

[Signature] 1/6/92
(Environmental Operations Manager) (Date)

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 By *[Signature]*
 Date 1/7/92

WOUNDS AND SKIN CONTAMINATION

EG&G ROCKY FLATS PLANT
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2.0 PURPOSE

To establish the requirements for handling wounds received by employees within a Radiologically Controlled Area, in addition to all occurrences of skin contamination.

3.0 SCOPE

This guidance defines the responsibilities and actions for handling occurrences of wounds and skin contamination, decontamination procedures, approved decontamination methods and materials, and occurrence documentation.

4.0 GENERAL

4.1 **Response Actions** - If an occurrence involves a combination of conditions, response actions will be taken in the following priority:

- Critical injury or illness
- Skin contamination
- Noncritical injury or illness
- Possible inhalation of radioactive material

4.1.1 Any radiological event which meets the criteria specified in Table I requires sending affected personnel to Internal Dosimetry (ID) for follow-up processing. Any individual with skin contamination will be considered by Radiological Engineering (RE) as a candidate for Possible Inhalation Exposure and referred to ID for consideration of bioassay. Any clothing contamination may be considered by RE as Possible Inhalation Exposure and referred to ID for consideration of bioassay. ID will determine appropriate bioassay or follow-up action according to the circumstances and levels of the event.

WOUNDS AND SKIN CONTAMINATION

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TABLE I:* Criteria for Internal Dosimetry Evaluation

SITUATION	ACTION LEVEL 1	ACTION LEVEL 2
Nasal/Mouth Smear	Positive to 200 dpm	≥ 200 dpm
Facial contamination	Positive to 800 dpm	≥ 800 dpm
Head and Neck Contamination	Positive to 8,000 dpm	$\geq 8,000$ dpm
Hand/Forearm and Clothing Contamination	5000 dpm to 16,000 dpm	$\geq 16,000$ dpm
Contamination Inside Respirator	N/A	Any detectable removable contamination
Airborne Contamination	40 to 400 DAC-hours	≥ 400 DAC-hours

* If discrepancies exist between this table and HSP 18.19-1, HSP 18.19-1 will supersede Table I.

4.2 Emergency Care - Emergency care of critically injured or ill personnel will take precedence over radiological actions.

WOUNDS AND SKIN CONTAMINATION

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- 4.3 Minimizing the Spread of Contamination - Care will be exercised to minimize the spread of contamination to emergency response personnel, equipment, and to uncontrolled areas, as long as it does not hinder emergency care or treatment.
- 4.4 First Aid for Wounds and Burns - Do not attempt to decontaminate wounds; however, burns caused by strong chemicals should be flushed with water.
- 5.0 INSTRUCTIONS
- 5.1 Wound Occurrence - Health and Safety Specialists (HSSs) and the Site Safety Officer (SSO) will immediately respond to a report of a wound occurrence in a Radiologically Controlled Area or any occurrence of skin contamination.
- 5.1.2 Both a Radiological Protection Incident Report and a Radiological Deficiency Report (Reference 6.2) will be initiated. See Form 2.3A.
- 5.2 Critically Injured - Emergency Assistance, ext. 2911, will be summoned for any critically injured person. This number may be called for noncritically injured persons as well, as detailed in the Site-Specific Health and Safety Plan.
- 5.3 Contaminated Personnel - Contaminated personnel will be identified and controlled as follows:
- 5.3.1 Personnel monitoring will be conducted as specified by Environmental Management Radiological Guideline Number 2.1 (Reference 6.1).
- 5.3.2 Minimize further problems by controlling the source of contamination, posting areas, or requiring the use of respiratory protection.

WOUNDS AND SKIN CONTAMINATION

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- 5.3.3 Posting of the area as contaminated will be in accordance with Environmental Management Radiological Guideline Number 1.3 (Reference 6.4).
- 5.4 **Contaminated Wounds** - Contaminated wounds will be covered with a towel or other suitable clean materials found in an on-site first aid kit.
- 5.4.1 DO NOT attempt to decontaminate the wound. Decontamination will be performed under medical supervision.
- 5.4.2 Arrange for the employee to be transported to Occupational Health (OH) as specified by sections 5.6.2 and 5.7 of this guide and record the location of the wound and levels of contamination on the Radiological Protection Incident Report Form (Form 2.3A). This form will be sent with the employee to OH.
- 5.5 **Skin Contamination** - Personnel with skin contamination measured at 5,000 disintegrations per minute (dpm) per Health and Safety Plan (HSP) 18.19 (or 1250 cpm when using a Ludlum 12-1A), with no wounds, should remain at the occurrence location until arrangements to minimize the spread of contamination can be taken. Methods to minimize contamination include cleansing with water and covering affected skin areas with Kimwipes, or cutting away or taping over affected areas of clothing. Field decontamination may be performed provided adequate decontamination equipment is available.
- 5.5.1 Portable screens should be provided for employees required to remove their clothing. Substitute coveralls will be provided as needed.
- 5.5.2 All contaminated personnel will be escorted by a HSS to the decontamination area.
- In non-plutonium areas, plastic tubs will be used for low-level skin decontamination (less than 5,000 dpm alpha and/or 50,000 dpm beta). Persons with skin contamination

WOUNDS AND SKIN CONTAMINATION

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greater than that listed above will be transported to OH facilities for decontamination. Water from these plastic tubs will be contained in a drum and properly labeled.

5.6 Contaminated Hair - Contaminated hair will be washed prior to showering.

- Limit cross-contamination of other body parts or clothing during the operation by using surgical drapes or other similar covering.
- Only lukewarm water and mild soap will be used for washing hair.
- Hair must be towel-dried before it is resurveyed.
- Repeat these steps as needed for any detectable contamination; however, do not repeat more than three times.

5.6.1 Other contaminated body areas will be treated as follows.

5.6.1.1 Guidelines for obtaining nasal smear (nasal smear or blow samples, if required, will be collected before a shower is taken):

- Fold a slightly damp 4.7 cm filter paper several times.
- Insert a Q-tip® into the center of the fold.
- Have the exposed individual carefully insert the filter into the nostril and thoroughly wipe the nasal passages. Use a separate filter for each nostril and be careful not to cross-contaminate.

WOUNDS AND SKIN CONTAMINATION

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- Drop each smear into a separate ziploc bag, labelling envelopes, as to left and right nostrils, appropriately.
- Survey the bag with a portable survey meter to check for gross contamination.

5.6.1.2 Wash or shower using only lukewarm water and mild soap or detergent. **DO NOT** use strong detergents, solvents, or brushes. Water temperature should be kept lukewarm to avoid causing skin pores to open, which may result in radioactive particles becoming embedded in the skin. Care should be taken not to abrade the skin during the decontamination process.

5.6.1.3 The contaminated individual will pat the skin dry with a towel.

5.6.1.4 Monitor for contamination. Repeat these steps as needed for any contamination detected; however, do not repeat more than three times.

5.6.1.5 Complete occurrence documentation as outlined in section 5.8 if no further decontamination is required.

5.6.2 Employee will be transported to OH for decontamination of residual contamination.

- Cover affected areas to prevent the spread of contamination.
- Record the location and levels of remaining contamination on the Radiological Protection Incident Report Form (Form 2.3A) and transmit with the employee to OH.

5.7 Transportation of the Employee - Transportation of the employee to OH will be arranged as follows:

5.7.1 Care will be exercised in transporting contaminated personnel to minimize the spread of contamination in Uncontrolled Areas. A subcontractor-owned or leased vehicle will normally be used for

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transportation. However, a Rocky Flats company-owned emergency response vehicle may be used if a critical injury is involved. The transporting vehicle will be controlled until released by the Environmental Management Radiological Engineer (EMRE).

5.7.2 A Health and Safety Specialist will accompany contaminated individuals to OH in the transport vehicle. The HSS will remain at OH until relieved by a Site Safety Officer.

5.8 Occurrence Documentation - Occurrence documentation will be prepared by the HSS in accordance with requirements of Environmental Management Radiological Guideline Number 10.1 (Reference 6.2). The SSO will review, approve, and transmit appropriate reports as required.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 2.1, Personnel Contamination Monitoring

6.2 Environmental Management Radiological Guideline Number 10.1, Radiological Deficiency Reporting Program

6.3 RD-5706, Wound Counting Using the Eberline SRM-200

6.4 Environmental Management Radiological Guideline Number 1.3, Posting of Radiation Protection Requirements

7.0 FORMS

RADIOLOGICAL PROTECTION INCIDENT REPORT

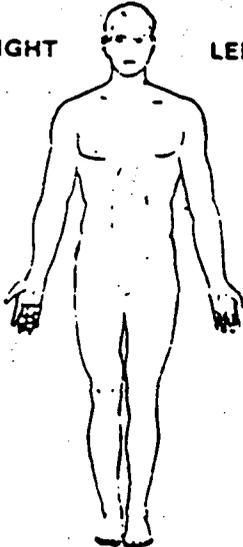
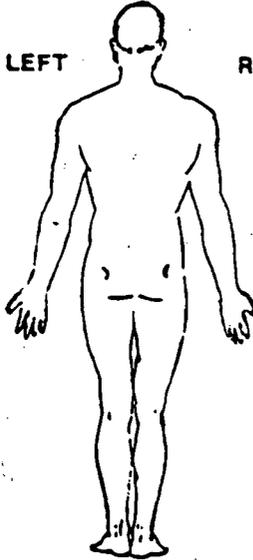
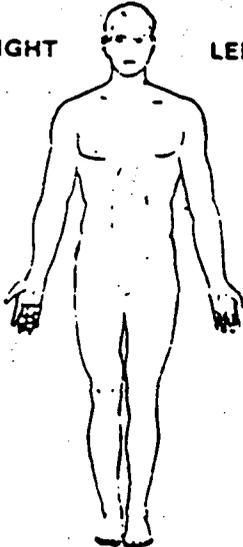
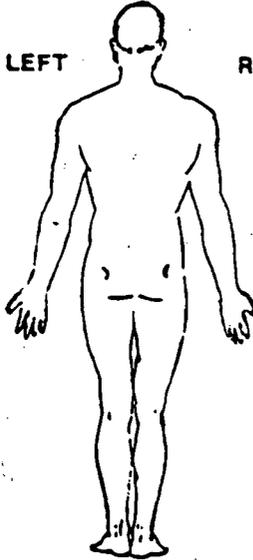
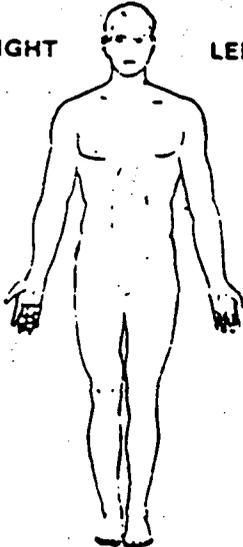
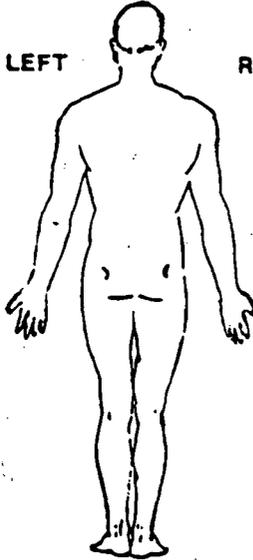
M M D D Y Y

BLDG			DATE				TIME			AREA	

RADIOLOGICAL PROTECTION INCIDENT REPORT
 (PERSONNEL CONTAMINATION, WOUND COUNTS, POSSIBLE INHALATIONS)

(Type or print neatly in BLACK ink Instructions, room for comments on back)

SSAN or

Employee - Last Name, Int. (print)		Employee #	Organization	Supervisors Name (print)							
Survey Instrument		Serial #		Date Cal./Source Checked							
Sent to Medical/ Int. Dosimetry	At _____ Hours For	Wound Description	Respiratory Protection	Representative Sample (dpm)							
		Laceration	None	Nasal Swab/Blow: Yes <input type="checkbox"/> No <input type="checkbox"/>							
Wound Count	Puncture	Half Mask	Type of Material Involved								
Body Count	Abrasion	Full Face Mask	(Pu. Am, etc.)								
Decontamination	Burn	Supplied Air	(oxide, metal, etc.)								
MARK INITIAL AND RESIDUAL SKIN CONTAMINATION LEVELS OUTSIDE OF BODY DIAGRAM. USE ARROWS TO INDICATE EXACT LOCATION OF CONTAMINATION ON BODY. MARK LOCATION OF WOUND WITH (X) ON BODY DIAGRAM. CIRCLE RESIDUAL LEVELS OF CONTAMINATION. DECONTAMINATION COMPLETED IN BUILDING? YES _____ NO _____		<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; width: 20%;">RIGHT</td> <td style="text-align: center; width: 20%;"></td> <td style="text-align: center; width: 20%;">LEFT</td> <td style="text-align: center; width: 20%;"></td> <td style="text-align: center; width: 20%;">LEFT</td> <td style="text-align: center; width: 20%;">RIGHT</td> </tr> </table>				RIGHT		LEFT		LEFT	RIGHT
RIGHT		LEFT		LEFT	RIGHT						
Reported By (print below)		(sign below)		Employee #	Date (mm.dd.yy)						
HSS											
SSO											

PERFORMANCE OF SURFACE CONTAMINATION SURVEYS

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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**TITLE:
PERFORMANCE OF SURFACE CONTAMINATION
SURVEYS**

This is a
CONTROLLED DOCUMENT
 EG&G -- ROCKY FLATS PLANT
 ENVIRONMENTAL MANAGEMENT DEPARTMENT

This is a RED Stamp

Approved By:

[Signature] 11/6/92
 (Radiological Engineering) *[Signature]* (Date)

[Signature] 11/6/92
 (Remediation Programs) (Date)

[Signature] 11/6/92
 (Environmental Operations Manager) (Date)

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REVIEWED FOR CLASSIFICATION/UCNI

By *[Signature]*
 Date 1/7/92

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2.0 PURPOSE

To establish requirements for the performance, documentation, and review of surface contamination surveys.

3.0 SCOPE

This instruction covers the techniques for using swipes, performing direct instrument readings and taking smears to determine removable and total radioactive surface contamination for routine evaluations, and for performing baseline surveys. These guidelines are intended for use by Subcontractors working under the Environmental Management Program.

4.0 GENERAL

4.1 Review of Survey Data - The Health and Safety Specialist (HSS) will be aware of the radiological conditions present or expected in the area, by reviewing the area's current and/or historical survey data, making note of:

- The type of contamination
- The range of loose surface and fixed contamination
- Areas of higher or lower contamination
- The range of penetrating radioactivity
- Areas of higher and lower radioactivity

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- Ludlum 31 Environmental Management Radiological Guideline Number 6.1 (Reference 6.2)
- Bicon Frisk-Tech Environmental Management Radiological Guideline Number 6.5 (Reference 6.11)

4.3.2 Smear-counting instrumentation will have an unexpired "calibration due date" on the calibration label. In addition, performance tests will be conducted as specified in Environmental Management Radiological Guideline Number 6.3 (Reference 6.3) for alpha counters, and as specified in Environmental Management Radiological Guideline Number 6.4 (Reference 6.4) for beta counters.

4.4 Survey Precautions

4.4.1 Surgeon's gloves will be worn (and changed when contaminated or torn) when taking smears where loose surface contamination is present or suspected.

- When changing gloves, hands should be checked for contamination.
- A pair of cotton gloves may be worn under surgeon's gloves.
- Leather gloves will be worn when surveying rough or sharp edges or when drums are to be handled. Leather gloves may be worn over surgeon's gloves.

4.4.2 Smears and swipes taken from within a controlled area will be disposed of in the same manner as radioactive waste, in accordance with Rocky Flats Work Order WO-4034 (Reference 6.7).

4.4.3 If survey results indicate contamination levels exceeding the limits for the current area posting as specified in Tables I and II, take the following action:

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- Promptly post and control the area in accordance with Environmental Management Radiological Guideline Number 1.3 (Reference 6.5), Environmental Management Radiological Guideline Number 9.1 (Reference 6.6)
- Notify the Site Safety Officer (SSO)

4.4.4 Instruments used in contaminated or potentially contaminated areas should be wrapped or bagged ensuring the detectors' active area is not covered. Exercise caution when removing the covering to avoid contaminating the instruments.

5.0 INSTRUCTIONS

5.1 Requirements for Routine Contamination Survey of Areas

5.1.1 The frequency with which routine surface contamination surveys are to be performed will be determined jointly by the SSO and the EMRE.

5.2 Requirements for Contamination Surveys

5.2.1 A smear survey will be performed as part of each pre- and post-job survey required by project-specific documents, such as the contamination control portion of a Health and Safety Plan. Minimum smear density will be as follows:

- Pre-job, at least one smear in each one square meter of surface.
- Post-job, at least one smear in each one square meter of surface.

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5.2.2 Direct contamination survey of the localized affected area will be performed as part of each pre- and post-job survey. The post-job surveys will be performed over the affected area.

5.3 Direct Measurement Technique

5.3.1 Surfaces or items that have the potential for fixed contamination will be surveyed for such contamination before any work, movement, or handling of materials. Fixed contamination may readily become removable during such activities and must be identified so that proper precautions may be taken. Suspected surfaces or items may be identified in a guideline or a work permit, or by user personnel.

5.3.2 Use a Ludlum Model 12-1A count-rate instrument or its equivalent, equipped with an air proportional detector for measuring direct alpha activity.

5.3.3 Use a Ludlum Model 31 count-rate instrument or its equivalent, equipped with a GM pancake detector for direct measurement of beta/gamma activity.

5.3.4 Use a shoulder strap to carry a non-belted instrument while climbing a ladder, or use a length of rope to hoist the instrument up after ascending and achieving secure footing.

CAUTION: CARE SHOULD BE TAKEN TO AVOID CONTAMINATING THE SURVEY INSTRUMENT PROBE BY CONTACT WITH A CONTAMINATED SURFACE.

5.3.5 Sweep the detector over the surface at a maximum rate of 2 inches per second, holding the detector within approximately 1/4 inch of the surface for alpha, and within 1/2 inch of the surface for beta/gamma surveys.

5.3.6 If an increase in audible or meter response is noted, slow the scanning rate to locate the source of the increased count.

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5.3.7 Determine the area of maximum activity and hold the probe stationary for at least 5 seconds in order to take a measurement.

5.3.8 Record the instrument readings in counts per minute (cpm) on the Radiological Contamination Survey Form (Form 3.1A) in accordance with section 5.7.

5.4 Smear Technique

CAUTION: SMEAR SURVEYS ARE PERFORMED TO QUANTIFY REMOVABLE CONTAMINATION LEVELS.

5.4.1 Each smear paper will be numbered and correspond to a numbered location on a diagram or sketch showing the area or item surveyed.

WARNINGS:

USE CAUTION IN SURVEYING ROUGH SURFACES TO AVOID PERSONAL INJURY OR TEARING OF THE SMEAR PAPER.

HANDLE SMEAR PAPERS CAREFULLY TO PREVENT PERSONAL CONTAMINATION OR THE SPREAD OF CONTAMINATION.

5.4.2 Hold a smear paper between the thumb and fingers, with the back of the smear against the fingers. Place the face of the smear paper against the surface to be smeared.

5.4.3 Apply moderate pressure across the smear paper to ensure that at least one-half of the face of the smear comes in contact with the surface being surveyed.

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- 5.4.4 Each smear should be taken from an area of approximately 100 square centimeters (16 square inches).
- 5.4.5 Place each smear paper in a "fold-over" envelope container to prevent cross-contamination. If a "fold-over" envelope is not available, a glassine envelope may be used.
- 5.4.6 Smears from out of the way locations on equipment, and from other potential sources of contamination, should be obtained to ensure that a complete assessment of the area or item is made.
- 5.4.7 Smear non-uniform objects and/or surfaces such as odd shapes, interior surfaces, and small items, ensuring that these surfaces are adequately monitored and that the face of the smear paper has come in contact with a representative portion of the object.

NOTE: WET OR MOIST SMEARS SHOULD BE DRIED WITH A HEAT LAMP BEFORE COUNTING SO THAT ALPHA ACTIVITY WILL NOT BE MASKED.

- 5.4.8 Count the smears according to instructions provided in Environmental Management Radiological Guideline Number 6.3 (Reference 6.3) or Environmental Management Radiological Guideline Number 6.4 (Reference 6.4).
- 5.4.9 Record the measured contamination on the Radiological Contamination Survey Form (Form 3.1A). Additional preprinted pages with continuing prenumbered spaces for recording survey results will be used as needed.
- 5.4.10 To reduce or eliminate false positive results when counting alpha smears taken in areas where the limit is 20 disintegrations per minute (dpm) per 100 cm² (for Controlled and Uncontrolled Areas), the following steps will be followed when the initial count result is greater than 20 dpm but less than or equal to 60 dpm:

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- Count the smear three additional times
- Average the four counts and enter the average as the final result on the standard survey form

5.5 Baseline and Routine Surveys

5.5.1 Baseline and Routine Surveys for Removable Contamination

- Removable-contamination smear surveys on Contractor's vehicles and Contractor's trailer floors will be conducted monthly. These will be used by the EMRE for baseline comparison.
- Surveys are to be conducted per section 5.4 of this guidance. The smear density will be one smear per each 10 square meter area.

5.5.2 Baseline Surveys for Direct Contamination

- Fixed contamination of areas is not anticipated. In the event of such an occurrence, the EMRE will develop and define appropriate requirements for surveying direct contamination.

5.5.3 Baseline survey results will be documented on Radiological Contamination Survey Forms separate from the results recorded for routine surveys.

- The SSO will file the completed survey forms in a master survey binder kept in each Site Health and Safety office

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- Survey forms will be filed by area
- An index of each area in the trailer and the survey areas completed will be kept in the master survey binder

5.6 **Release for Unrestricted-Use Surveys** - Surveys of property to be released for unrestricted use will be performed as described in Environmental Radiological Guideline 3.2 (Reference 6.12) and in accordance with the following:

5.6.1 **Direct Surveys** - Perform direct surveys for fixed-plus removable contamination in accordance with Environmental Management Radiological Guideline Number 6.5 (Reference 6.11).

5.6.1.1 The Bicron Frisk-Tech scaler/ratemeter equipped with the A-100 alpha detector or B-50 beta/gamma detector, or its equivalent, may be used for unconditional release surveys.

5.6.2 **Removable Contamination Surveys** - Perform smear surveys for removable contamination in accordance with section 5.4 of this guidance.

5.6.3 **Documentation** - Complete the Radiological Survey Form (Form 3.1B) for each item surveyed. Multiple items may be grouped on a single survey form, space permitting.

5.6.3.1 Provide a sketch or written description of the property, noting survey locations. Provide the survey results corresponding to each survey location, in its appropriate place on the form.

5.6.3.2 Survey results for removable and fixed-plus removable contamination will be recorded in dpm/100 cm².

5.6.3.3 Ensure that surveys for release for unrestricted use include the item number from the Record of Property Leaving Radiologically Controlled Areas.

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5.6.3.4 Complete other documentation, labels and tags for the property as required by Environmental Management Radiological Guideline Number 3.2 (Reference 6.11) and Health and Safety Plan (HSP) 18.10 (Reference 6.12).

5.7 Records

5.7.1 Surveys will be documented accurately and legibly in black ink. The data will be recorded in sufficient detail to ensure that the meaning and intent of the record is clear. Ditto marks and continuation lines are not acceptable for repeated data. In all cases each specific number or < number must be recorded independently.

5.7.2 Any corrections made to the recorded entries on the Radiological Contamination Survey Form will be made by drawing a single line through the incorrect entry and recording the correct entry. The originator of the recorded entry will initial and date the entry. When it is not possible for the originator of the error to make the correction, the SSO may enter a correction followed by his/her initials and the date the correction is made.

5.7.3 Record the results on the survey form in the space provided, matching the smear results to the location marked on the survey diagram or sketch. Smear results will be reported in dpm/100 cm².

NOTE: A MINIMUM DETECTABLE ACTIVITY OF 250 CPM HAS BEEN ESTABLISHED FOR THE LUDLUM MODEL 12-1A SURVEY INSTRUMENT.

THE MINIMUM DETECTABLE ACTIVITY FOR THE EBERLINE SAC-4 SMEAR COUNTER IS 3 DPM. A RECORDED RESULT OF 0 INDICATES THE ACTIVITY IS $\geq 0 < 3$.

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- 5.7.4 All swipe survey results and direct readings equal to or greater than 250 cpm for alpha activity will be recorded as specific values. Survey results less than 250 cpm will be recorded as <250 cpm, the established minimum quantitative level for the Ludlum 12-1A instrument.
- 5.7.5 Beta/gamma results when using the Model 31 will be recorded as a specific number in counts per minute (cpm) above background. The background level will be recorded on the survey form.
- 5.7.6 Identify on the survey diagram any temporary (e.g., rope, tape) boundaries with the symbol: X--X--X--X, and the Radiological Area designation.
- 5.7.7 Identify on the survey diagram step-off pads with the symbol: \\\
- 5.7.8 In addition to radiological survey data, the following information will be provided on the survey form:
- Site and site identification number (or other specific identification)
 - Date and time survey initiated (if the survey is continued or completed on a shift, note this in the comments section after the date and time initiated)
 - Survey description: identify the purpose of the survey (e.g., routine, post decon, etc.) and area or item surveyed
 - Type(s) of instrument(s) used, their serial number(s), the date calibrated, the date calibration is due, and the date of last performance test
 - Signature(s) and employee number or social security number of individual(s) performing the survey

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- 5.7.9 Submit the completed survey form to the SSO for review. Unacceptable survey forms will be corrected and promptly resubmitted.
- 5.7.10 A qualified SSO will countersign in the left margin of the survey form for all surveys performed by a HSS.
- 5.7.11 Copies of completed and approved survey forms will be posted at entrances to Radiological Areas and storage areas, as applicable. The original survey form will be retained in the Contractor's office for EMRE review.
- 5.7.12 A copy of the survey will be retained in the Site Health and Safety Office.

6.0 REFERENCES

- 6.1 Environmental Management Radiological Guideline Number 6.1, Performance Test and Operational Checks for Ludlum Models 12-1A and 31 Survey Instruments
- 6.2 Environmental Management Radiological Guideline Number 6.3, Performance Checking and Operating of Alpha-Scintillation Smear Counting Instrumentation
- 6.3 Environmental Management Radiological Guideline Number 6.4, Performance Testing and Operation of the Eberline BC-4 Beta Smear Counting Instrumentation
- 6.4 Environmental Management Radiological Guideline Number 1.3, Posting of Radiation Protection Requirements
- 6.5 Environmental Management Radiological Guideline Number 9.1, Respiratory Protection Requirements and Posting

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- 6.6 WO-4034, Waste Packaging Requirements
- 6.7 Environmental Management Radiological Guideline Number 1.2, Beta Radiation Surveys
- 6.8 Environmental Management Radiological Guideline Number 10.1, Radiological Deficiency Reporting Program
- 6.9 RE-0503, Frequency and Location Criteria for Radiation and Contamination Surveys
- 6.10 Environmental Management Radiological Guideline Number 6.5, Use of the Bicron Frisk-Tech with the A-100 and B-50 Detectors
- 6.11 Environmental Management Radiological Guideline Number 3.2, Survey Requirements for Conditional and Unrestricted Use
- 6.12 HSP 18.10, Release of Property for Conditional and Unrestricted Use
- 7.0 TABLES
- 8.0 FORMS

TABLES I AND II

TABLE I: ALPHA LIMITS			
Area	Removable		Total Fixed Plus Removable (dpm/100 cm²)
	Smears (dpm/100 cm²)	Swipes (dpm)	
Uncontrolled	20	N/A	300 ²
Controlled	20	N/A	300 ²
Radiological	200	500 ¹	3000 ²

TABLE II: BETA/GAMMA LIMITS		
Area	Removable Smear (dpm/100 cm²)	Total Fixed Plus Removable (dpm/100 cm²)
Uncontrolled	200	5,000 ³
Controlled	200	5,000 ³
Radiological	1,000	5,000 ³

- ¹ Minimum detectable activity using the Ludlum Model 12-1A with air proportional detector. Total efficiency (instrument and detector) is 50 percent or as indicated on the calibration sticker. 250 cpm equals 500 dpm. No activity per area is specified since swipes are not used to quantify activity levels.
- ² 300 dpm/100 cm² is the DOE Limit for Uncontrolled and Controlled Areas. 3000 dpm/100 cm² is the DOE Limit for Radiological Areas. The minimum detectable activity using the Ludlum Model 12-1A with air proportional detector of approximately 50 cm² is 1000 dpm/100 cm² which corresponds to a 250 cpm instrument meter reading of 500 dpm.
- ³ 5000 dpm/100 cm² is the DOE Limit for Uncontrolled and Controlled Areas and is the Rocky Flats Limit for Radiological Areas. The minimum detectable activity (MDA) using the Ludlum Model 31 rate meter with the 44-9 pancake GM detector is 5000 dpm/100 cm². This corresponds to a meter reading of 200 cpm. The maximum allowed background for this MDA is 100 cpm with the instrument range switch on the X1 setting.

ATTACHMENT 9.2

**RADIOLOGICAL
Contamination Survey**

Taken by: _____ Emp. #/SSAN _____
signature

Taken by: _____ Emp. #/SSAN _____
signature

Taken by: _____ Emp. #/SSAN _____
signature

Date: _____	Building: _____	Survey Description: _____ _____ _____
Time: _____	Room #: _____	
Shift: _____		
		Diagram/Sketch Attached: <input type="checkbox"/> Yes <input type="checkbox"/> No

INSTRUMENTATION USED

Smear Counters

Mfg:	_____	_____	_____	_____	_____
Model:	_____	_____	_____	_____	_____
Serial #:	_____	_____	_____	_____	_____
Date Calib'd:	_____	_____	_____	_____	_____
Cal. Due Date:	_____	_____	_____	_____	_____
Mfg:	_____	_____	_____	_____	_____
Model:	_____	_____	_____	_____	_____
Serial #:	_____	_____	_____	_____	_____
Date Calib'd:	_____	_____	_____	_____	_____
Cal. Due Date:	_____	_____	_____	_____	_____

Survey Instruments

Mfg:	_____	_____	_____	_____	_____
Model:	_____	_____	_____	_____	_____
Serial #:	_____	_____	_____	_____	_____
Date Calib'd:	_____	_____	_____	_____	_____
Cal. Due Date:	_____	_____	_____	_____	_____
Background:	_____	_____	_____	_____	_____

COMMENTS

Status:
 Within Limits
 Limits Exceeded
 Posted
 Deposted

SSO:

 Signature Date

**RADIOLOGICAL
Contamination Survey**

RESULTS

Date: _____ Time: _____ Building: _____ Room: _____

	<u>Initial</u>			<u>Resurvey</u>		
	cpm Removable (Swipe)	cpm Direct	dpm/100cm ² Removable (Smear)	cpm Removable (Swipe)	cpm Direct	dpm/100cm ² Removable (Smear)
1.	_____	_____	_____	1.	_____	_____
2.	_____	_____	_____	2.	_____	_____
3.	_____	_____	_____	3.	_____	_____
4.	_____	_____	_____	4.	_____	_____
5.	_____	_____	_____	5.	_____	_____
6.	_____	_____	_____	6.	_____	_____
7.	_____	_____	_____	7.	_____	_____
8.	_____	_____	_____	8.	_____	_____
9.	_____	_____	_____	9.	_____	_____
10.	_____	_____	_____	10.	_____	_____
11.	_____	_____	_____	11.	_____	_____
12.	_____	_____	_____	12.	_____	_____
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18.	_____	_____	_____	18.	_____	_____
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23.	_____	_____	_____	23.	_____	_____
24.	_____	_____	_____	24.	_____	_____
25.	_____	_____	_____	25.	_____	_____
26.	_____	_____	_____	26.	_____	_____
27.	_____	_____	_____	27.	_____	_____
28.	_____	_____	_____	28.	_____	_____
29.	_____	_____	_____	29.	_____	_____
30.	_____	_____	_____	30.	_____	_____
31.	_____	_____	_____	31.	_____	_____
32.	_____	_____	_____	32.	_____	_____
33.	_____	_____	_____	33.	_____	_____
34.	_____	_____	_____	34.	_____	_____
35.	_____	_____	_____	35.	_____	_____
36.	_____	_____	_____	36.	_____	_____
37.	_____	_____	_____	37.	_____	_____
38.	_____	_____	_____	38.	_____	_____
39.	_____	_____	_____	39.	_____	_____
40.	_____	_____	_____	40.	_____	_____
41.	_____	_____	_____	41.	_____	_____
42.	_____	_____	_____	42.	_____	_____
43.	_____	_____	_____	43.	_____	_____
44.	_____	_____	_____	44.	_____	_____
45.	_____	_____	_____	45.	_____	_____

RADIOLOGICAL SURVEY FORM

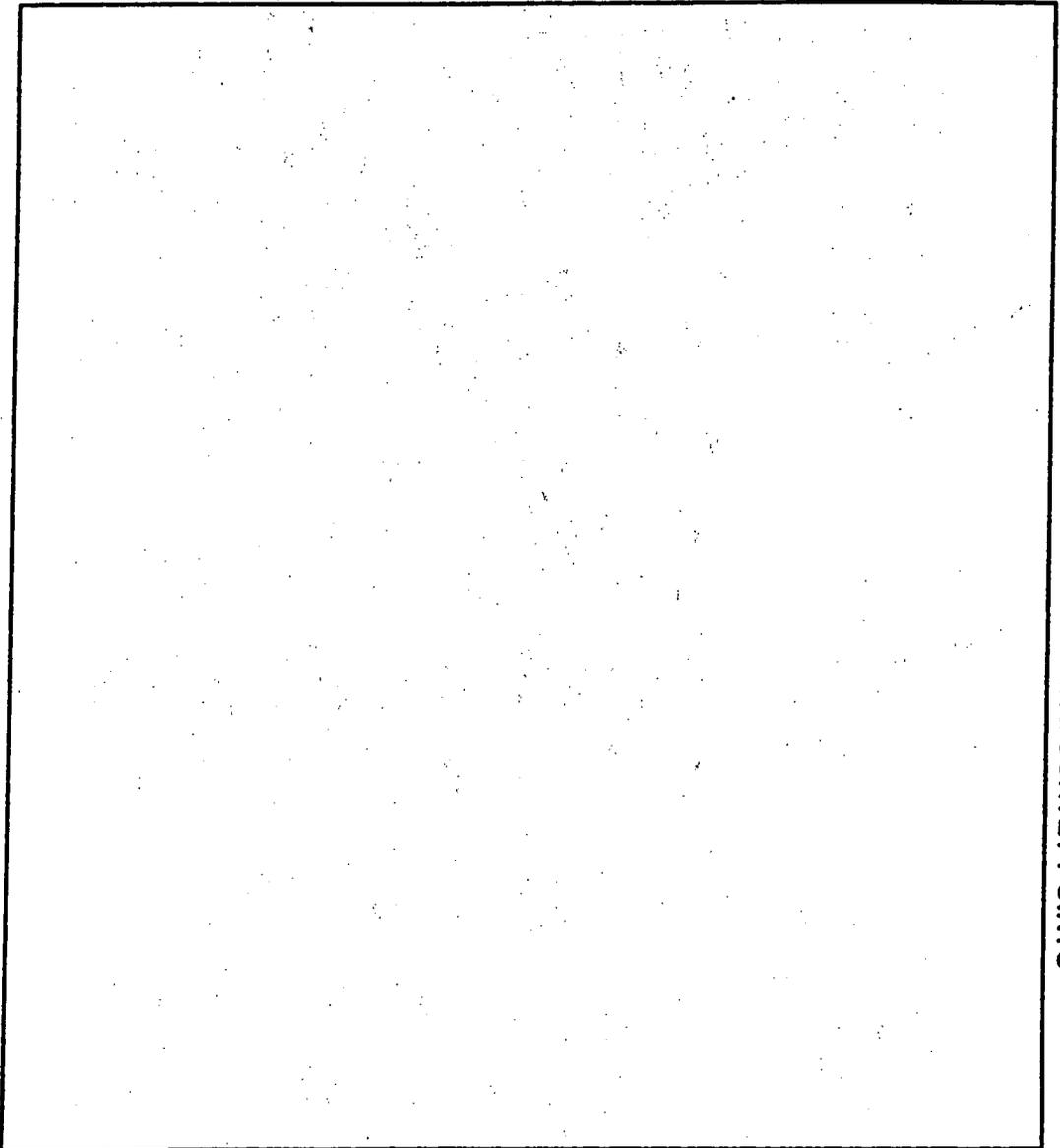
RADIOLOGICAL SURVEY

BUILDING/ROOM/LOCATION/ITEM NO.		DATE	TIME	SHIFT				
Survey by: Signature _____ /Employee # or SSAN _____								
Instruments Used:								
Smear Counters		Survey Instruments						
Mfg/Model								
Serial #								
Cal. Date								
Cal. Due Date								
Reason for Survey:								
Sketch of Item/Area		Survey Results Contamination dpm/100cm ²						
		Smear #	Smear Location/Description	Removable		g/cm ²	Fixed & Removable	
				Alpha	Beta/Gamma		Alpha	Beta/Gamma
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						10		
						11		
				12				
				13				
				14				
Background Beta/Gamma _____ Background Alpha _____ cpm/Scaler Factor Beta/Gamma _____ cpm/Scaler Factor Alpha _____ Location Key: O Smear □ Beta/Gamma Dose Rate △ Neutron Dose Rate • Contact Dose Rate		Radiation (mr/h)						
				Beta/Gamma	Neutron	Total		
					△			
					△			
					△			
					△			
					△			
					△			
					△			
					△			
					△			
					△			
					△			
					△			
		Status -Within Limits -Limits Exceeded						
Reviewed by: _____		Date _____						
SSO Signature		Date						

RADIOLOGICAL SURVEY FORM

Smear #	Smear Location/Description	Removable		Location	Removable + Fixed		Smear #	Smear Location/Description	Removable		Location	Removable + Fixed	
		Alpha	Beta		Alpha	Beta			Alpha	Beta		Alpha	Beta
				14									
				15									
				16									
				17									
				18									
				19									
				20									
				21									
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				56									
				57									
				58									
				59									
				60									

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

= Direct Frisk Location

= Smear Survey Location

REVIEWED BY: _____

DATE: _____

SURVEY REQUIREMENTS FOR CONDITIONAL AND UNRESTRICTED USE

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

Manual: 3-21000-OPS-EMRG
Guideline No.: 3.2, R.0
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Effective Date: December 6, 1991
Organization: Environmental Management

Category 2

**TITLE:
SURVEY REQUIREMENTS FOR CONDITIONAL
AND UNRESTRICTED USE**

Approved By:

CONTROLLED DOCUMENT
 EG&G -- ROCKY FLATS PLANT
 ENVIRONMENTAL MANAGEMENT DEPARTMENT

[Signature] 1/6/92
 (Radiological Engineering) For G. Maidner (Date)
[Signature] 1/6/92
 (Remediation Programs) (Date)
[Signature] 1/6/92
 (Environmental Operations Manager) (Date)

This is a RED Stamp

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REVIEWED FOR CLASSIFICATION/UCNI

By *[Signature]*
 Date 1/7/92

SURVEY REQUIREMENTS FOR CONDITIONAL AND UNRESTRICTED USE

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EM RADIOLOGICAL GUIDELINES

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2.0 PURPOSE

To establish the survey, control, and documentation requirements for property/material to be released from Radiologically Controlled Areas and specified Uncontrolled Areas where Subcontractors are performing work under the Environmental Management Program. Uncontrolled Areas are those which are below the limits specified in Tables I and II of the Standard Operating Procedure (SOP) 3.1, or work areas for which potential radiological contamination has not been identified.

3.0 SCOPE

This instruction specifies the criteria to be used for Conditional Release and Release for Unrestricted Use of property/material from Radiologically Controlled Areas. The documentation requirements for radiological property control and movement are also described.

4.0 GENERAL

4.1 Instrumentation

4.1.1 Release for unrestricted-use surveys of equipment, materials, and property, will be performed by using the instruments in this subsection or instruments of equivalent sensitivity to the type of radiation being measured. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

- Total Fixed-plus Removable Alpha Contamination
Bicron Frisk-Tech with Model #A-100 Detector

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- Total Fixed-plus Removable Beta/Gamma Contamination
Bicron Frisk-Tech with Model #B-50 Detector

- Removable Alpha Contamination
Eberline SAC-4

- Removable Beta/Gamma Contamination
Eberline BC-4

4.1.2 A conditional release survey will be performed with instrumentation capable of detecting fixed-plus removable and removable contamination at or below the limits in section 4.2.2.

4.2 Surface Contamination Limits

4.2.1 Release for Unrestricted Use

<u>Contamination</u>	<u>Removable</u>	<u>Total Fixed-plus Removable</u>
Alpha	20 dpm/100 cm ²	300 dpm/100 cm ²
Beta/Gamma	200 dpm/100 cm ²	1000 dpm/100 cm ²

4.2.2 Conditional Release

<u>Contamination</u>	<u>Removable</u>	<u>Total Fixed-plus Removable</u>
Alpha	20 dpm/100 cm ²	250 cpm with Ludlum 12-1A
Beta/Gamma	200 dpm/100 cm ²	100 net cpm with Ludlum 31 and pancake detector

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4.3 Performance of Surveys

4.3.1 Surveys for removable surface contamination will be performed and documented in accordance with Environmental Management Radiological Guideline Number 3.1 (Reference 6.3).

4.3.2 Surveys for Total Fixed-plus Removable Contamination will be performed in accordance with Environmental Management Radiological Guideline Numbers 3.1 (Reference 6.3) or 6.5 (Reference 6.4).

4.4 Unconditional Release of Property

4.4.1 All property leaving Radiologically Controlled Areas (RCAs) will be controlled as potentially contaminated and will not be released for unrestricted use until it has been surveyed and meets the release limits specified in section 4.2.1, or until it is evaluated by Radiological Engineering (RE) as suitable for release as specified in section 4.5.

4.4.2 Potentially contaminated property outside an RCA will require survey and/or evaluation prior to unconditional release.

4.5 Evaluation of Property to be Released for Unrestricted Use

4.5.1 Property will be treated as potentially contaminated if it has been used or stored in a manner in which surface contamination above allowable limits is possible.

4.5.2 Where potentially contaminated surfaces are not accessible for measurement of activity (as in electronic components and equipment, SAAMs), property may be released after a case-by-case evaluation. Documentation based on both the history of its use and available measurements will demonstrate that the unsurveyable surfaces are likely to be within the limits specified in section 4.2.1. The following practices are considered acceptable to determine the extent and magnitude of surface contamination:

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- 4.5.2.1 The item may be dismantled, to the extent necessary, to permit the surveying of potentially contaminated surfaces.
- 4.5.2.2 Items routinely hand-carried into an RCA (such as paperwork, pager, radio, watches rings, etc.) will be subjected to the same controls as personnel monitoring in accordance with HSP 18.02 (Reference 6.7); however, a documented property history is not required for release of routinely hand-carried items.
- 4.5.2.3 Property having the potential for the distribution of radioactive materials within its matrix (i.e., liquids, oil, etc.) will be sampled as directed by Radiological Engineering and analyzed for radioactivity. Release Criteria is specified in RE-1003 (Reference 6.1).
- 4.5.2.4 Property which has painted or coated surfaces other than original manufacturer's coatings will be evaluated to determine whether or not the activity in or under the coating exceeds the limits specified in section 4.2.1. Oil, grease, and other coatings that could mask surface contamination will be sufficiently removed to ensure contamination has not been masked prior to surveying.
- 4.5.3 If the property to be released cannot be adequately surveyed to demonstrate compliance with this guideline, the property will be retained and controlled as contaminated or potentially contaminated and the Environmental Management Radiological Engineer (EMRE) notified.
- 4.5.3.1 The EMRE will provide a written evaluation of the property based on history and the survey techniques to be employed, in accordance with RE-1003 (Reference 6.1).
- 4.6 Radiological Requirements for Property Leaving an RCA - The radiological documentation, labeling, and tagging requirements for property leaving an RCA, as specified in the body of this guide, are presented in a summary fashion in Form 3.2B. It should be noted that the attachment only addresses radiological requirements and that other property control measures, not contained within the scope of this guide, may apply.

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5.0 INSTRUCTIONS

5.1 Property Leaving an RCA

5.1.1 For each item leaving an RCA (except routinely hand-carried items described in section 4.5.2.2, waste containers, and laundry as described in sections 5.4 and 5.5), assign the next available item number on Form 3.2A, the Record of Property Leaving Radiologically Controlled Areas (RCAs).

5.1.1.1 Item numbers are a nine digit numeral sequentially assigned by individual hazardous substance site (IHSS) and year.

- The first four digits denote the IHSS number from which the material came.
- The fifth and sixth digits denote the year of survey.
- The last three digits are a sequential numbering by item.
- Each group is separated by a dash.
- For example, the tenth item surveyed in 1990 from IHSS 216.2 would be 216.2-90-0010.

5.1.2 Ensure the user/sender has completed the white portion of the Material Transfer Tag (Form 3.2C).

5.1.3 Request that the user/sender includes the property description, user name, destination, and recipient name on the Record of Property Leaving RCAs (Form 3.2A).

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5.1.4 Survey the property for surface contamination in accordance with Environmental Management Radiological Guideline Number 3.1 (Reference 6.3) and Environmental Management Radiological Guideline Number 6.5 (Reference 6.4).

5.1.4.1 Fixed-plus removable contamination surveys will employ the PAT/Increment technique described in Environmental Management Radiological Guideline Number 6.5 (Reference 6.4) for property leaving an RCA. Property within buildings designated by Radiological Engineering in Uncontrolled Areas (HSP 18.10, Reference 6.6) are also subject to this requirement. Property within the security area surrounding designated buildings may be surveyed by the scan technique described in Environmental Management Radiological Guideline Number 6.5 (Reference 6.4). The scan will include all accessible surfaces.

5.1.4.2 If the item cannot be completely surveyed, refer to section 4.5 of this guideline for any requirements.

5.1.4.3 Obtain material samples or special surveys as requested by Radiological Engineering in accordance with RE-1003 (Reference 6.1).

5.1.5 Enter the survey instrument numbers and survey results on the Record of Property Leaving RCAs (Form 3.2A).

5.1.5.1 Removable and Total Fixed-plus Removable Contamination survey results will be entered in units of dpm/100 cm². Minimum detectable activity levels are:

Frisk-Tech/A-100	<300 dpm/100 cm ²
Frisk-Tech/B-50	<1000 dpm/100 cm ²

5.2 Unconditional Release of Property - If survey results are below the limits specified in section 4.2.1, the item may be released for unrestricted use.

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- 5.2.1** Check the unconditional release block on the Record of Property Leaving RCAs (Form 3.2A), and sign and date the entry providing your employee number or social security number.
- 5.2.2** Complete a Property Release Approval for Unrestricted Use Label/Tag (Form 3.2D) noting date of survey and property description. Include the item number from the Record of Property Leaving RCAs. Submit the label/tag to the EMRE, or a designated alternate, for signature. Attach the label/tag to the item or to the property paperwork.
- 5.2.3** Complete the green portion of the Material Transfer Tag (Form 3.2C). The "valid until" date and time are determined as follows:
- If the item is located within a Radiological Area (RA), it should be removed immediately, or by no later than the end of the work shift, unless otherwise directed by the Site Safety Officer (SSO).
 - If the item is located in an RCA, it should be removed immediately, but no later than, midnight (2400 hrs.) on the day surveyed.
- 5.2.4** If the validity period is permitted to expire, the SSO or the EMRE will specify verification survey requirements based on the potential for recontamination of the item's surfaces.
- 5.3** Conditional Release from RCAs - If survey results exceed the limits specified in section 4.2.1, control the item as contaminated.
- 5.3.1** Package the item to contain any surface contamination during transfer through the Uncontrolled Areas as per HSP 18.10 (Reference 6.6). Uncontained property will be less than the conditional release limits specified in section 4.2.2.

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- 5.3.2** Ensure the item's intended destination is a Radiological Area (RA).
- 5.3.2.1** If the destination is other than an RA, (such as an RCA) notify the SSO. The SSO will ensure the item and/or its intended storage area are added to the Routine Survey Schedule.
- 5.3.3** Label or tag the item to alert personnel to its radioactive status as required by Environmental Management Radiological Guideline Number 1.3 (Reference 6.5).

NOTE: AIR SAMPLE FILTERS ARE EXEMPT FROM TAGGING AND LABELING REQUIREMENTS OF THIS PROCEDURE WHEN HAND-CARRIED BY SUBCONTRACTOR HEALTH AND SAFETY PERSONNEL. THE CONTAINER EXTERIOR SURFACES WILL MEET THE LIMITS OF 4.2.2 ABOVE.

- 5.3.4** Check the conditional release block on the Record of Property Leaving RCAs (Form 3.2A). Sign and date the entry providing your social security or employee number.
- 5.3.5** Complete a Property Conditional Release Tag (Form 3.2E). Make note of the item number, property description, receipt organization, location, and responsible individual. Complete survey date/time and signature/social security or employee number blocks.
- 5.3.5.1** Specify any special handling, transportation, and storage precautions for the item.
- 5.3.5.2** The EMRE will provide any additional precautions and sign the Conditional Release Tag, noting approval.
- 5.3.6** Affix the Property Conditional Release Tag (Form 3.2E) to the item.

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5.3.7 In the green portion of the Material Transfer Tag (Form 3.2C) signature block, write "See Property Conditional Release Tag." Note, in the yellow portion, that the item is radioactive material and specify any precautions to be taken during transportation.

5.4 **Waste and Material Containers** - Radioactive waste and material containers are conditionally released from an RCA and labeled in accordance with the On-site Transportation of Radioactive and Hazardous Materials Manual (Reference 6.8). Copies of the documented survey results will be turned over to Waste Operations personnel. Completion of the Record of Property Leaving an RCA (Form 3.2A) is not required for waste and material containers transferred to Waste Operations.

5.4.1 The radiation and contamination limits for drums and boxes transferred to Waste Operations are as follows:

<u>Contamination</u>	<u>Removable</u>	<u>Total Fixed-Plus Removable</u>
Alpha	20 dpm/100 cm ²	250 cpm with Ludlum 12-1A
Beta/Gamma	200 dpm/100 cm ²	Not applicable
<u>Radiation</u>	<u>Contact</u>	<u>At 1 Meter</u>
Gamma	200 mR/h	10 mR/h

5.4.2 **Surface Contamination** - Perform surface contamination surveys for fixed-plus removable alpha by using the Ludlum 12-1A. Removable contamination will be determined using the following smear density.

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- Drums - Three smears: one each, taken from the top, bottom, and the side.
- Boxes - Ten smears: two each, taken from the top, bottom, and the sides; and one taken from each end.

5.4.3 Gamma Surveys - Using an ion chamber instrument, survey the entire surface of the container (top, sides, ends, and bottom). Additional readings will be taken at 30 cm and one meter from the point of the highest surface reading.

5.4.3.1 Background radiation levels should not exceed 0.5 milliroentgen (mR/h) in the survey area, and will be subtracted from measured levels before recording.

5.4.4 Survey Results

If survey results exceed the above limits, notify the SSO.

5.4.5 If survey results are within the limits of section 5.4.1, complete the green portion of the Material Transfer Tag (RF-13070, Form 3.2C) and note, in the yellow portion, that the item is radioactive material. Specify any precautions to be taken during transportation.

5.5 Laundry - Laundry (protective clothing and respirators) leaving an RCA for cleaning and re-issue, will be surveyed, bagged, packaged, and labeled with a Material Transfer Tag and a Conditional Release Tag (Forms 3.2C and 3.2E). In addition, the exterior surfaces of the outmost packaging will be less than the limits for surface contamination specified in section 5.2.2.

5.5.1 Laundry will not be released for unrestricted use, unless surveyed and released in accordance with sections 5.1 and 5.2.

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5.5.2 Completion of the Record of Property Leaving RCAs (Form 3.2A) is not required for laundry.

5.5.3 Contaminated laundry will be disposed of as low level waste (LLW) and will not be sent for laundering/decontamination (Reference 6.9).

6.0 REFERENCES

6.1 RE-1003, Evaluation for Release of Property

6.2 DOE Order 5400.5, Radiation Protection of the Public and the Environment

6.3 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

6.4 Environmental Management Radiological Guideline Number 6.5, Use of the Bicon Frisk-Tech with the A-100 and B-50 Detectors

6.5 Environmental Management Radiological Guideline Number 1.3, Posting of Radiation Protection Requirements

6.6 HSP 18.10, Release of Property for Conditional and for Unrestricted use

6.7 HSP 18.02, Personnel Contamination Control Requirement for Radiologically Controlled Area

6.8 On-site Transportation of Radioactive and Hazardous Materials Manual

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6.9 EMD SOP FO.6, REV. 1, Handling of Personal Protective Equipment

7.0 FORMS

RADIOLOGICAL DOCUMENTATION, LABELING AND TAGGING REQUIREMENTS FOR PROPERTY LEAVING AN RCA

REQUIREMENT

	Record of Property Leaving the RCA	Material Transfer Tag	Property Release Approval For Unrestricted Use Tag/Label	Property Condition Release Tag	Property Release Evaluation (RE1003)	Label or Tag IAH EMRG 1.3
ITEM						
A. Items Meeting Release Criteria						
1. Items routinely hand carried into the RCA (i.e., pagers, paperwork, jewelry, radio, etc.)	No	No	No	No	No	No
2. Equipment, material parts not routinely hand carried into the RCA	Yes	Yes	Yes	N/A	(Note 1)	No
B. Items Not Meeting Release Criteria						
1. Item routinely hand carried into the RCA (i.e., pager, paperwork jewelry, radio, etc.)	Yes	Yes (Note2)	N/A	Yes (Note3)	N/A	Yes
2. Equipment, material parts not routinely hand carried into the RCA	Yes	Yes	N/A	Yes (Note3)	N/A	Yes
3. Controlled laundry (coveralls, respirators,	No	Yes	N/A	No (Note4)	N/A	Yes
4. Waste & material drums/crates	No (Note4)	Yes	N/A	No (Note4)	N/A	Yes (Note5)
5. Air sample filters (When hand carried by an HSS)	No	No	N/A	No	N/A	No

NOTE 1 Required if all surfaces were not accessible for survey, for items with the potential for radioactive material distributed within its matrix (oil, liquid), for items with other than original manufacturers coatings.

NOTE 2 Unless approval to hand carry the item is granted by Radiological Engineering, and criticality Engineering as required. Approval by Traffic is required outside the PSZ.

NOTE 3 Radiological Operations Supervision or Radiological Engineering approval is required for Conditional Release of Property to any area other than an RA.

NOTE 4 Only if being transferred directly to the laundry or Waste Operations custody. Otherwise, document and tag in accordance with B.1 above.

NOTE 5 Label/Tag is supplied by the operating group.

MATERIAL TRANSFER

CONDITIONAL USE ONLY

Item(S) _____
Quantity and Description _____

TRANSFER TO: _____
Name _____

Organization _____ Building & Room _____ Extension _____

TRANSFER FROM: _____
Name _____

Organization _____ Building & Room _____ Extension _____

The above described item(s) was approved for noncontrolled transfer on the Rocky Flats Plant site only, in accordance with HSP 18.10.

Approval Signature of Radiation Protection _____ Employee # _____ Date _____

NOTE: Recipient May Remove Tag Upon Receipt.

The above described item(s) was approved for controlled transfer on the Rocky Flats Plant site only, in accordance with HSP 18.10.

Approval Signature of Radiation Protection _____ Employee # _____ Date _____

RADIOLOGICAL HAZARDS
AND
 RADIOLOGICAL CONTROLS

are listed on the reverse of this tag.

Maintaining Control of the Above Described Item(s) is the Responsibility of the Custodian.

Signature of Custodian _____ Employee # _____ Date _____

RADIOLOGICAL HAZARDS

Survey Record Item No. _____		
Removable Contamination	α _____	dpm/100 cm ²
	β-γ _____	dpm/100 cm ²
Fixed & Removable Contamination	α _____	dpm/100 cm ²
	β-γ _____	dpm/100 cm ²
Gamma Dose Rate @ 30 cm	_____	mR/hr
Neutron Dose Rate @ 30 cm	_____	mrem/hr
RPT _____	Employee # _____	Date _____

RADIOLOGICAL CONTROLS

<input type="checkbox"/> Controlled Use in RCA (HSP 18.10) <ul style="list-style-type: none"> <input type="checkbox"/> Control Procedure Accepted (HSP 18.10) Procedure No. _____ <input type="checkbox"/> Daily Survey Required (ROI 3.02) <input type="checkbox"/> Transfer Between Radiological Areas (HSP 18.10) <input type="checkbox"/> Containment Accepted (HSP 18.10) 			
<input type="checkbox"/> Controlled - Unable to Survey (HSP 18.10) <ul style="list-style-type: none"> <input type="checkbox"/> Containment Accepted (HSP 18.10) <input type="checkbox"/> Control Procedure Accepted (HSP 18.10) Procedure No. _____ <input type="checkbox"/> Daily Survey Required (ROI 3.02) 			
<input type="checkbox"/> Radiological Engineering Concurrence <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">Radiological Engineer Signature</td> <td style="width: 20%; border-bottom: 1px solid black;">Employee #</td> <td style="width: 30%; border-bottom: 1px solid black;">Date</td> </tr> </table>	Radiological Engineer Signature	Employee #	Date
Radiological Engineer Signature	Employee #	Date	

Comments: _____

PROPERTY RELEASE APPROVAL FOR UNRESTRICTED USE

ITEM NO. _____

PROPERTY RELEASE APPROVAL
FOR UNRESTRICTED USE

DATE SURVEYED _____

HSS SIGNATURE _____

SSAN OR EMP. NO. _____

PROPERTY DESCRIPTION _____

PROPERTY CONDITIONAL RELEASE

ITEM NO. _____

PROPERTY CONDITIONAL RELEASE

RELEASED TO: _____	_____	_____
ORGANIZATION	LOCATION	NAME

DATE/TIME OF SURVEY _____

HSS SIGNATURE/ SSAN OR EMP. NO. _____

PROPERTY DESCRIPTION _____

SPECIAL PRECAUTIONS _____

APPROVAL: _____
SIGNATURE ENVIRONMENTAL MANAGEMENT RADIOLOGICAL ENGINEER (EMRE) SSAN OR EMP. NO.

PROPERTY RELEASE EVALUATION

ITEM NUMBER _____

PART I

(From Record of Property Leaving The RCA)

Description of Property to be Released _____

PART II

A. Property History _____

B. User/Sender: _____

Signature

Employee No. _____

Date: _____

Extension: _____

Page No. _____

=====

PART III

A. Radiological Engineering Evaluation _____

B. Survey/Sample Methods to be Used _____

C. Release Criteria _____

D. Evaluated By: _____

Radiological

Eng.: Signature _____

Employee No. _____

Date: _____

Extension: _____

HANDLING OF CONTAMINATED DOSIMETRY/SECURITY BADGES

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

Manual: 3-21000-OPS-EMRG
Guideline No.: 3.5, R.0
Page: 1 of 4
Effective Date: December 6, 1991
Organization: Environmental Management

Category 2

TITLE:
HANDLING OF CONTAMINATED DOSIMETRY/
SECURITY BADGES

CONTROLLED DOCUMENT

EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

This is a RED Stamp

Approved By:

[Signature] 1/6/92
 (Radiological Engineering) For G. M. Aldrich (Date)

[Signature] 1/6/92
 (Remediation Programs) (Date)

[Signature] 1/6/92
 (Environmental Operations Manager) (Date)

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REVIEWED FOR CLASSIFICATION/UCNI
 By *[Signature]*
 Date 1/7/92

HANDLING OF CONTAMINATED DOSIMETRY/SECURITY BADGES

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

Manual: OPS
Guideline No.: 3.5
Page: 2 of 4
Effective Date: December 6, 1991
Organization: Environmental Management

Category 2

2.0 PURPOSE

To provide requirements for the handling of radioactively contaminated dosimetry and security badges.

3.0 SCOPE

This instruction provides the requirements for the decontamination or disposition of contaminated body dosimetry badges and security badges, and for the documentation of badge contamination.

4.0 GENERAL

4.1 Decontamination of Badges - Employees should be requested to make a reasonable effort to decontaminate their assigned badges.

4.2 Contaminated Badges - Plant Protection is responsible for verifying the disposal of contaminated security badges and for escorting employees needing a replacement security badge.

4.3 Dosimetry Badge - Employees will not be permitted in a Radiologically Controlled Area (RCA) without proper dosimetry badge(s).

4.4 Contamination Limits - Contamination limits are specified in Environmental Management Radiological Guideline Number 3.2, Survey Requirements for Conditional and Unrestricted Use (Reference 6.1).

5.0 INSTRUCTIONS

5.1 Specific Contamination of Badges - Detectable contamination observed on dosimetry and/or security badges of personnel exiting from radiological areas, or contamination on dosimetry badges from the badge-change cases, will be handled in a manner specific for each badge.

HANDLING OF CONTAMINATED DOSIMETRY/SECURITY BADGES

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

Manual: OPS
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Organization: Environmental Management

Category 2

5.2 Contaminated Panasonic Body Dosimetry Badges - Contaminated Panasonic body dosimetry badges will be handled in the following manner:

5.2.1 Have the employee wipe the outside of the badge with a Kimwipe moistened with water or alcohol.

5.2.2 Resurvey the badge. If contamination has been reduced to background levels, return the badge to the employee or the badge-change case.

5.2.3 If the badge is still contaminated, open the badge and remove the dosimeter cartridges (Figure 3.5B).

5.2.4 Arrange for the employee to decontaminate the badge. If the badge cannot be completely decontaminated, contact the Environmental Management Radiological Engineer (EMRE) for guidance and a replacement badge.

5.2.5 Survey the cartridges and, if no contamination is detected, enclose in a plastic bag marked with the employee's name and employee number or social security number. If the employee is present, instruct the employee to take the bagged cartridges to EG&G External Dosimetry and request that a new badge be issued and the bagged cartridges inserted. If the employee is not present, place bag in the badge-change board with notification to obtain a new badge from External Dosimetry and insert the bagged cartridges.

5.2.6 If the dosimetry cartridges are contaminated, enclose in a plastic bag marked with the employee name and number and contact the EMRE for guidance.

5.3 Contaminated Security Badges - Contaminated security badges will be handled in the following manner:

5.3.1 Have the employee wipe the outside of the badge with a Kimwipe moistened with water or alcohol.

HANDLING OF CONTAMINATED DOSIMETRY/SECURITY BADGES

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

Manual: OPS
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Organization: Environmental Management

Category 2

5.3.2 Resurvey the badge. If contamination has been reduced to background levels, return the badge to the employee.

5.3.3 If the badge is still contaminated, place it in a plastic bag.

5.3.4 Mark the contamination level on the bag.

5.3.5 The Site Safety Officer (SSO) will notify and request Plant Protection to visually verify disposal of the badge in a manner consistent with the disposal of contaminated radioactive waste. Plant Protection will also escort the employee to obtain a replacement badge.

5.4 Documentation of Badge Contamination - Every occurrence of badge contamination will be documented in a Radiation Deficiency Report in accordance with Environmental Management Radiological Guideline Number 10.1 (Reference 6.3).

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 3.2, Survey Requirements for Conditional and Unrestricted Use

6.2 Environmental Management Radiological Guideline Number 6.3, Performance Checking and Operation of Alpha-Scintillation Smear Counting Instrumentation

6.3 Environmental Management Radiological Guideline Number 10.1, Radiological Deficiency Reporting Program

7.0 FIGURES

FIGURE 3.5A

WRIST BADGE

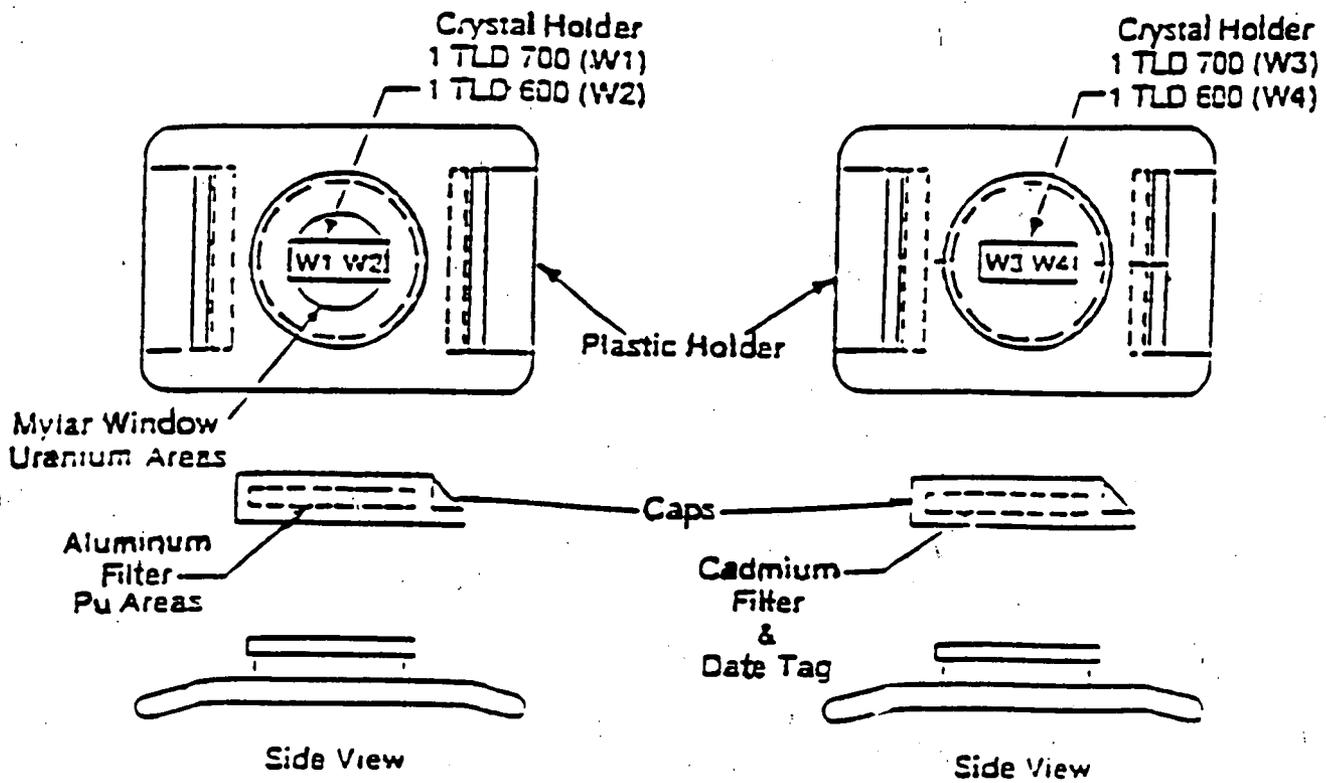
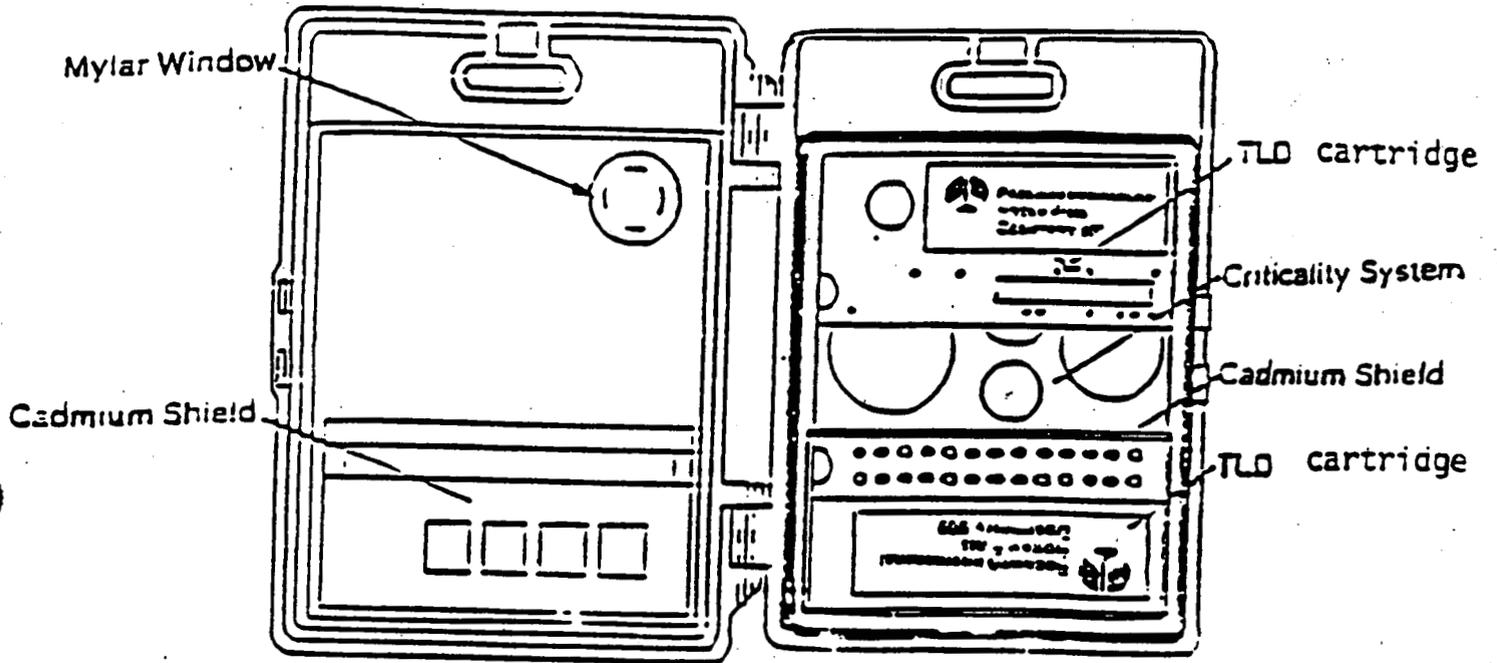


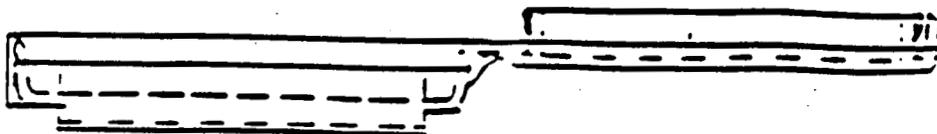
FIGURE 3.5B

PANASONIC TYPE
TLD DOSIMETRY BADGES

BODY BADGE



Front View



Side View

**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: 3-21000-OPS-EMRG
Guideline No.: 6.1, R.0
Page: 1 of 6
Effective Date: December 6, 1991
Organization: Environmental Management**

Category 2

**TITLE:
PERFORMANCE TEST AND OPERATIONAL
CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

Approved By:

[Signature] 1/16/92
(Radiological Engineering) For G. Malden (Date)

[Signature] 1/16/92
(Remediation Programs) (Date)

[Signature] 1/16/92
(Environmental Operations Manager) (Date)

CONTROLLED DOCUMENT

EG&G - ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

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**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
Guideline No.: 6.1
Page: 2 of 6
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Organization: Environmental Management**

Category 2

2.0 PURPOSE

To provide the requirements for performance tests and operational checks for radiation survey instruments.

3.0 SCOPE

This instruction defines the method for performance testing and operational checking of the Ludlum Model 12-1A and Model 31 Survey Instruments, performance and operational criteria, and the documentation of test results. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

4.0 GENERAL

4.1 Servicing Instruments with Expired Calibration Dates - Any instrument with an expired calibration date will be transferred to Radiation Instrumentation or a certified calibration facility for servicing.

4.2 Additional Servicing of Instruments - The Site Safety Officer (SSO) and Health and Safety Specialist (HSS) are permitted to replace defective batteries, cables, probes, and mylar in the Model 12-1A and Model 31 survey instruments. All other instrument servicing will be referred to Radiation Instrumentation or a certified calibration facility.

**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
Guideline No.: 6.1
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Organization: Environmental Management**

Category 2

5.0 INSTRUCTIONS

5.1 Ludlum Model 12-1A and Model 31 Instruments - All Ludlum Model 12-1A and Model 31 survey instruments (or their equivalents) will be operationally checked and performance tested before use, as specified in this guideline.

5.2 Visual Checks - The calibration label of each instrument to be used or tested will be visually checked to ensure the due date of calibration has not expired.

5.2.1 A visual inspection will be performed before using the instruments. This will include checking the cables, probes, meter faces, switches, and mylar for damage.

5.3 Operational Checks - The following operational checks will be conducted for each instrument:

5.3.1 A battery check will be conducted before each intermittent use of an instrument. Set the selector switch to the BATTERY position. The meter needle will come to rest over the meter scale area marked BAT TEST if the batteries are satisfactory.

5.3.2 The selector switch will be reset to the X1000 scale and the HV test button depressed for the Model 12-1A. The meter will read between 1.6 and 1.8 on the bottom scale if the battery supply is adequate.

- Replace the batteries and test the instrument again, if either of the tests outlined in sections 5.3.1 and 5.3.2 indicate the batteries are inadequate. Instruments showing inadequate battery check results will be returned to Radiation Instrumentation or a certified calibration facility.

**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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Category 2

5.3.3 Instrument operation will be verified with a check source at the start of each job for which the instrument is used. The following method (or equivalent method) may be used to complete the operation check:

- A plutonium-239 or similar source, approved for use by Radiological Engineering (RE), will be used with the Model 12-1A alpha instruments, and a strontium/yttrium-90 or similar source will be used with the Model 31 beta instruments
- Instrument operation will be observed by holding the instrument probe against the check source
- A positive deflection of the meter needle of $\pm 20\%$ of source value indicates instrument operation
- Non-operating instruments will be returned to Radiation Instrumentation or a certified calibration facility

5.4 **Performance Tests** - A performance test to verify calibration of survey instruments will be performed before each day of instrument use and following the replacement of batteries.

5.4.1 Checking of the instrument calibration label and batteries will follow the requirements outlined in sections 4.2, 5.3.1, and 5.3.2. The serial number of the instrument, due date of calibration, date/time, and HSS name and employee number or social security number will be recorded on the Daily Source Check Log specified for each instrument.

5.4.2 Readings of the Model 12-1A will be obtained for the source and instrument range selections.

**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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Organization: Environmental Management**

Category 2

- Meter readings will be recorded on the Ludlum Model 12-1A Daily Source Check Log (Form 6.1A)
- The serial number and standard calibration value of each source will be recorded on the source check logs
- A percent error will be calculated for each scale reading

5.4.3 Readings of the Model 31 will be obtained and recorded for the source value.

- With the selector switch set to the X1 scale in the "S" (slow) response mode, obtain and record a background reading taken away from the source
- With the instrument set at the X1 range, place the beta/gamma source on the probe
- Allow approximately 10-15 seconds for the meter response to stabilize before taking a reading of the meter
- Subtract the background reading from the source reading and record the result on the Ludlum Model 31 Daily Source Check Log (Form 6.1B)
- The serial number and standard value of each source will be recorded on the source check log
- A percent error will be calculated for each scale reading

5.4.4 Instruments with errors outside a $\pm 20\%$ range for any scale are not within an acceptable tolerance level and will be returned to Radiation Instrumentation or a certified calibration facility.

**PERFORMANCE TEST AND OPERATIONAL CHECKS FOR LUDLUM MODEL 12-1A
AND MODEL 31 SURVEY INSTRUMENTS**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
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Organization: Environmental Management**

Category 2

5.4.5 The Daily Source Check Logs will be checked to show whether or not instrument performance is within tolerance levels.

5.4.6 Instruments for which test results differ by more than $\pm 20\%$ will be transferred to Radiation Instrumentation or a certified calibration facility. This finding and the action taken will be noted in the Instrumentation Field Log Book.

5.5 Instrument Failure - For jobs requiring frequent HSS coverage, or job conditions adverse to instrument performance, a replacement probe and cable for the instrument may be carried by the HSS to the job site and installed on the instrument when it fails to operate.

5.5.1 The replacement probe and cable will have been performance tested with the instrument meter as per section 5.4 before use

6.0 **FORMS**

**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: 3-21000-OPS-EMRG
Guideline No.: 6.3, R.0
Page: 1 of 7
Effective Date: December 6, 1991
Organization: Environmental Management**

Category 2

TITLE:
PERFORMANCE CHECKING AND OPERATION OF
THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION

Approved By:

CONTROLLED DOCUMENT

EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

This is a RED Stamp

[Signature] 11/6/92
(Radiological Engineering) for G.M. Aldridge (Date)

[Signature] 11/6/92
(Remediation Programs) (Date)

[Signature] 11/6/92
(Environmental Operations Manager) (Date)

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**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
Guideline No.: 63
Page: 2 of 7
Effective Date: December 6, 1991
Organization: Environmental Management**

Category 2

2.0 PURPOSE

To specify the requirements for performance testing and operation of alpha-scintillation smear counting instrumentation.

3.0 SCOPE

This instrumentation provides the requirements for performance testing and operation of the Eberline SAC-4 alpha-scintillation smear counting instrumentation and documentation of test and assay results. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

4.0 GENERAL

4.1 Servicing of Alpha-Scintillation Counting Instruments - All servicing of alpha-scintillation counting instruments will be referred to Radiation Instrumentation, the equipment vendor, or the owning Subcontractor.

5.0 INSTRUCTIONS

5.1 Background Count Rate - Prior to use of alpha-scintillation counting instruments on each shift, the average background count rate will be determined and a performance test conducted.

5.1.1 The calibration label will be visually checked to ensure the due date of calibration has not expired.

**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
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Organization: Environmental Management**

Category 2

5.1.2 Determine the instrument background count rate by completing the following steps:

- **Open the sample drawer and carefully wipe the top of the drawer and planchet area using cotton swabs or kimwipes moistened with alcohol. Dispose of these materials in the Radioactive Waste receptacle.**
- **Place a clean smear on the sample tray with tweezers. The smear must remain flat in the sample tray while closing the drawer.**
- **Set the control switches of the SAC-4 counter as follows:**

(1) Power	ON
(2) Minutes	10
(3) Multiplier	x1
(4) Count Mode	TIMED

Note: Ensure the instrument power is turned on, at least 10 minutes before operation.

- **Press the START/RESET button. The counting lamp will be illuminated.**
- **At the completion of the count time, divide the total counts by 10 to determine the average background count rate.**
- **If the average background count rate is less than 1 cpm, record the value on the Performance Test Log Sheet (Forms 6.3A, 6.3B, 6.3C).**
- **Record the time of the background determination and the employee number or social security number in the space provided on the log sheet.**

**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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Category 2

- If the determination is equal or greater than 1, repeat the steps in the background guideline in section 5.1.2. If the second determination remains equal or greater than 1, do not use the instrument and notify the Site Safety Officer (SSO).

5.1.3 Determine the percent error using a calibrated plutonium-239 (Pu-239) alpha source or similar calibrated alpha source, approved for use by Radiological Engineering (RE).

- Ensure the source has a current calibration label and that the source value is not less than 15,000 disintegrations per minute (dpm).
- Record the serial number of the source on the Performance Test Log Sheet in the space labeled SRC S/N.
- Record the Certified Standard Laboratory (CSL) activity of the source on the log sheet in the space labeled VALUE. The CSL-certified activity is appropriate only for RFP-certified sources. Sources that are not RFP-certified will have other certification sources. The certified facility will be recorded on the Performance Test Log Sheet when non-RFP certified sources are used.
- Open the sample drawer and carefully place the alpha source, activity side up, in the middle of the sample holder.
- Close the sample drawer.
- With the count mode set to one minute, and all other controls set as per section 5.1.2, press the START/RESET button. The counting lamp will be illuminated.

PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION

EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES

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- When the counting lamp is no longer lit, record the counts per minute (cpm) on the log sheet in the space labeled SOURCE CPM.
- Determine the percent (%) error of the observed counts compared to the CSL source standard value per the following:

$$\% \text{ Error} = \frac{(\text{cpm} \times 3) - \text{CSL Value}}{\text{CSL Value}} \times 100$$

NOTE: This percent error has been calculated for the SAC-4, if you are using an equivalent instrument, refer to the manufacturer's specifications.

- Record the % error on the log sheet and plot this value on the Smear Counter Performance Chart (Form 6.3D).
- The SSO will review and approve of each shift record of performance testing. These records will be available in the project files for review by Radiological Engineering.
- If the % error does not lie within the $\pm 20\%$ range on the chart, do not use the instrument and notify the SSO.
- Remove the source from the sample holder and return it to the designated storage location.

5.2 Operation of the Alpha-Scintillation Counting Instrument - Normal operation of the alpha-scintillation counting instrument will be as specified.

**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

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Category 2

- Verify that the electrical power to the instrument has been on for 10 minutes.
- Set the instrument controls as per section 5.1.2; however, one-minute counts will be obtained for routine smear counts unless a longer count time is directed by the SSO.
- Pull the sample drawer open until fully extended and place the smear to be evaluated in the center of the sample holder, activity side up.
- Ensure the sample is a flat as possible to prevent contamination of the detector window. Carefully close the sample drawer.
- Press the START/RESET button.
- The instrument will count for the preset time. At the end of the count time, the instrument readout will display gross counts.
- Record the counts per minute and other information on the Gamma and Beta Contamination Survey Form (Form 1.1B) as required by Environmental Management Radiological Guideline Number 3.1 (Reference 6.1).
- Open the sample drawer and dispose of the smear in the Radioactive Waste receptacle.

**PERFORMANCE CHECKING AND OPERATION OF THE EBERLINE SAC-4 ALPHA-SCINTILLATION
SMEAR COUNTING INSTRUMENTATION**

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
Guideline No.: 6.3
Page: 7 of 7
Effective Date: December 6, 1991
Organization: Environmental Management**

Category 2

6.0 REFERENCES

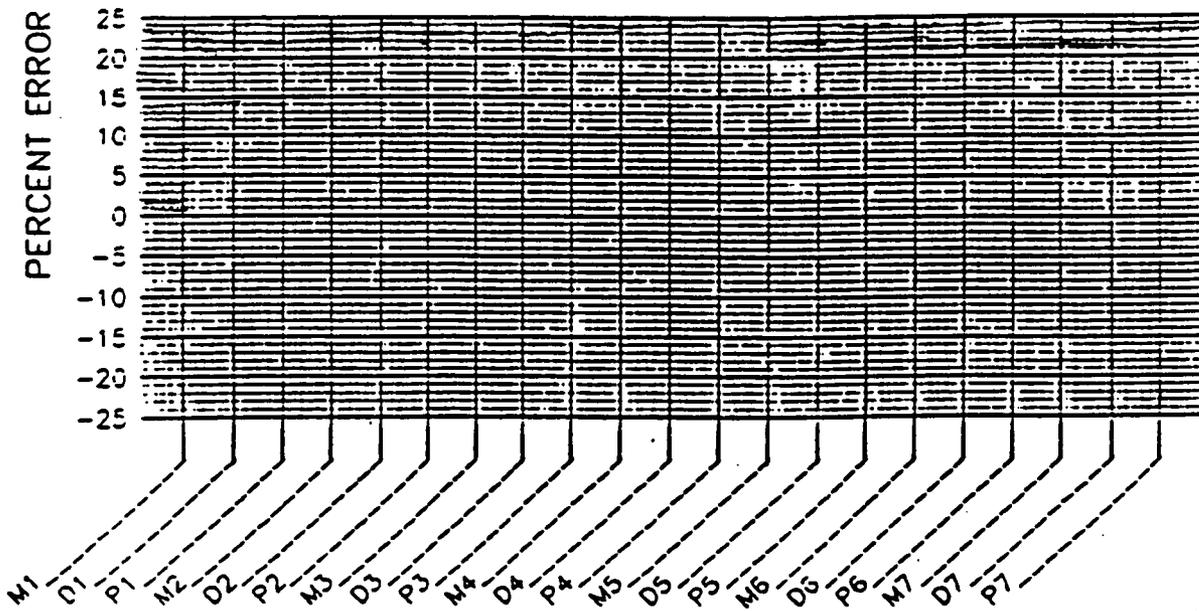
6.1 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

7.0 FORMS

SMEAR COUNTER PERFORMANCE CHART

BUILDING _____ LOCATION _____

DATES FROM: ___/___/___ TO: ___/___/___

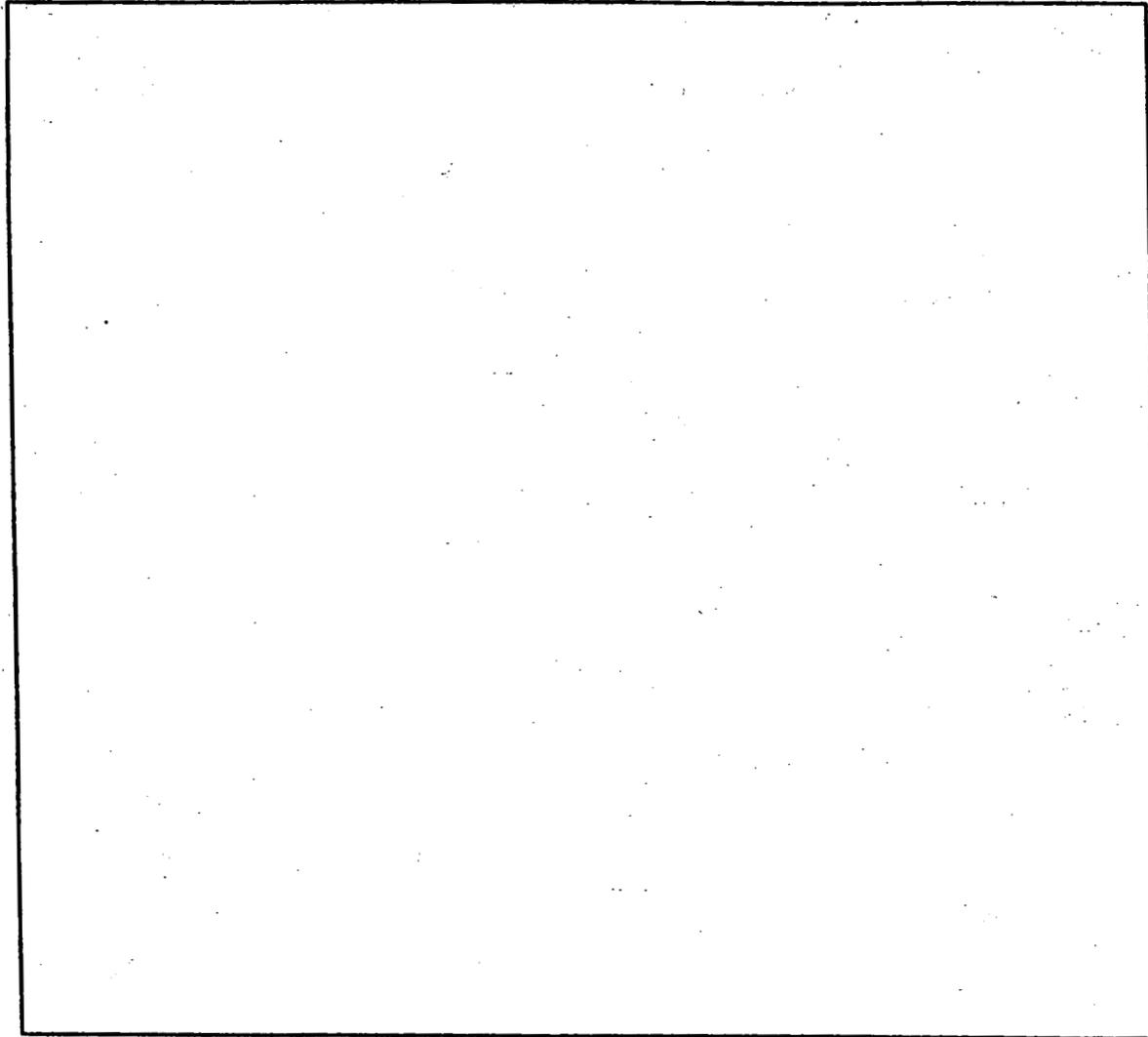


SMEAR COUNTER NUMBER: _____

M = MDS, D = DAYS, P = PMS
ENTER INIT & DATE BESIDE {M, D, P}

DATE FORMAT: MM/DD/YR
ACCEPTABLE LIMITS ARE WITHIN +/- 20%

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

= Direct Frisk Location

= Smear Survey Location

REVIEWED BY: _____

DATE: _____

PERFORMANCE TESTING AND OPERATION OF THE EBERLINE BC-4 BETA SMEAR COUNTING INSTRUMENTATION

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: 3-21000-OPS-EMRG
Guideline No.: 6.4, R.0
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Organization: Environmental Management**

Category 2

TITLE:
PERFORMANCE TESTING AND OPERATION OF
THE EBERLINE BC-4 BETA SMEAR COUNTING
INSTRUMENTATION

Approved By:

[Signature] 11/6/92
(Radiological Engineering) *for Gmajdich* (Date)

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[Signature] 11/6/92
(Remediation Programs) (Date)

EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

[Signature] 1/6/92
(Environmental Operations Manager) (Date)

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2.0 PURPOSE

This procedure provides the requirements for the performance testing, operation, and use of the Eberline BC-4.

3.0 SCOPE

This procedure provides instructions on performance testing, operation, use, and documentation of results when using the Eberline BC-4. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

4.0 GENERAL

The BC-4 has been modified to be insensitive to alpha radiation; therefore, the results obtained with the BC-4 will be reported in dpm/100cm² beta equivalent. All servicing will be referred to Radiation Instrumentation, the equipment vendor, or the owning Subcontractor.

5.0 INSTRUCTIONS

5.1 Conducting Background Count Rate and Performance Test - Prior to first use on each shift, the background count rate of each instrument will be determined and a performance test conducted.

5.1.1 The calibration label will be visually checked to ensure the due date of calibration has not expired. If calibration due date has passed, refer the instrument to Radiation Instrumentation, the equipment vendor, or the owning Subcontractor for servicing.

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5.1.2 Inspect the instrument for any physical damage that could effect its operations. If questionable, notify SSO.

5.1.3 Ensure that the instrument is connected to a power source 110 VAC/60 Hz.

5.1.4 Determine the instrument background count rate by completing the following steps:

- Open the sample drawer and carefully wipe the top of the drawer and planchet area using cotton swabs or kimwipes moistened with alcohol. Dispose of these materials in the Radioactive Waste receptacle.
- Place a clean smear on the sample tray with tweezers. The smear must remain flat in the sample tray while closing the drawer.
- Set the control switches of the BC-4 counter as follows:

(1) Power	ON
(2) Minutes	10
(3) Multiplier	x1
(4) Count Mode	TIMED

Note: Ensure the instrument power is turned on, at least 5 minutes before operation.

- Press the START/RESET button. The counting lamp will be illuminated.
- At the completion of the count time, divide the total counts by 10 to determine the background count rate, in counts per minute (cpm).

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- If the background count rate is between 25 and 60 cpm, record the value on the Performance Test Log Sheet (Form 6.4A). An acceptable background is between 25 and 60 cpm.

Note: Background levels may vary depending on location; background levels outside the range of 25 to 60 cpm may not be an instrument problem.

- Record the time of the background determination and the employee's initials in the space provided on the log sheet.
- If the determination is equal to or greater than 60 cpm, or equal to or less than 25 cpm, repeat the steps outlined in section 5.1.4. If the second determination remains less than 25 cpm, or greater than 60 cpm, do not use the instrument and notify the Site Safety Officer (SSO).

5.1.5 Determine the performance test percent error using a thin substrate Certified Standard Laboratory (CSL) SrY-90 beta source. The SrY-90 source should be nominal activity 20,000 disintegrations per minute (dpm). The CSL-certified activity is appropriate only for RFP-certified sources. Sources that are not RFP-certified will have other certification sources, which may include Radiological Engineering-approved sources. The certified facility will be recorded on the Performance Test Log Sheet when non-RFP certified sources are used.

- Ensure that the source has a current calibration label.
- Record the Chemistry Standards Lab Number or the assigned source number on the Performance Test Log Sheet in the space labeled SRC S/N.

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- Record the CSL activity of the source in dpm according to month of use, on the log sheet in the space labeled VALUE.
- Open the sample drawer and carefully place the beta source, activity side up, in the middle of the sample holder.
- Close the sample drawer.
- With the count mode set to one minute and all other controls set as per section 5.1.4, press the START/RESET button. The counting lamp will be illuminated.
- When the counting lamp is no longer lit, record the cpm on the log sheet in the space labeled SOURCE CPM.
- Determine the percent (%) error of the observed counts compared to the CSL source standard value (from the chart) per the following:

$$\% \text{ Error} = \frac{(\text{Net (cpm)} + 0.33) - \text{CSL (dpm)}}{\text{CSL (dpm)}} \times 100$$

Note: Efficiency is 0.33 for this instrument (other efficiencies are appropriate for equivalent instruments).

$$\text{Net (cpm)} = \text{Gross (cpm)} - \text{BKG (cpm)}$$

- Record the % error on the log sheet and plot this value on the Smear Counter Performance Chart (Form 6.4B).

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- The SSO will review and approve each shift record of performance testing. At the end of each week, final review of both sides of the Performance Test Log Sheet will be approved and signed by a SSO. These forms will be available in the project files for review by Radiological Engineering.
- If the % error does not lie within the $\pm 20\%$ range on the chart, do not use the instrument and notify the SSO.
- Remove the source from the sample holder and return it to the designated storage location.

5.2 Operation of the Beta Smear Counting Instrument - Operation of the beta smear counting instrument when counting smears will be as follows:

- Ensure the instrument power is turned on, at least 5 minutes before operation.
- Set the instrument controls as per section 5.1.4; however, one-minute counts will be obtained for routine smear counts unless a longer count time is directed by the SSO or Radiological Engineering.
- Pull the sample drawer open until fully extended and, using tweezers, place the smear to be evaluated in the center of the sample holder, activity side up.
- Ensure the sample is as flat as possible to prevent contamination of the detector window. Carefully close the sample drawer.
- Press the RESET/START button.

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- The instrument will count for the preset time. At the end of the count time, the instrument readout will display gross counts.
- Perform the following to determine the dpm value for the smear.

$$\text{dpm} = \frac{\text{counts (Gross-Instrument background per shift)}}{\text{count time in minutes} \times \text{efficiency}}$$

this reduces to:

$$\text{dpm} = \frac{\text{CPM (net)}}{\text{efficiency}}$$

Note: Efficiency is 0.33 for this instrument (other efficiencies are appropriate for equivalent instruments).

- Record the dpm smear value and other information on the Radiation Monitoring Survey Data Form as required by Environmental Management Radiological Guideline Number 3.1 (Reference 6.1).
- Open the sample drawer and, using tweezers, dispose of the smear in the Radioactive Waste receptacle.
- Repeat the above steps for all smears to be counted.

5.3 Smear Completion - When finished counting all smears, wipe the sample tray area and perform a one-minute count. The results in CPM will not be greater than $\pm 20\%$ of the daily background CPM value

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as recorded on the Performance Test Log Sheet. If the CPM value is greater or less than the $\pm 20\%$ after a second one-minute background count, repeat the 10-minute background check. If the background doesn't meet specifications; notify your SSO and refer the instrument to Radiation Instrumentation, the equipment vendor, or the owning Subcontractor for servicing.

6.0 REFERENCES

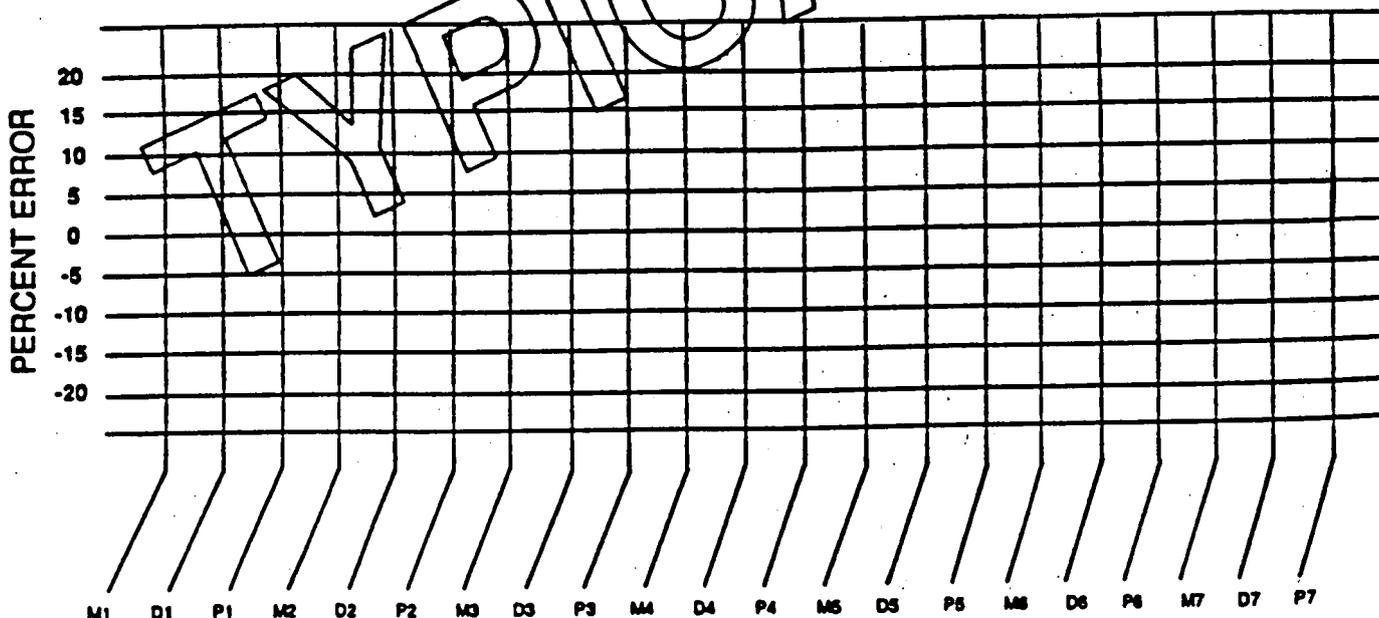
6.1 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

7.0 FORMS

SMEAR COUNTER PERFORMANCE CHART

BUILDING _____ LOCATION _____

DATES FROM: _____ TO: _____



SMEAR COUNTER NUMBER: _____

M = Mids, D = Days, P = PM's

Enter Initial and Date Beside (M, D, P)

DATE FORMAT MM/DD/YR

Acceptable limits are within +/- 20%

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A-100 AND B-50 DETECTORS**

Approved By:

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EG&G -- ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

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By *[Signature]*
Date 1/2/92

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2.0 PURPOSE

To provide the requirements for operational checks and use of the Bicron Frisk-Tech Ratemeter Scaler with the Bicron A-100 Alpha Detector or B-50 Beta-Gammer Detector.

3.0 SCOPE

This instruction defines the requirement for operation and use of the Bicron Frisk-Tech Ratemeter Scaler with the Bicron A-100 Alpha Detector or Bicron B-50 Detector. Routine instrument use and survey techniques to release property for unrestricted use are specified in this guideline. Performance of an instrument response test is also described. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

4.0 GENERAL

4.1 Description

4.1.1 The Bicron Frisk-Tech is a ratemeter/scaler that can be used as a portable (DC) or stationary (AC) instrument. The life of a battery charge is approximately 50 hours. Batteries require approximately 16 hours to recharge. Recharging occurs whenever the unit is connected to AC power. The display provides a linear scale of 0-500 counts per minute (cpm) with selectable multipliers of x1, x10, x100 and x1000. A six decade liquid crystal display is provided for operation in the scaler mode. The instrument provides an audible and visual alarm which is adjustable from 10% to 130% of full scale. Instrument response time may be adjusted on the front panel from 2 to 20 seconds. A front panel AC power indicator is provided.

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- 4.1.2 The Bicron A-100 is a zinc sulfide alpha detector with a sensitive area of 100 cm². The A-100 has no gamma sensitivity up to approximately 1 Roentgen per hour (R/h).
- 4.1.3 The Bicron B-50 is a plastic scintillation beta/gamma detector with a sensitive area of 50 cm². The B-50 has a gamma sensitivity of approximately 3,600 counts per minute, milliroentgens per hour (cpm/mR/h).
- 4.1.4 Headphones are available for optional use.

4.2 Precautions and Limitations

- 4.2.1 The detector should always be stored with its protective cover in place to prevent window damage.
- 4.2.2 Each detector/meter combination has been calibrated as a unit. Detectors and meters are not interchangeable (power cords are the only interchangeable parts).
- 4.2.3 Care should be exercised during surveys to avoid objects (i.e., sharp, protruding etc.) that can damage the detector window.
- 4.2.4 Any required instrument maintenance will be referred to Radiological Instrumentation, a certified vendor, or the Subcontractor for service.
- 4.2.5 The Frisk-Tech power switch should always be switched to OFF prior to connecting or disconnecting the detector cable.

5.0 INSTRUCTIONS

- 5.1 Operational Checks - the following checks will be performed prior to instrument use:

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- 5.1.1 Inspect the instrument and cable for physical damage that could affect its operation.
- 5.1.2 Verify that the daily performance test has been documented for the instrument in the Performance Test Log.
- 5.1.3 Check the calibration label to ensure calibration has not expired.
- 5.1.4 Verify the detector/instrument combination is a calibrated set according to directions on instrument label or cable tags, as applicable.
- 5.1.5 Ensure the detector is labeled with the 4π detector efficiency and a scaler factor is listed on the scaler/ratemeter.
- 5.1.6 Perform a battery check and ensure the instrument indicates in the BAT OK region.
- 5.1.7 Perform a response test to verify proper instrument operation.

- Set instrument controls to the position listed:

Power	ON
Rate Meter	x1
Response	Slow
Speaker	Pulse/Alarm
Volume	As desired

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- Remove detector protective cover and hold detector over the check source. Check sources used:

A-100 detector	Pu-239
B-50 detector	Sr-90

Note: May also use Radiological Engineering-approved sources.

- Acceptable instrument response is confirmed by an audible increase in count rate and upscale meter movement

5.1.8 If the instrument fails any of the above checks, affix a Repair Tag, RF-47200, notify the SSO, procure another instrument, and repeat above checks.

5.2 **Performance of Surface Contamination Surveys - Scan** - Routine surveys for alpha contamination may be performed with the Bicron A-100 detector and beta/gamma surveys performed with the Bicron B-50 detector. These detectors will measure total fixed and removable surface contamination. Smear surveys are taken in accordance with Environmental Management Radiological Guideline Number 3.1 (Reference 6.4).

5.2.1 Ensure audible response is set to ON and the volume adjusted so as to be heard above area noise levels.

5.2.2 Determine instrument background count rate near the item/area to be surveyed. Alpha background for the A-100 will be less than 2 cpm and beta/gamma background will be less than 250 cpm for the B-50.

5.2.3 Set the ratemeter switch (x1, x10, etc.) to yield an on-scale reading based on expected contamination levels for the area/item to be surveyed.

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- 5.2.4 Scan the item at a rate of approximately 2 inches per second, holding the detector within approximately 1/8 inch of the surface.
- 5.2.5 If an increase in audible response is noted, slow the scan rate to locate the source of the increased count.
- 5.2.6 Hold the detector over the area where increased counts have been detected and wait for the instrument meter response to stabilize (approximately 15 seconds for high activity sources). Determine the count rate by subtracting the background count rate.

- 5.2.7 Calculate surface activity in accordance with the following (dpm is "disintegrations per minute"):

$$\text{dpm} = \frac{[\text{counts/min (cpm)}] - (\text{background counts/min})}{\text{Detector efficiency (in decimal form)}}$$

- 5.2.8 For the A-100 (100 cm²) detector, the above calculation yields results in dpm/100cm²; however, for the B-50 (50 cm²) detector, the dpm value must be multiplied by 2 to express results in dpm/100cm².
- 5.2.9 Document survey results in accordance with Environmental Management Radiological Guideline Number 3.1 (Reference 6.4).

- 5.3 Performance of Surveys to Release Property for Unrestricted Use - The Bicron A-100 and B-50 detector, in conjunction with the Eberline SAC-4 and the BC-4 (or their equivalents), are used to perform surface contamination surveys of property to be released for unrestricted use. The survey techniques described below will ensure that residual surface contamination at or below the limits specified in Environmental Management Radiological Guideline Number 3.2 (Reference 6.5) can be detected.

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- 5.3.1 Ensure audible response is set to ON and adjusted so as to be heard above area noise levels.
- 5.3.2 Set the instrument controls to the positions listed:

For Surveys:

Power	ON
Ratemeter	x1
Response	Slow
Speaker	Pulse/Alarm
Volume	As desired
Scaler Count Time	0.1 minute
(back panel)	

For Background Check, all controls set as listed for surveys above except:

Scaler Count Time 1 minute
(Back panel)

- 5.3.3 Push the meter RESET button to obtain a one-minute background count near the area where the item is to be surveyed. The background count will be displayed in the LCD scaler window.
- 5.3.4 If the alpha background count rate exceeds 2 cpm for the A-100 detector, or the beta/gamma background for the B-50 detector exceeds 250 cpm; the instrument and item should be relocated to a lower background area, shielded, or the detector decontaminated, as appropriate.

Note: Ensure scaler count time control is returned to the 0.1 minute setting upon completion of background check.

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5.3.5 Perform a response test as described in section 5.1.7, before and after each item surveyed, to ensure proper instrument response.

5.3.6 Measure the residual contamination on an item by obtaining a series of PAT/Increment counts across accessible surfaces in increments which correspond to the active area of the detector within the protective edges of the detector.

Note: For inaccessible surfaces, refer to Environmental Management Radiological Guideline Number 3.2 (Reference 6.5) and RE-1003 (Reference 6.6) for further guidance.

- Remove the protective covering from the detector and position the detector at one corner so that a systematic pattern of measurements will be obtained over the entire area of each surface. Adjacent measurements will be overlapped by the dimensions of the protective edges of the detector ensuring that the surface is covered by the active detector area.
- A marker may be used to mark and define each detector PAT/Increment, as determined by the Site Safety Officer (SSO), to ensure an efficient survey process.
- The protective edges of the detector will rest on the surface of the item being surveyed. The detector will be positioned so that surface protrusions do not touch the mylar covering.
- Set the instrument controls as per section 5.3.2 and obtain a scaler count for each area in which the detector is placed. The counting cycle is initiated by depressing the meter reset button. The count light will go out upon completion of count cycle.

5.3.7 Determine surface activity for the PAT/Increment survey using the following calculation:

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$$(\text{dpm})/100\text{cm}^2 = (\text{net scaler counts}) (\text{scaler factor})$$

- 5.3.8 Record the scaler counts for each PAT/Increment surveyed, and all other required survey data, in accordance with Environmental Management Radiological Guideline Number 3.1 (Reference 6.4).
- 5.3.9 Determine if the item or area meets release criteria for total fixed and removable contamination by comparison of survey results to the limits for surface contamination specified in Environmental Management Radiological Guideline Number 3.2 (Reference 6.5).
- 5.3.10 If surface contamination results exceed the limits, notify the SSO for property disposition.

6.0 REFERENCES

- 6.1 Bicron Frisk-Tech Ratemeter/Monitor Manual - Technical manual for the Bicron Frisk-Tech ratemeter/monitor with alarm, Rev. A, 11/88
- 6.2 Bicron B-50 Scintillation Manual - Technical manual for the Bicron B-50 Scintillation probe, Rev. Original, 7/88
- 6.3 Bicron A-100 Scintillation Detector Manual - Technical manual for Bicron A-100 Scintillation Detector
- 6.4 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys
- 6.5 Environmental Management Radiological Guideline Number 3.2, Survey Requirements for Conditional and Unrestricted Use
- 6.6 RE-1003, Evaluation for Release of Property (in production)

USE OF THE BICRON FIDLER (FIELD INSTRUMENT FOR THE DETECTION OF LOW-ENERGY RADIATION)

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USE OF THE BICRON FIDLER (FIELD
INSTRUMENT FOR THE DETECTION OF LOW
ENERGY RADIATION)**

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(Environmental Operations Manager) (Date)

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By *[Signature]*
Date 1/7/92

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2.0 PURPOSE

To provide requirements for the use of the Bicron Field Instrument for the Detection of Low-Energy Radiation (FIDLER).

3.0 SCOPE

This guide covers the general use of the Bicron FIDLER to identify low-energy gamma and x-ray emitting radiation sources and to document survey findings. Equivalent instruments may be used. The Health Physics Instrumentation Committee will determine if a given instrument is equivalent. Procedures detailing the use of proposed equivalent instruments, including information regarding non-routine maintenance/repair facilities to be used, will be prepared and submitted to the Health Physics Instrumentation Committee.

4.0 GENERAL

4.1 The FIDLER Unit Components - The FIDLER unit consists of a Bicron Analyst meter, equipped with a scaler option, and a Bicron G-5 thin window scintillation probe connected by a signal cable. This instrument also includes a Bicron G-5 HV handle and a Rocky Flats Plant (RFP)-designed detector housing.

4.2 Low-Energy Radiation Detection - The use of the FIDLER provides a qualitative indication of the presence or absence of low-energy radiation sources. Other methods must be used for quantitative measurements of sources.

4.3 Detection of 17 rev X-rays - The FIDLER is set up to detect 17 keV x-rays from transuranics (It may also be set up to detect 60 keV gamma photon emissions).

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5.0 INSTRUCTIONS

5.1 Instrument Verification - Prior to using the instrument, perform the following checks:

- Ensure the instrument's calibration due date has not expired.
- Inspect the instrument for physical damage that could affect its operation.
- Ensure that the instrument has successfully passed a performance check within the last 24 hours. The instrumentation department is responsible for this performance check.
- Perform a battery check and ensure that the needle reads in the BAT OK region.

5.2 Instrument Failure - If the instrument fails any of the above checks, tag it out of service and refer it to Radiation Instrumentation, a certified vendor, or the owning Subcontractor for servicing.

5.3 Instrument Controls - Set the instrument controls as follows:

Response Mode	Slow
Audio	ON
Scale	x100
Mode	Channel 1

5.4 Background Reading - Determine a background reading in the area of use by holding the probe still and performing a one-minute scaler count. To perform the one-minute scaler count, press the count button. The red LED lamp will be illuminated, indicating that the scaler is counting. When the LED lamp goes out, the count is finished. Record the counts per minute (cpm) from the scaler display located on the

USE OF THE BICRON FIDLER (FIELD INSTRUMENT FOR THE DETECTION OF LOW-ENERGY RADIATION)

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instrument face. The background count should be taken approximately 15 feet from the items to be surveyed. When doing a soil surface scan, it is recommended that the background be taken over the ruts in a gravel road or over a location where the background of the soil is known.

5.5 Probing - Hold the probe at least 12 inches from the item or surface being surveyed if the item is much larger than the probe. If the item is the same size or smaller than the probe, hold the probe on contact.

5.6 Scanning - Scan slowly, no faster than two inches per second, to give the instrument time to respond. Scan rates greater than two inches per second drastically reduce the probability of detection. The operator should listen closely to the audio output, as it responds faster than the instrument reading.

5.7 Surveying - When surveying, any response above background should be investigated by holding the instrument still for one minute to verify the above-background reading. If an above-background reading is confirmed, slow the scanning speed. Attempt to locate the source by moving the probe in different directions and by scanning in the directions yielding the highest above-background readings.

5.7.1 When the highest reading is located, perform a one-minute scaler count, and record the results of the count and the location the reading was taken.

Note: Readings in excess of $2 \times \sqrt{\text{background}}$ should be reported to the Site Safety Officer (SSO).

5.8 Battery Check - Periodically during use, perform a battery check to ensure the batteries are still good.

5.9 Positive Location of Source Procedure - If a source is located, notify your SSO and obtain instructions on how the activity should be quantified. Other methods will be used for final quantification.

All surveys performed with the FIDLER must be documented on a Gamma Survey Form (Form 6.6A).

USE OF THE BICRON FIDLER (FIELD INSTRUMENT FOR THE DETECTION OF LOW-ENERGY RADIATION)

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5.10 Original Survey Copy - The original copy of the survey will be reviewed and approved by the SSO and kept in the project files for the duration of the project. At the end of the project, the files will be turned over to EG&G.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 1.1, Radiation Surveys

7.0 FORMS

GAMMA SURVEY

CONTROL NO. SPECIAL

Taken by: _____ SSAN or Emp. # _____ Reviewed by: _____
 Taken by: _____ Emp. # _____ SSO _____ SSAN or Emp. # _____
 Taken by: _____ Emp. # _____ Name/Organization _____ Emp. # _____

Date: _____	Building: _____	Survey Description: _____ _____ _____
Time: _____	Room #: _____	
Shift: _____		

BICRON FIDLER

Mfg:	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>	<u>FIDLER</u>
Model:	_____	_____	_____	_____	_____
Serial #:	_____	_____	_____	_____	_____
Date Perf. Ck:	_____	_____	_____	_____	_____
Date Calib'd:	_____	_____	_____	_____	_____
Cal. Due Date:	_____	_____	_____	_____	_____

	BKG	c/m METER	SCALER	AREA POSTED (Y/N)		BKG	c/m METER	SCALER	AREA POSTED (Y/N)
1.	_____	_____	_____	_____	12.	_____	_____	_____	_____
2.	_____	_____	_____	_____	13.	_____	_____	_____	_____
3.	_____	_____	_____	_____	14.	_____	_____	_____	_____
4.	_____	_____	_____	_____	15.	_____	_____	_____	_____
5.	_____	_____	_____	_____	16.	_____	_____	_____	_____
6.	_____	_____	_____	_____	17.	_____	_____	_____	_____
7.	_____	_____	_____	_____	18.	_____	_____	_____	_____
8.	_____	_____	_____	_____	19.	_____	_____	_____	_____
9.	_____	_____	_____	_____	20.	_____	_____	_____	_____
10.	_____	_____	_____	_____	21.	_____	_____	_____	_____
11.	_____	_____	_____	_____	22.	_____	_____	_____	_____

GAMMA SURVEY

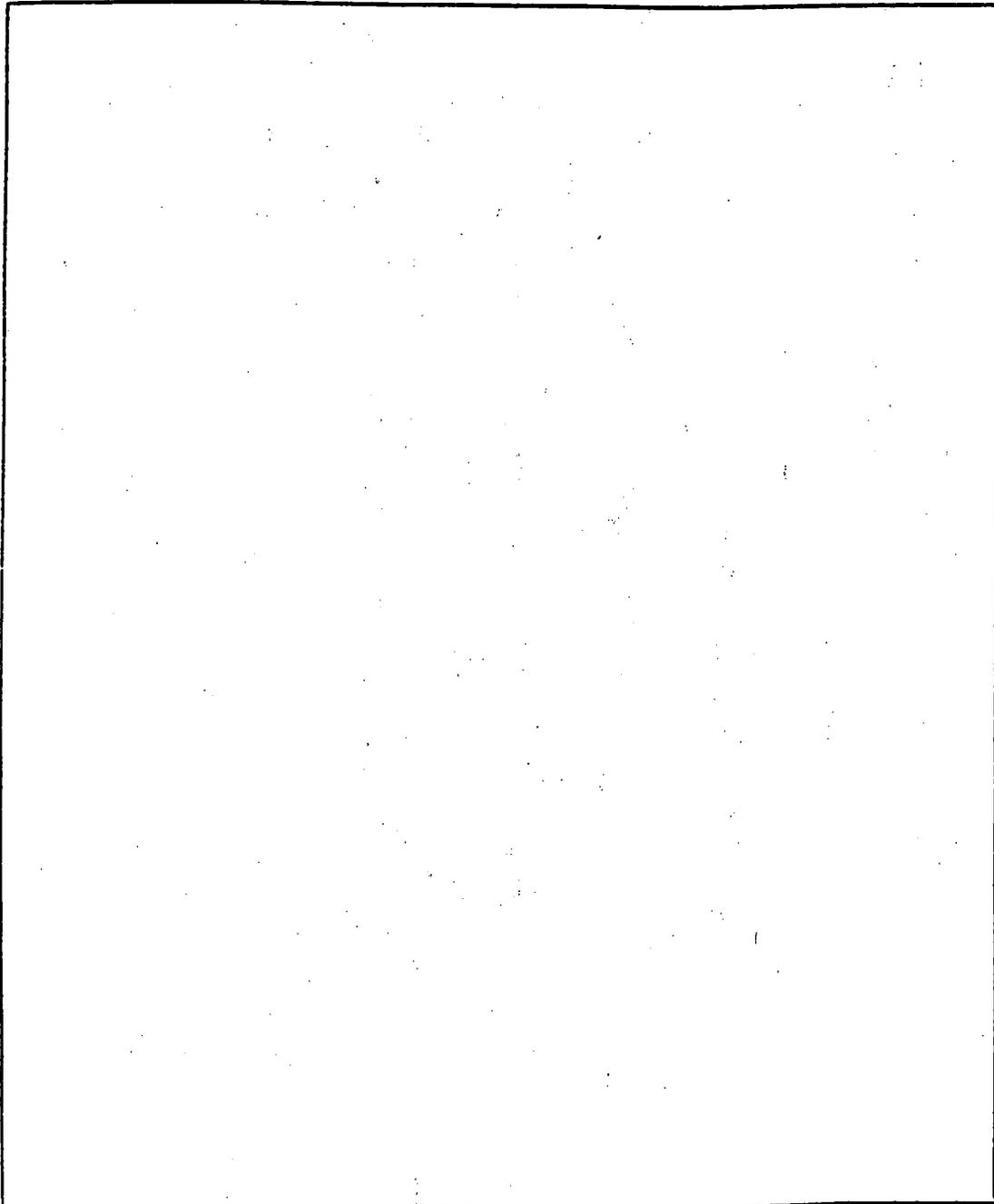
CONTROL NO. SPECIAL

	BKG	c/m METER	SCALER	AREA POSTED (Y/N)		BKG	c/m METER	SCALER	AREA POSTED (Y/N)
23.	_____	_____	_____	_____	50.	_____	_____	_____	_____
24.	_____	_____	_____	_____	51.	_____	_____	_____	_____
25.	_____	_____	_____	_____	52.	_____	_____	_____	_____
26.	_____	_____	_____	_____	53.	_____	_____	_____	_____
27.	_____	_____	_____	_____	54.	_____	_____	_____	_____
28.	_____	_____	_____	_____	55.	_____	_____	_____	_____
29.	_____	_____	_____	_____	56.	_____	_____	_____	_____
30.	_____	_____	_____	_____	57.	_____	_____	_____	_____
31.	_____	_____	_____	_____	58.	_____	_____	_____	_____
32.	_____	_____	_____	_____	59.	_____	_____	_____	_____
33.	_____	_____	_____	_____	60.	_____	_____	_____	_____
34.	_____	_____	_____	_____	61.	_____	_____	_____	_____
35.	_____	_____	_____	_____	62.	_____	_____	_____	_____
36.	_____	_____	_____	_____	63.	_____	_____	_____	_____
37.	_____	_____	_____	_____	64.	_____	_____	_____	_____
38.	_____	_____	_____	_____	65.	_____	_____	_____	_____
39.	_____	_____	_____	_____	66.	_____	_____	_____	_____
40.	_____	_____	_____	_____	67.	_____	_____	_____	_____
41.	_____	_____	_____	_____	68.	_____	_____	_____	_____
42.	_____	_____	_____	_____	69.	_____	_____	_____	_____
43.	_____	_____	_____	_____	70.	_____	_____	_____	_____
44.	_____	_____	_____	_____	71.	_____	_____	_____	_____
45.	_____	_____	_____	_____	72.	_____	_____	_____	_____
46.	_____	_____	_____	_____	73.	_____	_____	_____	_____
47.	_____	_____	_____	_____	74.	_____	_____	_____	_____
48.	_____	_____	_____	_____	75.	_____	_____	_____	_____
49.	_____	_____	_____	_____	76.	_____	_____	_____	_____

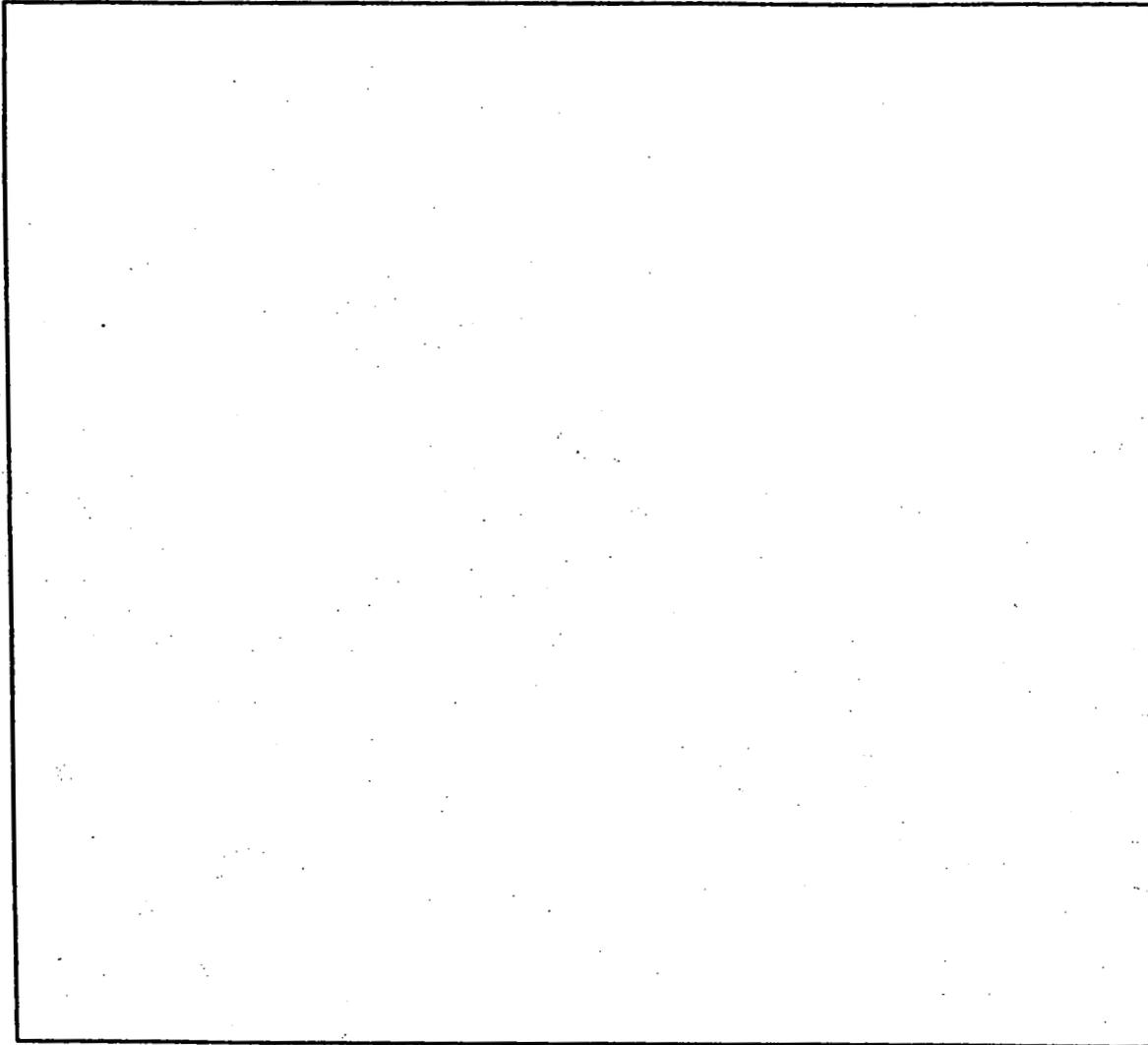
GAMMA SURVEY

CONTROL NO. SPECIAL

AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



AREA OR EQUIPMENT DRAWING SHOWING SURVEY POINTS



/// = Step-off Pad

X-X-X = Boundaries of Posted Area

= Direct Frisk Location

= Smear Survey Location

REVIEWED BY: _____

DATE: _____

RESPIRATORY PROTECTION REQUIREMENTS AND POSTING

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**Manual: 3-21000-OPS-EMRG
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Category 2

TITLE:
RESPIRATORY PROTECTION REQUIREMENTS
AND POSTING

Approved By:

[Signature] 11/6/92
(Radiological Engineering) For G. Malden (Date)

[Signature] 11/6/92
(Remediation Programs) (Date)

[Signature] 11/6/92
(Environmental Operations Manager) (Date)

CONTROLLED DOCUMENT
EG&G -- ROCKY FLATS PLANT
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REVIEWED FOR CLASSIFICATION/UCHI
By *[Signature]*
Date 11/7/92

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2.0 PURPOSE

To establish requirements for the posting and documentation of designated Airborne Radioactivity Areas and/or Respiratory Protection Required Areas.

3.0 SCOPE

This instruction provides the criteria for designating Respirator Protection Required Areas and outlines the requirements for the posting of an area, removal of posting, and documentation of posting activities.

4.0 GENERAL

4.1 **Hazardous Chemical Spills** - Whenever a hazardous chemical spill occurs, all personnel will be evacuated from the area as soon as possible. Emergency responses will comply with Site-Specific Health and Safety Plans (SSHSP). Post the area with yellow "caution" tape and Contact SSO signs.

4.1.1 Self-contained Breathing Apparatus (SCBA) will be required for re-entry into the area until such time as the SSO has evaluated the situation and specified alternate personal protective gear.

5.0 INSTRUCTIONS

5.1 **Respiratory Protection Required** - Areas requiring respiratory protection will be posted under the following conditions:

5.1.1 When removable-alpha surface contamination levels are determined to be 2,500 dpm/100 cm² (1,250 cpm by Ludlum 12-1A) or greater, over an area of 10 square feet or more, and/or when removable beta/gamma surface contamination levels are determined to be 25,000 cpm/100 cm² with the Ludlum Model 31 count rate meter, or its equivalent. Contamination levels below these limits may

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require the posting of the area, depending on materials and conditions as determined by the Site Safety Officer (SSO). The SSO must take into consideration residual radioactive contamination in soil.

- 5.1.2 During any operation that requires the use of respiratory protection, clearly post access to area as per section 4.1.1. Alternate methods of respiratory protection will be approved by the SSO.
- 5.1.3 In all cases, personnel performing the work will wear a full-face respirator unless directed otherwise by Industrial Hygiene, the SSO, SOPs, SSHSP, or Emergency Response Procedures.
- 5.2 **Posting** - The posting of an area will be accomplished using standard Respiratory Protection Required inserts.
- 5.2.1 Respiratory Protection Required signs and Posting Log Sheets (Form 9.1A) will be located at a central location, or at the work sites.
- 5.2.2 All access routes to an area will be conspicuously posted so that access to this area would require the crossing or passing of a physical barrier, as defined in section 5.2.3.
- 5.2.3 Physical barriers will be used to adequately identify Respiratory Protection Required Areas. The barrier may consist of rope, chain, marking tape, or any combination of these. Portable barriers, such as signs on stands and chain stanchions, are also acceptable.
- 5.2.4 Entire areas will be posted.
- 5.3 **Documentation** - A Posting Log Book, or a Health and Safety Specialist's (HSS's) or SSO's Log Book, will be completed prior to posting an area or a site.

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5.3.1 The log book will be project-specific and include the following:

- IHSS number (Individual Hazardous Substance Site)
- Date and time posted
- HSS name and social security number
- Justification for posting
- Date and time deposited
- SSO review of completed posting log sheets.

5.3.2 The HSS Log Book will be completed in sufficient detail to describe reasons for posting an area.

5.3.3 Prior to the start of any operation requiring the use of respiratory protection, and subsequent to any applicable posting, the HSS will inform the SSO about the operation and posting procedures.

5.3.4 If decontamination efforts have not been completed by the end of the current shift, and will not be resumed in the following shift, the HSS will assist in controlling for the radioactive hazard until such time as the decontamination can be resumed. Controlling for the hazard may involve covering an area with plastic sheeting to prevent an increase in airborne radioactivity or restricting access to the area to prevent further spread of the contaminant. The SSO will have final approval of the radioactive hazard control conditions.

5.4 Health and Safety Specialist - The HSS will ensure that personnel involved in the operation have a current, approved quantitative or qualitative respirator fit-test card, and that they wear the proper respiratory protective device.

5.5 Completion of Operation Requiring Respiratory Protection - After the completion of any operation requiring respiratory protection, the HSS will survey the area of concern according to Environmental Management Radiological Guideline Number 3.1 (Reference 6.1). Industrial Hygiene may be required

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to assist. The HSS will inform the SSO of the completion of the operation and the post-operation survey results. Any decision regarding when to remove the respiratory protection will be made by the SSO and will be based upon provisions established in the applicable Site-Specific Health and Safety Plan.

- 5.5.1 After all affected areas have been completely decontaminated, or the source of the contamination has been completely contained, the SSO may authorize the removal of Respiratory Protection Required signs. This removal will be recorded in the Health and Safety Field Log Book and/or survey map.
- 5.5.2 Any actions regarding the posting and removal of posted Respiratory Protection Required signs, will be logged on the HSS Log Book.
- 5.5.3 Once the removal of respiratory protection requirement is authorized, the HSS will make an "all clear" announcement and ensure that all Respiratory Protection Required signs are removed and noted on the Posting Log Sheet.

NOTE: ALL POSTED SIGNS MUST BE REMOVED.

- 5.5.4 Completed log books will be transmitted to the SSO for review and approval.
- 5.6 Adequate Contamination Control - Certain operations will require the construction of an enclosure (house), with an air mover attached, to ensure adequate contamination control.
- 5.6.1 For operations with enclosures and air movers, with air-monitoring instrumentation equipped with alarm systems within 10 feet of the door, Respiratory Protection Required signs only need to be posted in the immediate vicinity of the enclosure entrance.
- 5.6.2 For operations with enclosures and air movers, that lack air-monitoring instrumentation with alarm systems within 10 feet of the door, post the entire area Respiratory Protection Required.

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5.6.3 The SSO will contact Radiological Engineering for the final determination on the enclosure and air mover requirements for specific operations.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 3.1, Performance of Surface Contamination Surveys

7.0 FORMS

POSTING LOG SHEET

RESPIRATORY POSTING FOR WORK AREA: _____ LOCATION: _____

DATE POSTED: _____ TIME POSTED: _____

HSS POSTING: _____ SSAN OR EMPLOYEE #: _____

OPERATION/EVENT NECESSITATING POSTING: _____

DATE DEPOSTED: _____ TIME DEPOSTED: _____

HSS DEPOSTING: _____ SSAN OR EMPLOYEE #: _____

JUSTIFICATION FOR DEPOSTING: _____

MANAGEMENT REVIEW: _____ DATE: _____ TIME: _____

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TITLE:
RADIOLOGICAL DEFICIENCY REPORTING
PROGRAM

This is a
CONTROLLED DOCUMENT
EG&G — ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

Approved By:

Kate D. Quinn 1/6/92
 (Radiological Engineering) for GMA Director (Date)

D.M. Amundson 1/6/92
 (Remediation Programs) (Date)

M. B. Frost 1/6/92
 (Environmental Operations Manager) (Date)

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REVIEWED FOR CLASSIFICATION/UCNI
 By *[Signature]*
 Date 1/7/92

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2.0 OBJECTIVE

To provide requirements for filling out Radiological Deficiency Reports (RDRs).

3.0 SCOPE

This instruction provides the criteria and procedures for reporting radiological deficiencies in the workplace in accordance with the Radiological Deficiency Report.

4.0 GENERAL

4.1 Reported Information - All reported information should be:

- Legible
- Accurate
- Complete

5.0 INSTRUCTIONS

5.1 Originator

5.1.1 A Radiological Deficiency Report (Form 10.1A) will be filed by the originator whenever an event occurs in a radiological area. The following are examples of when an RDR would be initiated (these examples are meant as guidelines only, and should not be considered to be complete):

- Whenever spills or leaks of radioactive material, or ruptures of radioactive material containers, result in removable contamination levels above the area's maximum allowed levels, or whenever actions occur which contradict Field Operations SOPs.

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- **Controlled Area or equipment contamination is discovered during routine surveys that is out of character compared with previous surveys**
- **Uncontrolled Area contamination**
- **Improperly posted areas**
- **Contamination of Dosimetry/Security badges**
- **Whenever a Radiological Protection Incident Report is required as per section 5.3 of this guideline**
- **Contamination of personal clothing or items**
- **Whenever personnel exposure limits have been exceeded**
- **Other conditions or circumstances which, in the judgement of the originator, merit investigation (i.e., any condition which indicates the loss of control of radioactive material)**

5.1.2 The deficiency will be identified, at the top of the report form, as follows:

- **Date (mm/dd/yy) of deficiency**
- **Time (24-hours) of deficiency**

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- Specific Location of deficiency including, where applicable:
 - Building Number
 - Room Number
 - Pad Number
 - IHSS Number (Individual Hazardous Substance Site)
- Include any other information that will help to identify the location

5.1.3 The individuals involved in the deficiency will be identified in the originator section of the RDR form. A Health and Safety Specialist (HSS) should not be listed as an "involved" individual unless directly involved with, or affected by, the deficiency (i.e., personnel contamination of an HSS). Provide the social security number, organization/company affiliation, job/ classification, and name of immediate supervisor. If more space is needed to list the individuals involved, use a second RDR form, but assign the same RDR number to it.

5.1.4 The DESCRIPTION OF EVENT section of the report will be completed by noting the following information, where applicable:

NOTE: CONTACT THE SSO TO OBTAIN ANY UNKNOWN DATA REQUIRED TO FILL OUT ORIGINATOR SECTION OF RDR FORM.

5.1.4.1 Select a description of the event that most clearly describes it and provide a detailed description including pertinent facts (i.e., square feet contaminated, range of contamination, activities). The six investigative questions that should be answered: WHO, WHAT, WHEN, WHERE, WHY, and HOW.

5.1.4.2 State any immediate corrective action taken at the time of the deficiency discovery to minimize the hazards and risks, if any, to those individuals directly involved with the event.

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5.1.4.3 Note the following information, where applicable:

- Routine or pre-job survey
- Total number of elevated air samples
- Total number of special air samples
- Description of the occurrence (i.e., contamination levels, number of special and routine air samples taken, size of affected area, discovery of the occurrence)

5.1.5 The originator preparing the RDR will sign the report, provide his or her employee number or social security number in the block designated as ORIGINATOR, insert the date and time the RDR was originated, and then transmit the RDR to the SSO.

5.2 Site Safety Officer (SSO)

5.2.1 The SSO will immediately notify the Environmental Management Radiological Engineer (EMRE) if there is a potential Department of Energy (DOE) Reportable Occurrence. Use the categorization matrix in Form 10.1E as a guide to assist in determination.

5.2.2 If the event is a reportable occurrence, then the EMRE will ensure that a reportable occurrence tracking number is provided to the SSO for inclusion in the appropriate area on the RDR form.

5.2.3 The SSO will ensure that supporting documentation is attached, including: copies of survey forms, accident report forms, air sample results, radiological work permits, witness statements, etc.

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- 5.2.4 The SSO reviewing the RDR will sign in the block designated SSO, provide his or her employee number or social security number, and the date and time of the review.
- 5.2.5 Ensure copies of the RDR package are made and distributed as follows:

Original - Environmental Management Radiological Engineer (EMRE)

Copies - Subcontractor Health and Safety Officer (HSO)

- 5.2.6 Forward by the end of shift (or next working day) the original RDR package to the Environmental Management Radiological Engineer. The RDR form can be faxed to the Subcontractor HSO.
- 5.2.7 Determine by the next working day, whether a critique for non-reportable occurrences is to be conducted by consulting with the EMRE.

NOTE: FOR REPORTABLE OCCURRENCES, THE OTHER PROCEDURAL REQUIREMENTS, SUCH AS CONDUCTING CRITIQUES AND DEVELOPING OCCURRENCE REPORTS, WILL CONTINUE PARALLEL WITH THE PROCESSING OF THE RDR.

- 5.3 Radiological Protection Incident Report - A Radiological Protection Incident Report (Form 10.1B) will be prepared for each employee having positive or potential contact with radioactive material as follows:

- Positive wound or skin contamination, as identified in the Environmental Management Radiological Guideline Number 2.3 (Reference 6.1)
- Potential inhalation of radioactive material as identified in the Environmental Management Radiological Guideline Number 2.2 (Reference 6.2)

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- Whole body exposure to penetrating radiation of >100 milliRems per week (mrem/wk) unless previously specified in section 5.1.2

5.3.1 The event will be identified at the top of the RDR report form as previously specified in section 5.1.2.

5.3.2 The Radiological Protection Incident Report (Form 10.1B) will be completed according to the instructions on the reverse side of the form, as follows:

- Identify the employees involved (name, organization, and supervisor)
- Specify survey instrument data (type, serial number, and calibration/ source check date)
- Time and reason employee was sent to Medical
- Description of wound (laceration, puncture, abrasion, and/or burn)
- Respiratory Protection in use at the time of occurrence (none, full-face mask, or supplied air)
- For possible inhalation, list dpm of representative sample (if a nasal swab/blow was obtained) and list type and form of radioactive material
- Complete body diagram showing location of initial and residual contamination, wound location, and decontamination

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- The minimum detectable activity (MDA) using the Ludlum Model 12-1A with air-proportional detector total efficiency (instrument and detector) is 50 percent. The disintegrations per minute (dpm) can be determined as follows:

$$\frac{\text{cpm}}{\text{efficiency}} = \text{dpm}$$

5.3.3 The SSO will review and give approval, sign the appropriate report block, and transmit the reports to the EMRE. Any related final contamination surveys, work permits, welding permits, and special air sample reports, will be transferred with the original RDR package.

5.3.3.1 The EMRE, in conjunction with the SSO, will conduct an investigation of the occurrence, report findings, and corrective actions to be taken. The completed report will be permanently retained by the EMRE.

5.3.4 If the event is a reportable occurrence, then communication will be made with the SSO to determine who the responsible manager is.

5.3.5 The EMRE, in conjunction with the Operations Manager, will determine whether a critique is to be conducted, if a reportable occurrence is involved, and make the proper notifications to Radiological Operations, Radiological Engineering, EG&G Management, DOE, the responsible manager, and other involved parties, as to the date, time, and location of the critique.

5.3.6 If the event is a non-reportable occurrence, no action is necessary for further processing of the RDR.

6.0 REFERENCES

6.1 Environmental Management Radiological Guideline Number 2.3, Wounds and Skin Contamination

RADIOLOGICAL DEFICIENCY REPORTING PROGRAM

**EG&G ROCKY FLATS PLANT
EM RADIOLOGICAL GUIDELINES**

**Manual: OPS
Guideline No.: 10.1
Page: 9 of 9
Effective Date: December 6, 1991
Organization: Environmental Management**

Category 2

- 6.2 Environmental Management Radiological Guideline Number 2.2, Possible Inhalation Exposure
- 6.3 HSP 3.02, Radiological Deficiency Reports
- 6.4 DOE 5480.11, Radiation Protection for Occupational Workers
- 6.5 DOE 5000.3A, Occurrence Reporting and Processing of Operations Information
- 6.6 RFP Manual 1-10000 ADM, Procedure 16.01, Occurrence Reporting Process
- 6.7 RFP Manual 1-10000 EPP, Procedure 6.01, Occurrence Categorization Procedure
- 6.8 RE-1202, Administration of the RDR Program
- 6.9 RFP Dictionary, First Edition
- 7.0 **FORMS**

RADIOLOGICAL DEFICIENCY REPORT

ROCKY FLATS
RADIOLOGICAL DEFICIENCY REPORT

RDR Number:
RSP Number:
Occurrence Reporting Number:

O R I G I N A T O R	DATE:	LOCATION: (Indicate all applicable locations)																						
	TIME:	Building _____ Room _____	Building _____ Room _____	Building _____ Room _____	Pod _____ Other _____																			
INDIVIDUALS INVOLVED: () Unknown																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Name</th> <th style="width: 15%;">Employee No.</th> <th style="width: 20%;">Org/Company</th> <th style="width: 20%;">Job/Classification</th> <th style="width: 20%;">Supervisor</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>					Name	Employee No.	Org/Company	Job/Classification	Supervisor															
Name	Employee No.	Org/Company	Job/Classification	Supervisor																				
DESCRIPTION OF EVENT: (Check all that apply. If none apply, check "other" and explain) <input type="checkbox"/> General Area Contamination <input type="checkbox"/> Wound (confirmed positive) <input type="checkbox"/> Personnel Contamination (Skin) <input type="checkbox"/> Failure to Obtain/Adhere to Pre-evaluation <input type="checkbox"/> Company Clothing Contamination <input type="checkbox"/> Poor Housekeeping in Controlled Area <input type="checkbox"/> Personal Clothing Contamination <input type="checkbox"/> Misuse of Respiratory System <input type="checkbox"/> Contamination in Uncontrolled Area <input type="checkbox"/> Radiological Posting Violation <input type="checkbox"/> Spill Contributing to Area Contamination <input type="checkbox"/> Dosimeter Lost/Not Worn <input type="checkbox"/> Loss of Radioactive Sources <input type="checkbox"/> Improper Use of Radiological Containment <input type="checkbox"/> Improperly Marked Radioactive Material <input type="checkbox"/> Improper Disposal of Rad Waste <input type="checkbox"/> Improper or Lacking Radiological Posting <input type="checkbox"/> Improper Wearing of Anti-C Clothing <input type="checkbox"/> ALARA Concerns <input type="checkbox"/> Improper Frisking of Personnel/Items <input type="checkbox"/> Exceeding Exposure Limits <input type="checkbox"/> Potential/Confirmed Inhalation Ingestion <input type="checkbox"/> Exceeding Exposure Administrative Limit <input type="checkbox"/> Loss of Containment/Control <input type="checkbox"/> Procedure Violation/Inadequacy <input type="checkbox"/> Other _____ <input type="checkbox"/> Rad Work Permit Violation/Inadequacy <input type="checkbox"/> Positive SAAR Alarm w/o Respiratory Protection																								
DESCRIPTION OF DEFICIENCY: INCLUDE DOCUMENTATION - RSPs, SURVEYS, AIR SAMPLES RESULTS, ETC. ANSWER WHO, WHAT, WHEN, WHERE, WHY, AND HOW (Use additional pages as necessary)																								
IMMEDIATE CORRECTIVE ACTION:																								
ORIGINATOR: EMPLOYEE #		DATE: TIME	REVIEWED: RAD OPS FOREMAN	DOE 5000.3A, CATEGORIZATION: () Emergency () Unusual Occurrence () Off Normal () Internally Reportable OPS Manager: (if applicable)																				
DATE: TIME		DATE: TIME	EMPLOYEE #	DATE: TIME																				
MANAGER RESPONSIBLE FOR CORRECTIVE ACTION:		TARGET DATE:	Radiological Building Engineer	DATE: TIME																				
NAME:				DATE: TIME																				
ACTIONS TAKEN INCLUDING THOSE TO PREVENT REOCCURRENCE: (Use additional pages as necessary)																								
I HAVE CORRECTED THIS RDR AND RECOMMEND CLOSURE. DATE:																								
RESPONSIBLE MANAGER: EMPLOYEE #:																								
STATUS: () Satisfactory () Unsatisfactory () Redirected NAME:																								
CONCURRENCE: EMPLOYEE #: DATE:																								
APPARENT CAUSE CATEGORY: () Procedures () Communications () Equipment () Training () Personnel () Management Systems () Planning () Other _____																								
THIS RDR APPEARS TO HAVE BEEN ADEQUATELY ADDRESSED, REQUIRES NO FURTHER ACTION, AND IS CLOSED.			RSE MANAGER:	DATE:																				

RADIOLOGICAL DEFICIENCY REPORT

Page 2 of 2

RADIOLOGICAL DEFICIENCY REPORT
(on reverse side of RDR form)

INSTRUCTION: ORIGINATOR (EMRG 10.1 and RE 1202 for complete instructions on filling out forms.)

- Date and Time is the date and time of deficiency occurrence if known or when discovered. Date and Time of completion of originator section is the date and time the RDR is written. Location is where the deficiency occurred. Include all applicable locations on where the deficiency occurred.
- If the deficiency does not directly involve personnel or personnel involved cannot be identified, then mark box "unknown."
- List all individuals involved in the deficiency. An HSS should not be listed as an involved individual unless they were directly involved in the deficiency. If more forms are needed, then use a second RDR form.
- Check the "Description of Event" block that most clearly and closely describes what occurred or was discovered. Check all descriptions that apply.
- When describing the deficiency, provide detailed pertinent facts such as square feet of area contaminated, range of contamination and activities, number(s) of SAAMs alarmed, failed equipment, tanks, "B"-box, windows, air sample results, so that a reasonably knowledgeable person can understand the deficiency. Answer the questions: Who, What, When, Where, Why, How.
- Provide signature, employee number, date, time and forward to the Radiological Operations Foreman.

GENERAL:

- RDR forms shall have all information entered in an accurate, legible, and complete manner in black ink.
- Information entered onto the RDR form shall not be abbreviated to fit the space available; additional sheets should be attached as required to ensure completeness. Standard abbreviations as noted in the Rocky Flats Dictionary will be permitted.
- Errors should be corrected by drawing a single line through the incorrect entry/data, and following it with the corrected information. The individual changing the information shall enter his/her initials next to the striking line. The use of correction fluid or tape is prohibited to assure that all changes to the information are patently obvious.

RADIOLOGICAL PROTECTION INCIDENT REPORT

M M D D Y Y			
B L D G	D A T E	T I M E	A R E A

RADIOLOGICAL PROTECTION INCIDENT REPORT

(PERSONNEL CONTAMINATION, WOUND COUNTS, POSSIBLE INHALATIONS)

(Type or print neatly in BLACK ink. Instructions, room for comments on back)

Employee - Last Name, Int. (print)		SSAN or Employee #	Organization	Supervisor's Name (print)	
Survey Instrument		Serial #	Date Cal./Source Checked		
Sent to Med. Int. Dos		Wound Description	Respiratory Protection	Representative Sample (dpm)	
At	Hours For	Laceration	None	Nasal Swab/Blow: Yes	No
Wound Count		Puncture	Half Mask	Type of Material Involved	
Body Count		Abrasion	Full Face Mask	(Pu, Am, etc.)	
Decontamination		Burn	Supplied Air	(oxide, metal, etc.)	
<p>MARK INITIAL AND RESIDUAL SKIN CONTAMINATION LEVELS OUTSIDE OF BODY DIAGRAM.</p> <p>USE ARROWS TO INDICATE EXACT LOCATION OF CONTAMINATION ON BODY</p> <p>CIRCLE RESIDUAL LEVELS OF CONTAMINATION.</p> <p>MARK LOCATION OF WOUND WITH (X) ON BODY DIAGRAM.</p> <p>DECONTAMINATION COMPLETED IN BUILDING?</p> <p>YES _____ NO _____</p>		<p>RIGHT LEFT LEFT RIGHT</p>			
Reported by (print below)		(sign below)		Employee No.	Date (mm.dd.yy)
HSS					
SSO					

RDR APPARENT CAUSE CATEGORY

Procedures/Rad Work Permit

- o Not available, technically deficient
- o Unclear, difficult to use
- o Wrong sequence, inadequate
- o Wrong revision, typographical errors
- o Rad requirements inadequate

Personnel

- o Human error, accidental
- o Employee attitudes, awareness inadequate
- o Willful violation
- o Poor ergonomics
- o Poor work environment
- o Procedure non-compliance
- o Poor work practices
- o Poor housekeeping
- o Work area supervision inadequate
- o Improper instruction given
- o Area posted improperly/inadequately

Communications

- o Standard terminology not used
- o Conflicting verbal instructions
- o Written messages unclear/conflicting
- o Labels/signs absent/unclear
- o Communication not timely; late
- o Noisy environment
- o Communication between shifts inadequate

Planning

- o Assessment of job scope or difficulty incorrect
- o Use of mockups inadequate
- o Assessment of job duration inadequate
- o Interfacing job planning inadequate
- o Radiological not involved in planning from beginning

Training

- o Not available, infrequent task
- o Task analysis wrong
- o Skill/experience inadequate
- o Facilities not available
- o Radiological training inadequate

Equipment

- o Failure/malfunction, operator abuse
- o Functionally inadequate
- o Environment not appropriate to equipment
- o Equipment design/capability poor
- o Material wrong/defective
- o Preventive maintenance inadequate
- o Wrong tools/fixtures
- o Installation/maintenance error
- o Equipment unavailable/breakdowns frequent

Management System

- o Operating procedures not at work site
- o Insufficient management attention
- o Supervisor job participation inadequate
- o No corrective action system
- o Manager unaware of requirements
- o Responsibilities and interfaces not defined
- o Interdepartment coordination lacking
- o Supervision/management attitudes
- o Supervision - no job plan
- o Supervision - did not instruct or hold proper briefing
- o Radiological/other work group communications inadequate

RDR DATA SHEET

Number Assigned	Bldgs/ Pad/ Area Involved	Description of Event	Brief Description of Deficiency	Originator	Responsible Manager	Corrective Action Target Date	Responsible RBE	Date RDR Closed

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EYT	UNUS OCCU	OFF NORM	INT REPT OCCR
RADIOLOGICAL							
<u>Release:</u>							
■ A release with exposure to general public at site perimeter of greater than 1 REM whole body or greater than 5 REM thyroid.	X						
■ An event that breaches the roof or exterior walls of a radioactive material processing building to the extent that radioactive materials control is threatened	X						
■ Discovery of new radioactive material resulting from operations with significant consequences to the general public, i.e., exposure at site perimeter of greater than 1 REM whole body or greater than 5 REM thyroid.	X						
■ Loss of any primary confinement/containment which results in uncontrolled radiological material off-site greater than EPA guidelines.	X						
■ Any release of radioactive material that is not a normal monitored release and could reasonably be expected to result in an annual dose or dose commitment to any member of the general population greater than 500 mREM.		X					
■ Any release of radioactive material to controlled or uncontrolled areas in concentrations which, if averaged over a period of 24 hours, would exceed 5000 times the respective concentration guides specified for such materials in DOE Order 5400.5 and 5480.11.		X					

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
RADIOLOGICAL <u>Release</u> <ul style="list-style-type: none"> ■ Loss of any primary confinement/containment which results in uncontrolled radiological material off-site less than EPA guideline. ■ Loss of any primary confinement/containment which results in an uncontrolled radiological material release which is contained within the site boundary. ■ Release of radioactive material that exceeds a reportable quantity and is not federally permitted. ■ Release of radionuclide material that violates environmental requirements in permits, regulations or DOE standards. ■ Release below emergency levels which requires immediate (<4 hours) reporting to regulatory authorities or triggers specific action levels for an outside agency. ■ Any contamination spread off-site by personnel (EMRG 2.1, EMRG 3.2) ■ An off-site occurrence in sufficient proximity that the site will furnish primary spill response that results in the release of radioactive material. ■ Discovery of off-site contamination due to DOE operations which does not represent an immediate threat to the public. (EMRG 3.2) ■ Any discovery of groundwater contamination. (DOE 5400.5) 		X					
		X					
				X			
				X			
					X		
					X		
					X		

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
RADIOLOGICAL <u>Release</u> <ul style="list-style-type: none"> ■ Any release of radionuclide material to controlled or uncontrolled areas that is not part of a normal monitored release. ■ Any controlled release of radionuclide material that occurs as a monitored part of normal operations which exceeds what historical data and/or analysis show is expected as a result of normal operations. ■ Any release of radioactive material outside controlled areas. ■ Any detection of a radionuclide in a sanitary or storm sewer, waste or process stream, or any holding points where such a material is not expected and for which an immediate explanation is not available. ■ Contamination is spread to uncontrolled areas of the site. (EMRG 3.2) ■ Any contamination detected within a controlled area in excess of established limits or within a building structure in uncontrolled areas. (EMRG 3.1) ■ Any unplanned contaminated spill in working areas. ■ Discovery of any on-site contamination attributable to DOE operations. 						X X X X X X X X	

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
RADIOLOGICAL <u>Release</u> <ul style="list-style-type: none"> ■ Discovery of contamination that results or could result in significant consequences of off-site release (i.e., exceeding safe exposure limits to workers or public). ■ Any controlled, uncontrolled, or accidental release which is not classified as an unusual occurrence but which will be reported to outside agencies in a format other than routine monthly or quarterly reports. ■ Any Radiological Assistance Occurrence 	X				X	X	
FIRE/EXPLOSION <ul style="list-style-type: none"> ■ Any event that causes uncontrolled release of radioactive material. ■ An explosion that breaches the roof or exterior walls of a radioactive material processing building to the extent that radioactive (toxic) materials control is threatened. ■ An explosion that results in a release of hazardous materials to the environment that creates a potential life threatening hazard to on-site employees, or exposure to off-site populations. 	X						
	X						
	X						

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EYT	UNUS OCCU	OFF NORM	INT REPT OCCR
<p>FIRE/EXPLOSION</p> <ul style="list-style-type: none"> ■ A fire is in progress or has occurred that involves actual or imminent substantial reduction of facility safety systems which may result in radioactive releases greater than EPA guidelines or toxic chemical releases greater than the Immediately Dangerous to Life and Health (IDLH) level at the site boundary. ■ A fire that results in a release of radioactive materials to the environment, but at levels which would result in off-site concentrations within permissible limits. ■ A fire that is not promptly controlled by fire protection personnel or involves the release of visible smoke to the environment, which may cause public concern or result in significant contamination. 	X						
<p>CRITICALITY/SECURITY</p> <ul style="list-style-type: none"> ■ Loss of accountability of a nuclear source in excess of exempt quantities as specified in 10 CFR 30.71 (Schedule B) and the State of Colorado standards. ■ Loss of accountable special nuclear material. ■ Any apparent loss or theft of radioactive or nonradioactive material in quantities and circumstances such that it would constitute a threat to the safety and health of individuals. 		X		X	X		

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
<p>CRITICALITY/SECURITY</p> <ul style="list-style-type: none"> ■ Any fissionable material in a process system or in non-process systems not designed or expected to accommodate such material. ■ Any unplanned accumulation of fissionable material within primary confinement boundaries. <p>RADIOLOGICAL</p> <p><u>Transportation</u></p> <ul style="list-style-type: none"> ■ Any release of reportable quantities of radioactive materials off-site during transportation activities. (>CFR49 Criteria) ■ Radioactive material release suspected or detected in concert with a major transportation incident. ■ Any shipment of radioactive material that arrives at its destination damaged to the extent that there is substantial reduction in the effectiveness of the package; contents are leaking or may have leaked; or there is detectable contamination. ■ Any shipment of radioactive material that arrives at its destination with a non-reconcilable manifest discrepancy or with an incomplete or missing manifest. ■ Any release of radioactive material off-site during DOE/site transportation activities. 					X	X	
			X				
			X				
					X		
						X	
					X		

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
<p>RADIOLOGICAL</p> <p><u>Transportation</u></p> <ul style="list-style-type: none"> ■ Any other violations of regulatory or DOE requirements during the transportation of radioactive materials. ■ Any release of radioactive material during DOE/Site Transportation activities. ■ Any releases of trace quantities of radioactive material caused by a vehicular or transportation accident. <p><u>Personnel Safety</u></p> <ul style="list-style-type: none"> ■ Any exposure to high levels of radiation sufficient to cause fatalities or require hospitalization (i.e., such as criticality accidents). ■ Serious injury with radioactive contamination involved which requires treatment at an offsite hospital, and subsequent activation of the hospital's Radiological Emergency Plan. ■ Any exposure resulting in adverse physical response or requiring medical treatment. ■ Any single or cumulative exposure that violates a regulatory limit (e.g., DOE 5480.11 and HSP 18.01). 							
				X		X	
			X			X	
					X		
					X		

CATEGORIZATION MATRIX

EVENT	CATEGORIZATION						
	GEN EMER	SITE EMER	ALRT	UNUS EVT	UNUS OCCU	OFF NORM	INT REPT OCCR
<p>PERSONNEL SAFETY</p> <ul style="list-style-type: none"> ■ Fetal exposure in excess of 500 MREM. ■ Any single or cumulative internal uptake that on the basis of early assay data will result in a dose or dose commitment in excess of the pertinent annual standard set forth in DOE 5480.11. ■ Any event that results in five or more individual contaminations. (ROI 2.1) ■ Any event requiring off-site medical assistance for contaminated personnel. ■ Any single or cumulative exposure not categorized an Unusual Occurrence that violates an administrative limit. (HSP 19.01) ■ Any case where personnel receive confirmed contamination (EMRG 2.2) ■ Any potential or confirmed internal assimilation, whether from personnel or operating area contamination. (EMRG 2.2) ■ Any case where personnel clothing (not protective clothing) receives confirmed contamination. (EMRG 2.1) 					X		
					X		
					X		
					X		
						X	
						X	
						X	