 Fermilab		ES&H Section Procedures	
Procedure Number/Name ESH-RPO-DECON-02 Personnel Decontamination in the Field			Effective Date: 8/21/2020
Written by: Kathy Graden		Reviewed and Updated By: Kathy Graden	Date 06/03/2021

Personnel Contamination and Personnel Decontamination in the Field

Approvals

Written By:

Kathy Graden, Radiation Safety Officer (RSO)

Reviewed By:

Joel Fulgham, RCT Group Leader

Reviewed By:

Sue McGimpsey, RSO

Reviewed By:

Ben Russell, RSO

Approved By:

Maddie Schoell, Radiation Physics Operations (RPO) Department Head

Revision History

Author	Description of Change	Revision Number	Revision Date
Kathy Graden	Initial document	0	8/21/2020
Kathy Graden	Incorporation of instructions to report event to Fermilab Occupational Medicine Office for CAIRS reporting	1	6/3/2021

Table of Contents

Approvals	1
Revision History.....	2
Table of Contents	3
Procedure	4
1.0 Purpose.....	4
2.0 Scope	4
3.0 Summary.....	4
4.0 Definitions	4
5.0 Responsibilities	4
6.0 Health and Safety Warnings	5
7.0 Material, Equipment & Training Needed	6
8.0 Procedural Steps	7
9.0 Data and Records Management	11
10.0 Quality Assurance/Quality Control	11
11.0 References	11
12.0 SOP Signature Sheet.....	12
13.0 Procedure Specific Training Checklist	12
14.0 Attachments	12

Procedure

1.0 Purpose

The purpose of this procedure is to provide instructions for Radiological Control Technicians (RCTs) and assigned Radiation Safety Officers (RSOs) on response to personnel contamination and personnel decontamination in the field.

2.0 Scope

This procedure is limited to personnel decontamination in the field and does not include personnel decontamination at the Site 39 decontamination facility.

3.0 Summary

In the majority of personnel contamination cases, decontamination can successfully take place in the field. With assigned RSO oversight, RCTs are the primary radiological control organization personnel that will conduct personnel decontamination in the field.

4.0 Definitions

Radioactive contamination: loose surface or removable - Radioactive material that can be removed from surfaces by non-destructive means, such as casual contact, wiping, brushing, or washing. It is not volume activated material.

5.0 Responsibilities

5.1 Fermilab Fire Department

If a person is injured, becomes injured, ill, or overly agitated such as a panic attack, before or during decontamination, medical treatment takes precedence over decontamination. Call x3131 to report the injury, illness, or agitated state if emergency personnel are not already on the scene. Fire Department personnel are responsible for the contaminated person if medical attention is required.

Fire Department personnel are responsible to transport the contaminated person to a local hospital as needed. See ESHS-Decon-01 Fermilab Personnel Decontamination Procedure at Site 39 Decontamination Facility for more information.

5.2 RCTs

- 5.2.1 RCTs notify assigned RSO of potential contaminated person. RCTs are responsible for being aware of the potential types of radioactive contamination in an area such as accelerator produced isotopes (API), beryllium-7 (Be-7), tritium, etc.
- 5.2.2 RCTs gather information regarding the event and communicate this information to the assigned RSO.
- 5.2.3 RCTs conduct survey of contaminated person.
- 5.2.4 RCTs inform assigned RSO of contamination survey results and advise RSOs of whether radon daughter products or API of less than 1,000 net counts per minute (cpm) are suspected.
- 5.2.5 Upon RSO approval, RCTs conduct decontamination of the person in the field and inform assigned RSO of decontamination survey results.

- 5.2.6 RCTs record information, survey results, and decontamination survey results on Decontamination in the Field Information Sheet and Checklist (R.P. Form #119). See References, Section 11.0 for link to form.
- 5.2.7 RCTs provide all documentation to assigned RSO.
- 5.2.8 RCTs conduct post-decontamination surveys and decontamination as necessary.
- 5.2.9 RCTs assist with transport to Site 39 decontamination facility if required.

5.3 Assigned RSOs

- 5.3.1 The assigned RSO is responsible for reviewing circumstances surrounding the contamination event and determining if contamination is most likely of result of radon daughter products or API measuring less than 1,000 net cpm, or hard to detect radionuclides (tritium, Be-7). In practice, RCTs will conclude whether or not contamination is from radon or is less than the 1,000 net cpm limit for API and will inform RSOs accordingly.
- 5.3.2 Assigned RSOs give approval (remotely) to commence with decontamination.
- 5.3.3 If contamination is most likely not from radon and is above the API threshold of above 1,000 net cpm, assigned RSO instructs RCTs to assist the contaminated person to Site 39 decontamination facility. In this case, RSOs should go to Site 39 decontamination facility.
- 5.3.4 RSOs do not have to respond to the location of the contamination but may give approval remotely. However, RSOs should prepare to come on-site/to the scene/Site 39 decontamination facility.
- 5.3.5 RSOs notify the Senior Radiation Safety Officer (SRSO) of the contamination event.
- 5.3.6 Post-event, RSO provides SRSO with documentation (R. P. Form #119). See References, Section 11.0 for link to form.
- 5.3.7 If the assigned RSO for the area of the contamination event is not available, these responsibilities fall to other available RSOs within the RPO Department.

5.4 SRSO

- 5.4.1 The SRSO notifies the Chief Safety Officer (CSO) and other upper management of a field decontamination event.
- 5.4.2 The SRSO discusses and recommends whether or not the Emergency Operations Center (EOC) should be activated and whether or not DOE Fermi Site Office should be notified. For example, the EOC may be activated if a person is transported to a local hospital.
- 5.4.3 The SRSO approves bioassay sample collection and analysis. See ESHS-Decon-01 Fermilab Personnel Decontamination Procedure at Site 39 Decontamination Facility for more information.
- 5.4.4 The SRSO supports RCTs and assigned RSOs with event documentation and follow-up actions that may be required.

6.0 Health and Safety Warnings

Personnel performing steps of this procedure will come into contact with contaminated and/or potentially contaminated persons. As such, proper precautions should be taken to reduce the spread of contamination to other areas or transferred to other personnel.

NOTE: Not all radionuclides can be detected with field survey instruments. If Be-7, tritium, or other non-detectable radionuclides are suspected, additional instruments may be needed for accurate analysis and bioassays may be needed.

In addition, potential contamination events will likely be stressful for the contaminated person and others involved in the event response. Care should be given during all communication and interactions to ensure that radiological control personnel act in a professional and sympathetic manner and are forthright with actions and steps that need to be taken and communication of survey results.

Regarding release of accelerator produced radionuclides to the sanitary sewer system, it has been calculated that at 1,000 net cpm flushing more than one-half gallon of water down the sink after decontamination will prevent contaminant levels above surface water derived concentration limits. Therefore, no significant environmental hazard exists as a result decontaminating a person using soap and water at a sink.

Radiation Physics Note #7, External Dosimetry Technical Basis Document sites that no significant contamination levels exist to cause an annual total effective dose greater than 100 mrem. At levels less than 1,000 net cpm for API or for radon, personnel decontamination in the field will not result in any significant radiation dose to the contaminated person or to response personnel.

7.0 Material, Equipment & Training Needed

7.1 Material & Equipment Required:

- 7.1.1 PPE for RCTs
 - Gloves
 - Shoecovers, optional
 - Labcoat, optional
 - Coveralls, optional
- 7.1.2 PPE for Assigned RSOs (if RSO responds to scene)
 - Gloves
 - Shoecovers, optional
 - Labcoat, optional (required if RSO has direct contact with contaminated person)
 - Coveralls, optional
- 7.1.3 PPE for contaminated person (used for any transport of person to other areas such as a restroom, Site 39, etc.)
 - Gloves
 - Shoecovers as deemed necessary
 - Coveralls as deemed necessary
 - Hood, optional (required if contamination found on the head and/or hair)
- 7.1.4 Frisker or E140N
- 7.1.5 Alpha meter (if available)
- 7.1.6 Baby wipes
- 7.1.7 Sticky material such as duct tape
- 7.1.8 Radioactive waste bags
- 7.1.9 Personnel Decontamination in the Field Information Sheet and Checklist (R.P. Form #119)

7.2 Training Required

- 7.2.1 Radiological Worker Training (FN000470 and FN000471) or DOE Core Academics for RCTs (FN000277) and RCT Continuing Training and Requalification (FN000300)
- 7.2.2 Personnel Decontamination Training (FN000366)

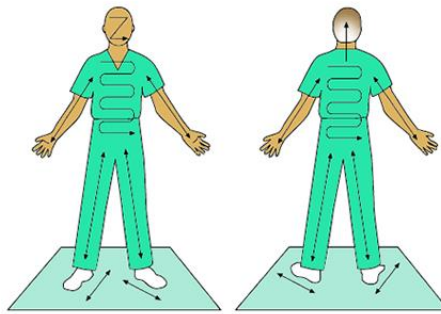
8.0 Procedural Steps

8.1 RCT Response – Proceed to Location, Gather Information, and Conduct Initial Contamination Survey

- 8.1.1 RCTs should ensure that all required material in Section 7.0 is gathered prior to proceeding to the location.
- 8.1.2 When possible, at least two RCTs should respond to the location of the contamination event.
- 8.1.3 RCTs should notify the assigned RSO via phone and provide any information that is known at the time.

One RCT should begin gathering and documenting information about the contamination event and record information on Personnel Decontamination in the Field Information Sheet and Checklist (R.P. Form #119). If only one RCT is able to respond, ask any unaffected available personnel to help with documentation. For example, information should include:

- Number of persons involved
 - Work being performed
 - Does it involve a water system?
 - Location of the contamination incident
 - Is it in the vicinity of a posted Contamination or High Radiation Area?
 - Is Be-7, tritium, or other hard to detect radionuclides suspected?
 - Radioactive source involved
- 8.1.4 The other RCT personnel should conduct an initial contamination survey of the person following the steps below:
- a. Don gloves and other PPE as necessary to protect oneself from cross-contamination.
 - b. Help the person remove protective clothing and other PPE that may be contaminated if not already done. Protective clothing is contaminated if the frisker reads ≥ 50 net cpm.
 - c. If an alpha meter is available, survey the person to determine whether contamination is from radon daughter products. If no alpha meter is available, survey the person using a frisker or E140N. Start at the person's head and do a cursory survey holding the probe $\frac{1}{4}$ inch away from the surface to see if there are any obvious areas of contamination. The priority is to survey the mouth, nose, ears, head/hair, exposed skin, and personal clothing.
 - d. Next, survey the person's whole body at a rate of one inch per second. To prevent contaminating the frisker, don't touch the person's skin or personal clothing with the detector probe. A person's personal clothing is contaminated if the frisker reads ≥ 50 net cpm.



Proper Surveying Technique

- e. If you notice an increase in count rate, hold the detector probe over the area for five seconds to allow the meter to stabilize.
 - f. A person's skin is contaminated if the frisker reads ≥ 100 net cpm.
 - g. Explain the results of the survey to the contaminated person.
 - h. If no alpha meter is present, wait about 15 to 20 minutes after the initial survey and then resurvey the person(s). If the second survey shows a lower count rate due to radioactive decay, the contamination is presumed to be radon daughter products.
- 8.1.5 RCTs should contact the assigned RSO via phone a second time to provide additional information and survey results. RCTs should not release personnel until approved by RSO.

8.2 RCT Response - Decontamination of Localized Skin Areas

Upon RSO approval, begin decontamination using soap and **lukewarm** water or baby wipes in the areas of highest contamination first using the following method(s).

8.2.1 Soap and Water Method

- a. If there is access to a sink, select appropriate PPE to transport the person to the sink. If transport in a government vehicle is required, instruct the person to don gloves at a minimum. Use soap and **lukewarm** water to decontaminate localized skin areas that can be cleaned. Protect clean areas of skin and personnel clothing from splashes using large tissues or PPE.
- b. If entry to a restroom is required, someone of the same gender must conduct decontamination.
- c. Blot the area once per paper tissue and repeat until the person's skin is dry. Discard tissue in a radioactive waste bag.
- d. Survey the area after each cleaning to determine if contamination levels are less than 100 net cpm. **Repeat the above steps no more than two times.** Explain survey results to the person.
- e. Survey the sink and soap dispenser and decontaminate as necessary.
- f. If decontamination efforts are unsuccessful after two attempts, transport the contaminated person to Site 39 decontamination facility.

8.2.2 Baby Wipes Method

- a. Use baby wipes to gently decontaminate intact skin. Clean the skin using a “wipe and pick up” type of motion. Begin at the outer area of contamination and wipe inward to bring contamination to the center, then pick up (like cleaning up a paint spill). See diagram below. Discard baby wipes in a radioactive waste bag.



Proper Cleaning Technique

- b. After cleaning, place a large paper tissue over cleaned area to blot the area dry. Blot the area once per paper tissue. Do not wipe back and forth. Repeat until the skin is dry. Discard materials in a radioactive waste bag.
- c. Survey the area after each cleaning to determine if contamination levels are less than 100 net cpm. **Repeat the above steps no more than two times.** Explain survey results to the person.
- d. If decontamination efforts are unsuccessful after two attempts, transport the contaminated person to Site 39 decontamination facility.

8.3 RCT Response - Decontamination of Dry Personal Clothing

- 8.3.1 If removal of clothing compromises personal privacy such as the removal of pants, the person indicates that they are not comfortable, or decontamination of dry personal clothing is unsuccessful, transport the person to Site 39 decontamination facility.
- 8.3.2 Use sticky material to decontaminate dry clothing. Dry clothing may be removed to the extent that it does not compromise personal privacy. For example, outer layers of clothing such as an over shirt may be removed if the person is wearing an undershirt or tee shirt underneath. Duct tape is often effective in removing contamination. Conduct a survey of the clothing to determine if results are below 50 net cpm.
- 8.3.3 If the person’s personal clothing is contaminated with radon, take one of two options depending on what the contaminated person prefers:
 - a. Do not remove personal clothing. Instruct the person not to enter enclosures or return to normal work until they frisk to verify that they are no longer contaminated (due to radon decay). RCTs should wait with the person or meet the person at the end of the workday to help with confirmatory frisk. Persons should not leave site until they have no radon contamination on their personal clothing.
 - b. If the person is more comfortable with removal of radon contaminated clothing and there are no personal privacy issues, assist the person with removal of personal clothing. Bag the clothing, place it in a radioactive waste bag, and hold the clothing

for decay. As available, RCTs may offer sweatpants, tee shirts, or sweatshirts to replace personal clothing.

8.4 RCT Response - Conducting Post-Event Area Wipe Survey and Area Decontamination

8.4.1 After the contaminated person has been successfully decontaminated or has been transported to Site 39 decontamination facility, available RCTs (those not assisting decontamination efforts at Site 39 decontamination facility) should conduct area wipe surveys and decontaminate the area as determined by the assigned RSO. If the contamination results from radon, no area decontamination or surveys are required because it will decay and will not be detected on wipes.

8.4.2 Document surveys on applicable survey maps and attach to Personnel Decontamination in the Field Information Sheet and Checklist (R.P. Form 119). See References, Section 11.0 for link to form.

8.5 Assigned RSO Response

8.5.1 Based on the information gathered and the survey results, the assigned RSO will determine whether field decontamination is appropriate or instruct RCTs and contaminated person(s) to go to Site 39 decontamination facility. Assigned RSO decision should be based on the following criteria:

- a. Number of contaminated persons does not exceed **two**. More than two persons require decontamination at the Site 39 decontamination facility.
- b. Area of body that is contaminated is limited to hands, arms, legs, or dry personal clothing that may be removed without compromising personal privacy. Facial contamination requires decontamination at Site 39 decontamination facility.
- c. Results of the initial and second contamination survey indicate either radon (no cpm limit) or API of less than 1,000 net cpm with a frisker or E140N.
- d. If tritium contamination is suspected, transport person to Site 39 decontamination facility to provide urine bioassay collection information and complete applicable R.P. forms. Since tritium cannot be removed from skin, bioassays are used to determine internal dose or negative verification of no intake.
- e. If Be-7 contamination is suspected, transport person to Site 39 decontamination facility to provide urine bioassay collection information and complete applicable R.P. forms. Since Be-7 is difficult to measure, bioassays are used to determine internal dose or negative verification of no intake. All post-decontamination survey wipes need to be taken to the Radionuclide Analysis Facility (RAF) for analysis. If other equipment is available to obtain a faster result, that system should be utilized.
- f. If it is feasible to decontaminate the person using soap and water or baby wipes.
- g. If contaminated clothing is dry or wet. Dry clothing may remain on the person if it is known to be radon or it may be decontaminated. Alternatively, some parts of clothing may be removed if removal of clothing does not compromise person privacy. If personal clothing cannot be removed without compromising personal privacy, transport the person to Site 39 decontamination facility.
- h. If clothing is wet, remove as much wet clothing as possible without compromising personal privacy. If wet clothing cannot be removed without causing privacy issues, decontamination should take place at Site 39 decontamination facility. Wet clothes

should be disposed of as radioactive waste unless they can be dried and stored for decay before being returned. Dry clothes will be provided.

- i. If radioactive sources are involved, decontamination should take place at Site 39 decontamination facility because alpha emitters could be involved. When alpha emitters are involved (except for radon), urine bioassays need to be collected.

8.5.2 If the assigned RSO determines that personnel decontamination in the field is appropriate, the following steps should be taken:

- a. Instruct RCTs to don a new set of gloves or remove outer glove (and other PPE as necessary) and begin decontamination of localized skin areas.
- b. Notify the SRSO and explain the situation. Follow any additional instructions provided by the SRSO.
- c. If not already conducted by RCT, record information, survey results, and decontamination survey results on Decontamination in the Field Information Sheet and Checklist (R.P. Form #119). See References, Section 11.0 for link to form.

8.5.3 Report the contamination event and provide documentation to the Fermilab Occupational Medicine Office (FOMO). The event needs to be reported to the FOMO in all cases (regardless of no injury/injury). If there is no injury, the event will be documented as “report only.” The FOMO will gather any other necessary information for Computerized Accident Incident Reporting System (CAIRS) reporting from the individual.

9.0 Data and Records Management

Personnel Decontamination procedures are located on DocDB at <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=184> (right click on link and select “Open Weblink in Browser”).

Decontamination in the Field Information Sheet and Checklist (R.P. Form #119) is located on DocDB at <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=5736> (right click on link and select “Open Weblink in Browser”).

10.0 Quality Assurance/Quality Control

This procedure is subject to a review/update frequency requirement of five years and is due 8/31/2025.

11.0 References

ESHS-Decon-01 Fermilab Personnel Decontamination Procedure at Site 39 Decontamination Facility <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=184> (right click on link and select “Open Weblink in Browser”).

Decontamination in the Field Information Sheet and Checklist (R.P. Form #119) <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=5736> (right click on link and select “Open Weblink in Browser”).

Radiation Physics Note #7, Fermilab External Dosimetry Technical Basis Document <https://esh-docdb.fnal.gov/cgi-bin/sso/ShowDocument?docid=2192> (right click on link and select “Open Weblink in Browser”).

12.0 SOP Signature Sheet

N/A. Training described in section 7.2 is tracked in TRAIN.

13.0 Procedure Specific Training Checklist

N/A. Training described in section 7.2 is tracked in TRAIN.

14.0 Attachments

None