

## Spill Response

### 1.0 Statement

In the event of radioactive contamination or spill, which does not involve injury or personal contamination, immediate action must be taken to control the spread of contamination. Individuals shall take steps to control the possible spread of contamination. Cordon off the area. Immediately inform the RSO, 709 – 864 - 8250 during normal business hours or Campus Enforcement and Patrol, 709 – 864 - 4100 for a 24-hour response.

### 2.0 Minor Radiological Incident

Minor spills involve less than 100 exemption quantities (EQ) of a nuclear substance.

### 3.0 Major Radiological Incident

Major spills involve more than 100 EQ, or contamination of personnel, or release of volatile material.

### 4.0 Procedure

- 4.1 **Immediately inform co-workers in the area.** Inform supervisor and ask for their support. Keep unnecessary personnel away from the area. Leave fume hood fan on.
- 4.2 **Ensure your own safety and the safety of others.** Do not do anything to contaminate yourself or others. Do not do anything to cause increased spread of contamination. Step back 1 or 2 meters – preferably onto a clean disposable absorbent pad. If possible, check for radioactive contamination of people before proceeding.
- 4.3 If you are not trained to cope with the severity of incident, **immediately inform the Radiation Safety Officer (709-864-8250)** during normal work hours. If after hours, call Campus Enforcement patrol for a 24-hour response at **709-864-4100**.
- 4.4 Cordon off the area. Unnecessary persons should be prevented from entering or remaining in the contaminated area.
- 4.6 Get the Spill Kit (see Appendix B for recommended spill kit contents) and survey meter for nuclear substances other than H-3 or C-14 (for H-3 and C-14 use Liquid Scintillation Counting).
- 4.7 Wear gloves and foot covers to avoid contamination.
- 4.8 Monitor the area to determine the extent of contamination with suitable meter. For H-3 and C-14 you need to use liquid scintillation techniques.
- 4.9 **For spills:** Surround the spill with absorbent material. Cover liquid spills with absorbent material. Use wetted absorbent material for dry spill. If radioiodine compounds are spilled, small amount of 0.1M NaOH and 0.1M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> should be added to the spill carefully to bind any free iodine present.

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4.10 *For radioactive contamination:* Decontaminate using absorbent material, while using the meter to determine the progress. Use specific decontamination techniques that are listed in Table 1: AREA AND MATERIAL DECONTAMINATION at the end of this RSOP. The initial approach should be scrubbing with small quantities of hot water containing suitable cleaning agents. Use no more liquid than necessary in order to minimize the spread of contamination.

#### 4.0 Re- Monitor

Re-monitor for contamination, decontaminate and repeat until removable contamination is below 0.5 Bq/cm<sup>2</sup> for public areas.

#### 5.0 Wastes Generated

All wastes (chemicals, water, rags, etc.) created during the decontamination procedures are to be disposed of in accordance with the RSOP09 Disposal of Radioactive Waste. Keep long half-life and short half-life waste separate.

#### 6.0 Records

Records of decontamination procedure and contamination monitoring results shall be filed in the EHA Assistant and kept as part of the records for the permit. Complete a Radioisotope Spill Report Log (Appendix A) and keep a copy with Radiation Safety Records binder. Send a copy to the RSO. The Radioisotope User Permit (RUP) Holder shall complete the “Description of Occurrence” and “Description of Actions taken to Prevent Recurrence” section of the Radioisotope Spill Report Log.

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**Table 1: AREA AND MATERIAL DECONTAMINATION**

<b>Method</b>	<b>Surface</b>	<b>Action</b>	<b>Technique</b>	<b>Advantages</b>	<b>Disadvantages</b>
Hot water and Detergent, Tide or Water Softener (Calgon)	All surfaces.	Dissolves and erodes.	For spills and small surfaces. Blot up liquid and wipe with cleaning solution. Glassware, other equipment or of porous surfaces and clothing may be washed by immersion and agitation in solution.	Extremely effective if done immediately after spill and on nonporous surfaces.	Of little value in decontamination of long standing contaminants.
Complexing agents	Nonporous surfaces.	Forms soluble complexes with contaminating material.	Complexing agent solution of 3 % agent (by weight) of agent. Spray surface with solution. Keep surface moist for 30 minutes by respraying. Flush with water.	Holds contamination in solution. Easily stored; Carbonates and citrates are non-toxic and noncorrosive.	Requires application for 5 to 30 minutes. Little penetration power.
Alconox EDTA	All surfaces.	Dissolves and complexes contaminating material.	Use standard cleaning procedures.	A very good general decontaminating agent.	Not very effective on porous surfaces or in decontamination of long standing contaminants.
Organic solvents	Nonporous surfaces.	Dissolves organic materials (oil - paint, etc.).	Immerse entire unit in solvent or apply in wiping procedure.	Quick dissolving action.	Requires good ventilation and fire precautions. Toxic to personnel.
Abrasion (Dutch Cleanser)	Nonporous surfaces.	Removes surface.	Use conventional procedures.	Contamination may be reduced to as low a level as desired.	Impracticable for porous surfaces because of penetration by moisture.
Inorganic acids mixtures	Metal surfaces.	Dissolves porous deposits of same.	Use dip- bath procedure for movable items. Acid should be kept at a concentration of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Flush surface with water, scrub with a water-detergent solution, and rinse.	Corrosive action on metal and porous deposits Corrosive action may be moderated by addition of corrosion inhibitors to solution.	Personal hazard. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors.
Oven Cleaner	All surfaces.	Dissolves organic and some inorganic.	Spray or paint on area. Wipe off with damp cloth after 30 minutes.	Extremely effective in removing materials.	Strong corrosive agent. May damage surface. Use caution in handling material.



# Radiation Safety Operating Procedure

## Spill Response

### Appendix A - Radioisotope Spill Report Log



Department of  
Health and Safety

# Radioisotope Spill Report Log

This report is to be completed by the Radioisotope User Permit Holder or Senior Laboratory Supervisor

### LOCATION

The spill occurred at (time) \_\_\_\_\_ a.m. / p.m. on (date) \_\_\_\_\_  
 in room #/area \_\_\_\_\_ of building \_\_\_\_\_

### CONTAMINATION MONITORING INSTRUMENTS

Contamination meter used to check for contamination:

Meter Make: \_\_\_\_\_ Meter Calibration Date: \_\_\_\_\_  
 Meter Model: \_\_\_\_\_ Meter Serial Number: \_\_\_\_\_

### WIPE TEST RECORD OF SPILL AREA

Wipe Test #	Wipe Test 1 Bq/cm <sup>2</sup>	Wipe Test 2 Bq/cm <sup>2</sup>	Wipe Test 3 Bq/cm <sup>2</sup>	Wipe Test 4 Bq/cm <sup>2</sup>	Wipe Test 5 Bq/cm <sup>2</sup>
Point A					
Point B					
Point C					
Point D					
Point E					

### DESCRIPTION OF WIPE TEST POINTS (provide copy of wipe map)

Point A	
Point B	
Point C	
Point D	
Point E	

### Spill Response

Appendix B - Radioisotope Spill Control Kit (recommended contents).

1. Several radiation warning signs to be posted to warn personnel of the spill.
2. Radiation warning tape to seal items which may be contaminated.
3. Several pairs of disposable gloves to be worn by personnel involved in the clean-up.
4. Small plastic bags to serve as receptacles for wet or dry waste material. They may also serve as emergency shoe covers.
5. Masking tape to seal items which are not contaminated.
6. A grease pencil to outline the perimeter of the spill.
7. Large plastic bags to contain waste material, whether or not contaminated.
8. Tongs or forceps to handle contaminated items.
9. Paper bags to contain sharp objects or broken glass.
10. Gauze sponges to absorb spills. A box of tissues can also be included for the same purpose.
11. Paper towels to blot up the contaminated area.
12. Detergent solution to emulsify the spilled material and make it easier to clean from surfaces. Radioiodine users must also include a bottle of a solution of 0.1 M sodium hydroxide, 0.1 M sodium thiosulfate, 0.1 M sodium iodide which can be poured on iodine spills to reduce volatility and dilute the spilled material.
13. A can of scouring powder (e.g. Ajax) to be used when scouring is needed to remove contamination from a surface.
14. Identification tags to label all material for disposal.
15. Filter papers to perform wipe tests to determine if all contamination has been removed.
16. A pair of scissors to cut tape, filter papers, etc.
17. Pieces of bench covering to be taped down over the spill area after the spill has been cleaned up until wipe tests have been counted and the area has been certified to have less than permissible contamination levels.

Spill control kits should be customized based on the specific radiation hazards in the laboratory. Contents must be verified and documents as verified at least annually. This spill control kit should be placed in a bag or small carton, suitably labeled and kept in an accessible place in the laboratory. It is important to replenish the supplies in the kit each time it is used.

**A spill control kit is mandatory in all open-source radioisotope laboratories.**