RADIATION SAFETY TRAINING

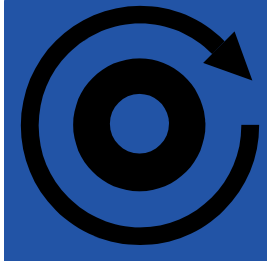
RESEARCH AND DEVELOPMENT SERVICE

RADIATIONSAFETYTRAININGPORTLAND

VA MEDICAL CENTER

RESEARCH

AND DEVELOPMENT SERVICE



RADIATIONSAFETY

Introduction

Radiation workers are to be instructed annually of the following:

1) Areas where radioactive materials are to be stored, transferred, and used.
2) Health protection associated with exposure to radiation.
3) Precautions and procedures to minimize radiation exposure.
4) Purpose and function of protection devices employed.
5) Applicable portions of the U.S. Nuclear Regulatory Commission (NRC) regulations.
6) The responsibility to report conditions that may lead to excess exposure, or that violate NRC regulations.
7) The appropriate response to unusual occurrences or malfunctions.
8) Individual rights to radiation exposure records.
9) The right of a woman to declare (or not) her pregnancy.

RADIATIONSAFETY Introduction

Radiation workers should understand that if they have any further questions or problems relating to these matters or any other radiation safety issues that they are to contact:

The Radiation Safety Office (P2IMAG)

Bldg. 100/Room 2D 107B, ext. 54483.

After hours or emergencies, call the Energy Center at x56300 or *20.

Posting and Labeling of Radioactive Areas

The universal radiation warning colors are black or magenta on a yellow background.

The trefoil radiation symbol is shown below, with various warning language depending on the situation.

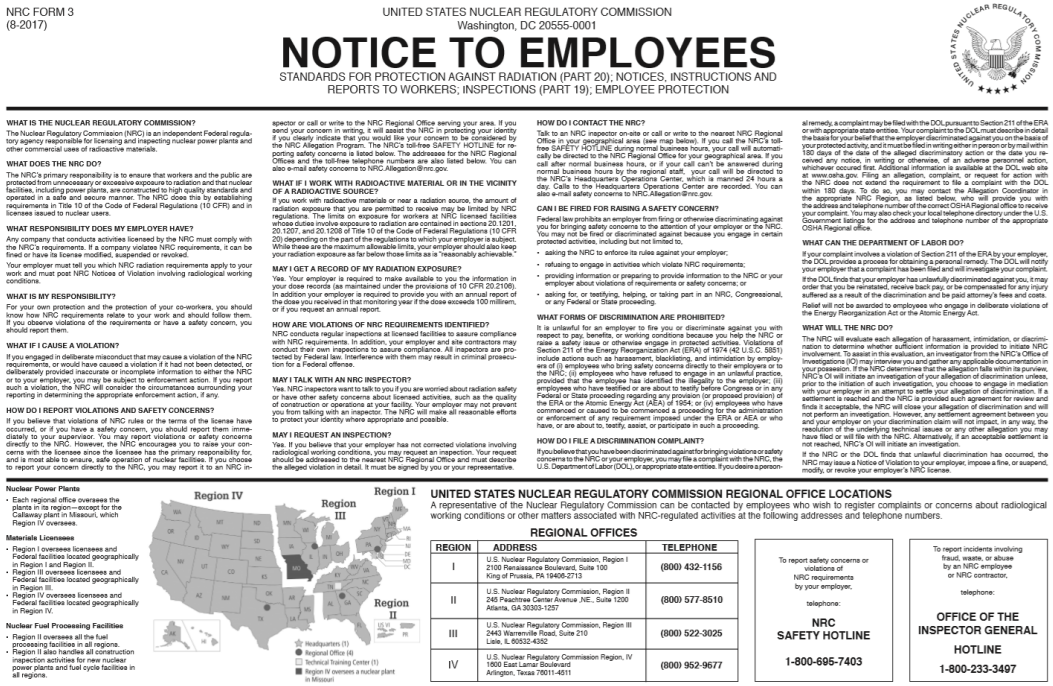
Caution
Radiation Area
If > 5 mR/hr @ 30 cm

Caution
Radioactive Materials
In radioactive material use areas

Caution - Equipment Produces Radiation When Energized
On the control panel of X-ray machines

Caution
High Radiation Area
If >100 mR/hr @ 30 cm

Posting
Notice to Employees



NRC FORM 3
(8-2017)

UNITED STATES NUCLEAR REGULATORY COMMISSION
Washington, DC 20555-0001

NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION (PART 20); NOTICES, INSTRUCTIONS AND REPORTS TO WORKERS; INSPECTIONS (PART 19); EMPLOYEE PROTECTION

WHAT IS THE NUCLEAR REGULATORY COMMISSION?

The Nuclear Regulatory Commission (NRC) is an independent Federal regulatory agency responsible for licensing and inspecting nuclear power plants and other commercial uses of radioactive materials.

WHAT DOES THE NRC DO?

The NRC's primary responsibility is to ensure that workers and the public are protected from unnecessary or excessive exposure to radiation and that nuclear facilities, including power plants, are constructed to high quality standards and operated in a safe and secure manner. The NRC does this by establishing requirements in Title 10 of the Code of Federal Regulations (10 CFR) and in licenses issued to nuclear users.

WHAT RESPONSIBILITY DOES MY EMPLOYER HAVE?

Any company that conducts activities licensed by the NRC must comply with the NRC's requirements. If a company violates NRC requirements, it can be fined or have its license modified, suspended or revoked.

Your employer must tell you which NRC radiation requirements apply to your work and must post NRC Notices of Violation involving radiological working conditions.

WHAT IS MY RESPONSIBILITY?

For your own protection and the protection of your co-workers, you should know how NRC requirements relate to your work and should follow them. If you observe violations of the requirements or have a safety concern, you should report them.

WHAT IF I CAUSE A VIOLATION?

If you engaged in deliberate misconduct that may cause a violation of the NRC requirements, or would have caused a violation if it had not been detected, or deliberately provided inaccurate or incomplete information to either the NRC or to your employer, you may be subject to enforcement action. If you report such a violation, the NRC will consider the circumstances surrounding your reporting in determining the appropriate enforcement action, if any.

HOW DO I REPORT VIOLATIONS AND SAFETY CONCERNS?

If you believe that violations of NRC rules or the terms of the license have occurred, or if you have a safety concern, you should report them immediately to your supervisor. You may report violations or safety concerns directly to the NRC. However, the NRC encourages you to raise your concerns with the licensee since the licensee has the primary responsibility for, and is most able to ensure, safe operation of nuclear facilities. If you choose to report your concern directly to the NRC, you may report it to an NRC inspector or call or write to the NRC Regional Office serving your area. If you send your concern in writing, it will assist the NRC in protecting your identity if you clearly indicate that you would like your concern to be considered by the NRC Allegation Program. The NRC's toll-free SAFETY HOTLINE for reporting safety concerns is listed below. The addresses for the NRC Regional Offices and the toll-free telephone numbers are also listed below. You can also e-mail safety concerns to NRC.Allegation@nrc.gov.

WHAT IF I WORK WITH RADIOACTIVE MATERIAL OR IN THE VICINITY OF A RADIOACTIVE SOURCE?

If you work with radioactive materials or near a radiation source, the amount of radiation exposure that you are permitted to receive may be limited by NRC regulations. The limits on exposure for workers at NRC licensed facilities whose duties involve exposure to radiation are contained in sections 20.1201, 20.1207, and 20.1208 of Title 10 of the Code of Federal Regulations (10 CFR 20) depending on the part of the regulations to which your employer is subject. While these are the maximum allowable limits, your employer should also keep your radiation exposure as far below those limits as is "reasonably achievable."

MAY I GET A RECORD OF MY RADIATION EXPOSURE?

Yes. Your employer is required to make available to you the information in your dose records (as maintained under the provisions of 10 CFR 20.2106). In addition your employer is required to provide you with an annual report of the dose you received in that monitoring year if the dose exceeds 100 millirem, or if you request an annual report.

HOW ARE VIOLATIONS OF NRC REQUIREMENTS IDENTIFIED?

NRC conducts regular inspections at licensed facilities to assure compliance with NRC requirements. In addition, your employer and site contractors may conduct their own inspections to assure compliance. All inspectors are protected by Federal law. Interference with them may result in criminal prosecution for a Federal offense.

MAY I TALK WITH AN NRC INSPECTOR?

Yes. NRC inspectors want to talk to you if you are worried about radiation safety or have other safety concerns about licensed activities, such as the quality of construction or operations at your facility. Your employer may not prevent you from talking with an inspector. The NRC will make all reasonable efforts to protect your identity where appropriate and possible.

MAY I REQUEST AN INSPECTION?

Yes. If you believe that your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the nearest NRC Regional Office and must describe the alleged violation in detail. It must be signed by you or your representative.

HOW DO I CONTACT THE NRC?

Talk to an NRC inspector on-site or call or write to the nearest NRC Regional Office in your geographical area (see map below). If you call the NRC's toll-free SAFETY HOTLINE during normal business hours, your call will automatically be directed to the NRC Regional Office for your geographical area. If you call after normal business hours, or if your call can't be answered during normal business hours by the regional staff, your call will be directed to the NRC's Headquarters Operations Center, which is manned 24 hours a day. Calls to the Headquarters Operations Center are recorded. You can also e-mail safety concerns to NRC.Allegation@nrc.gov.

CAN I BE FIRED FOR RAISING A SAFETY CONCERN?

Federal law prohibits an employer from firing or otherwise discriminating against you for bringing safety concerns to the attention of your employer or the NRC. You may not be fired or discriminated against because you engage in certain protected activities, including but not limited to,

- asking the NRC to enforce its rules against your employer;
- refusing to engage in activities which violate NRC requirements;
- providing information or preparing to provide information to the NRC or your employer about violations of requirements or safety concerns; or
- asking for, or testifying, helping, or taking part in an NRC, Congressional, or any Federal or State proceeding.

WHAT FORMS OF DISCRIMINATION ARE PROHIBITED?

It is unlawful for an employer to fire you or discriminate against you with respect to pay, benefits, or working conditions because you help the NRC or raise a safety issue or otherwise engage in protected activities. Violations of Section 211 of the Energy Reorganization Act (ERA) of 1974 (42 U.S.C. 5851) include actions such as harassment, blacklisting, and intimidation by employers of (i) employees who bring safety concerns directly to their employers or to the NRC; (ii) employees who have refused to engage in an unlawful practice, provided that the employee has identified the illegality to the employer; (iii) employees who have testified or are about to testify before Congress or in any Federal or State proceeding regarding any provision (or proposed provision) of the ERA or the Atomic Energy Act (AEA) of 1954; or (iv) employees who have commenced or caused to be commenced a proceeding for the administration or enforcement of any requirement imposed under the ERA or AEA or who have, or are about to, testify, assist, or participate in such a proceeding.

HOW DO I FILE A DISCRIMINATION COMPLAINT?

If you believe that you have been discriminated against for bringing violations or safety concerns to the NRC or your employer, you may file a complaint with the NRC, the U.S. Department of Labor (DOL), or appropriate state entities. If you desire a personal remedy, a complaint may be filed with the DOL pursuant to Section 211 of the ERA or with appropriate state entities. Your complaint to the DOL must describe in detail the basis for your belief that the employer discriminated against you on the basis of your protected activity, and it must be filed in writing either in person or by mail within 180 days of the date of the alleged discriminatory action or the date you received any notice, in writing or otherwise, of an adverse personnel action, whichever occured first. Additional information is available at the DOL web site at www.osha.gov. Filing an allegation, complaint, or request for action with the NRC does not extend the requirement to file a complaint with the DOL within 180 days. To do so, you may contact the Allegation Coordinator in the appropriate NRC Region, as listed below, who will provide you with the address and telephone number of the correct OSHA Regional office to receive your complaint. You may also check your local telephone directory under the U.S. Government listings for the address and telephone number of the appropriate OSHA Regional office.

WHAT CAN THE DEPARTMENT OF LABOR DO?

If your complaint involves a violation of Section 211 of the ERA by your employer, the DOL provides a process for obtaining a personal remedy. The DOL will notify your employer that a complaint has been filed and will investigate your complaint.

If the DOL finds that your employer has unlawfully discriminated against you, it may order that you be reinstated, receive back pay, or be compensated for any injury suffered as a result of the discrimination and be paid attorney's fees and costs.

Relief will not be awarded to employees who engage in deliberate violations of the Energy Reorganization Act or the Atomic Energy Act.

WHAT WILL THE NRC DO?

The NRC will evaluate each allegation of harassment, intimidation, or discrimination to determine whether sufficient information is provided to initiate NRC involvement. To assist in this evaluation, an investigator from the NRC's Office of Investigations (OI) may interview you and gather any applicable documentation in your possession. If the NRC determines that the allegation falls within its purview, NRC's OI will initiate an investigation of your allegation of discrimination unless, prior to the initiation of such investigation, you choose to engage in mediation with your employer in an attempt to settle your allegation of discrimination. If a settlement is reached and the NRC is provided such agreement for review and finds it acceptable, the NRC will close your allegation of discrimination and will not perform an investigation. However, any settlement agreement between you and your employer on your discrimination claim will not impact, in any way, the resolution of the underlying technical issues or any other allegation you may have filed or will file with the NRC. Alternatively, if an acceptable settlement is not reached, NRC's OI will initiate an investigation.

If the NRC or the DOL finds that unlawful discrimination has occurred, the NRC may issue a Notice of Violation to your employer, impose a fine, or suspend, modify, or revoke your employer's NRC license.

Nuclear Power Plants

- Each regional office oversees the plants in its region—except for the Callaway plant in Missouri, which Region IV oversees.

Materials Licensees

- Region I oversees licensees and Federal facilities located geographically in Region I and Region II.
- Region III oversees licensees and Federal facilities located geographically in Region III.
- Region IV oversees licensees and Federal facilities located geographically in Region IV.

Nuclear Fuel Processing Facilities

- Region II oversees all the fuel processing facilities in all regions.
- Region II also handles all construction inspection activities for new nuclear power plants and fuel cycle facilities in all regions.

UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICE LOCATIONS

A representative of the Nuclear Regulatory Commission can be contacted by employees who wish to register complaints or concerns about radiological working conditions or other matters associated with NRC-regulated activities at the following addresses and telephone numbers.

REGIONAL OFFICES

REGION	ADDRESS	TELEPHONE
I	U.S. Nuclear Regulatory Commission, Region I 2100 Renaissance Boulevard, Suite 100 King of Prussia, PA 19406-2713	(800) 432-1156
II	U.S. Nuclear Regulatory Commission, Region II 245 Peachtree Center Avenue, NE., Suite 1200 Atlanta, GA 30303-1257	(800) 577-8510
III	U.S. Nuclear Regulatory Commission, Region III 2443 Warrenville Road, Suite 210 Lisle, IL 60532-4352	(800) 522-3025
IV	U.S. Nuclear Regulatory Commission Region, IV 1600 East Lamar Boulevard Arlington, Texas 76011-4511	(800) 952-9677

To report safety concerns or violations of NRC requirements by your employer, telephone:

NRC SAFETY HOTLINE

1-800-695-7403

To report incidents involving fraud, waste, or abuse by an NRC employee or NRC contractor, telephone:

OFFICE OF THE INSPECTOR GENERAL HOTLINE

1-800-233-3497

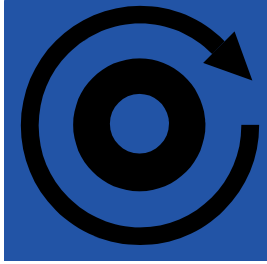
The notice to employee's form is required wherever radioactive materials or x-ray units are used and/or stored

Personal Radiation Monitoring

- Radiation badges (dosimeters) are used to measure occupational, whole body radiation exposure to workers.
- **Badges are required if an employee is likely to exceed 10% of any dose limit. Badges are only given to radiation workers.**
- Wear the badge in the area likely to receive the highest dose; usually the collar or chest area.
- The badge is always worn OVER the lead apron.
- Store the badge in a radiation-free area when not in use.
- There is no need to wear a badge if only low energy isotopes such as H-3, C-14, & S-35 are being used as the badge is unable to read these low energies.

Personal Radiation Monitoring (cont.)

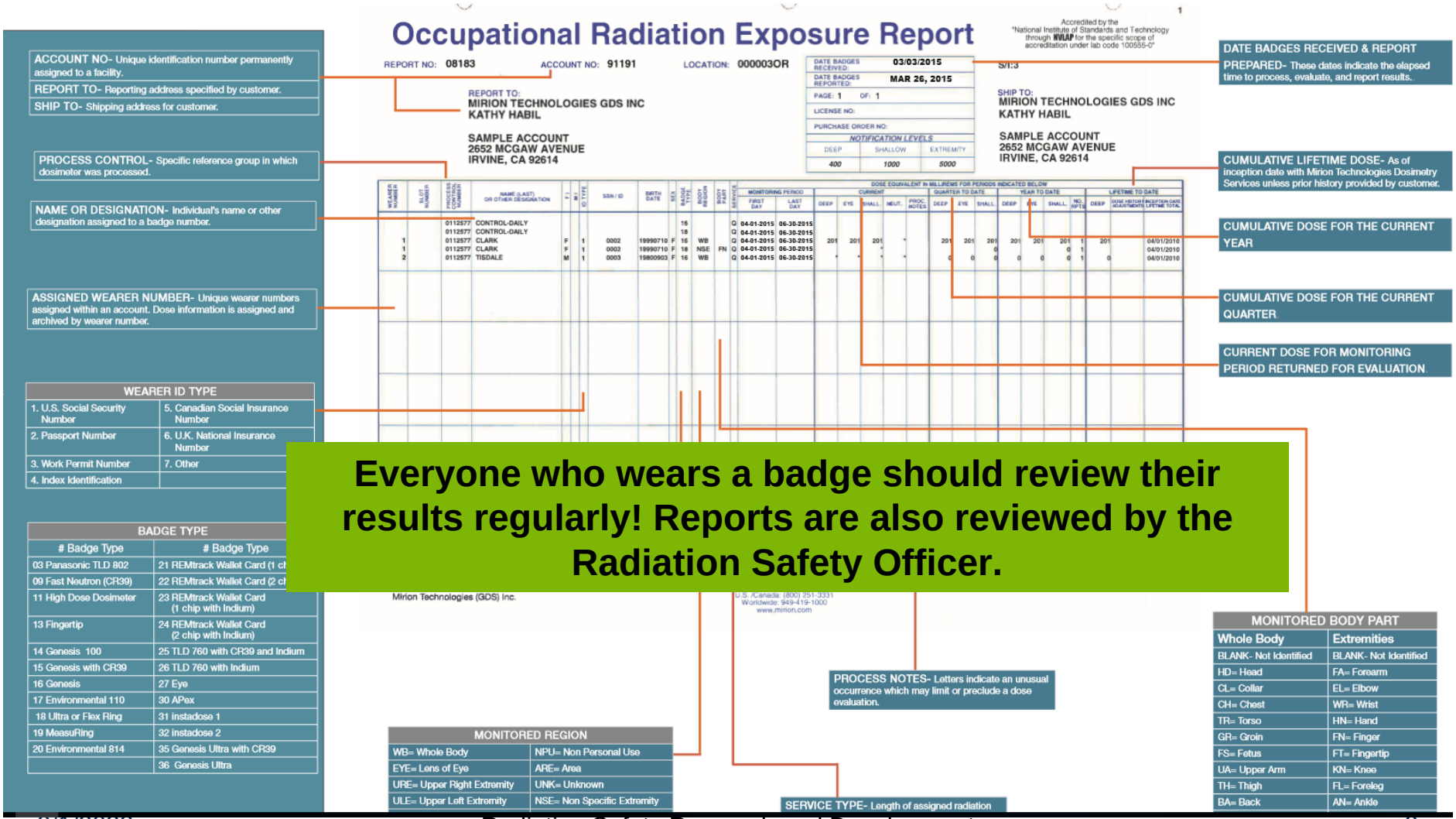
- It is very important that **YOU** return your old badge to the badge coordinator on time. This occurs on or about the last working day of each wear period.
- Late badges mean we are late in reviewing your exposure. <u>This is a compliance issue.</u>
- The dose on your badge is your **OCCUPATIONAL DOSE.** Occupational dose is the dose received by an individual during the course of employment only.
- Any radiation you are exposed to outside of work **<u>does not</u>** apply to your occupational dose. This includes x-rays you received at your dentist's office, exposure you received from flying at 33,000 feet, or exposure you received from having a radiation treatment. You should NOT wear your dosimetry badge for any of these scenarios.



Personal Radiation Monitoring (cont.)

- If you lose your dosimeter, inform your badge coordinator. You will be provided a replacement badge.
- If you work a second job where you are monitored for radiation, inform your Radiation Safety Officer or badge coordinator.
- If you left your badge in a radiation area and think it may have been exposed (without you wearing it) please contact the RSO.

Radiation Dosimetry Reports



Radiation Dosimetry Reports

With each wear period (a month or a quarter), 3 dose values are reported:

DOSE EQUIVALENT IN MILLIREMS

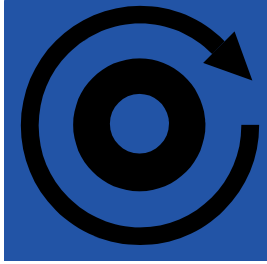
MONITORING PERIOD		CURRENT				
FIRST DAY	LAST DAY	DEEP	EYE	SHALL.	NEUT	PROC. NOTES
02/01/2019	02/28/2019	1	1	1	*	
07/01/2019	07/31/2019	*	*	*	*	
		*	*	*	*	
		*	*	*	*	
07/01/2019	07/31/2019	*	*	*	*	
07/01/2019	07/31/2019	3	3	3	*	
07/01/2019	07/31/2019	*	*	*	*	
06/01/2019	06/30/2019	7	9	9	*	
07/01/2019	07/31/2019	3	3	5	*	
07/01/2019	07/31/2019	2	3	3	*	
06/01/2019	06/30/2019	2	3	5	*	
07/01/2019	07/31/2019	*	*	*	*	
06/01/2019	06/30/2019	122	122	122	*	
		37				
07/01/2019	07/31/2019	*	*	*	*	
07/01/2019	07/31/2019	2	3	3	*	
07/01/2019	07/31/2019	5	5	5	*	
07/01/2019	07/31/2019	*	*	*	*	
07/01/2019	07/31/2019	2	3	3	*	
07/01/2019	07/31/2019	*	*	*	*	
07/01/2019	07/31/2019	14	15	15	*	

Wear Period

Dose to the whole body (deep dose)

Dose to Lens of Eye

Shallow= Skin/Extremity dose



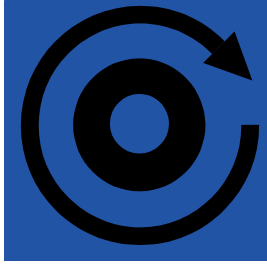
Annual dose Limits

These are highly conservative risk-based limits that attempt to identify a level of risk comparable to other safe industries.

Exposed area / individual	Traditional Units	International (SI) Units
Whole Body	5 rem / year	50 mSv / year
Lens of eye	15 rem / year	150 mSv / year
Other Organs	50 rem / year	500 mSv / year
Skin or Extremity	50 rem / year	500 mSv / year
Child/minor	10% of adult limits	10% of adult limits
Embryo/fetus	0.05 rem / month	0.5 mSv / month
General Public	0.1 rem / year	1 mSv / year

Annual dose Limits (cont.)

- Dose Limits are set to keep your risk of injury similar to other employment fields.
- Dose limits are the amounts of radiation, below which, no adverse effects have ever been observed.
- Dose limits are not a target, however. We must keep radiation exposure As Low As Reasonably Achievable (ALARA).
- If you exceed a dose limit, this is a reportable event, and your work scenario may be changed to avoid any additional exposure.
- Quarterly ALARA levels are established to track and follow up on significant exposure before it becomes a problem, and to ensure compliance with dose limits.
- The RSO will review your dose. If you exceed an ALARA limit, you will be notified and asked to account for what may have contributed to your dose.



Radiation and Pregnancy

- The most radiosensitive period for the embryo is from 8 to 15 weeks gestation age.
- The VA is responsible for assuring that the duties of a female worker will not result in a dose equivalent that is more than 500 mrem to the fetus, during the nine-month gestation.
- We allow for 55 mrem in any given month.

Worker Pregnancy Policy

- Declared Pregnant Worker (DPW) regulations only apply to female workers already deemed necessary to wear dosimetry. If not issued a badge, there is not enough radiation exposure to warrant declaring a pregnancy.
- Declaration of pregnancy is ***voluntary*** and if desired must be in writing (to Radiation Safety) with the estimated date of conception.
- A monthly fetal monitor will be issued and must be worn in the abdominal area (waist) under a lead apron (if applicable).
- If a pregnant employee does not declare her pregnancy in writing , she must be treated as any other worker who is not pregnant.
- **Consult with the RSO if you would like to declare your pregnancy. The RSO will be happy to answer any questions you may have and discuss ways you can reduce your dose. The RSO will provide you with the facts and radiation safety precautions to help you make an informed decision.**

Radioactivity Receipt and Inventory

Ordering

Ordering may be performed through the following sources:

- PVA Research Foundation
- PVA Research
- Credit Card4.OHSU (Oracle)

Delivery should **always** be to:
Authorized user's name, c/o Radiation Safety,
Bldg. 100, Room 2D159,
Portland VA Medical Center.
Radiation Safety needs to identify and record all radioactive shipments prior to receipt by the research labs.
Occasionally the vendor will need a copy of our license in order to ship material. Contact Radiation Safety if this is required.

Radioactivity Receipt and Inventory (cont.)
Inventory

If a package is received directly (from our mail room, the OHSU warehouse, etc.) **inform Radiation Safety** as soon as reasonable. Packages need to be logged in and the proper paperwork generated.

If you receive a package directly **AND** it is crushed, damaged or leaking, call the Energy Center at x56300 or *20 and have them call the RSO “stat”. If possible, please detain the delivery person.

When you receive a package from Radiation Safety, you should get a "use sheet" with a unique number for each vial of material.

Research Authorized Users (RAU) are required to account for ALL of the radioactive materials they have received.

For each vial of material received, you can keep track of the use of the material by any means you wish.

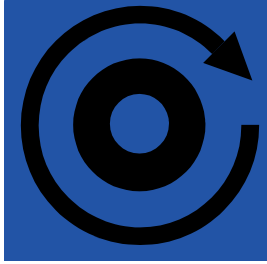
Radioactivity Receipt and Inventory (cont.)

1. There are **two sheets** for inventory of each vial of radioactive materials:
   - One with a unique number given to you by the RSO when the material was delivered.
   - The second is your own accounting for the material while it is in use in your lab.
2. The RAU can, at any time, be asked for a current inventory of their radioactive materials on hand. You must have a current use sheet for each vial, which details where the activity went with a total remaining activity equal to the amount in the vial.
3. When you are finished with the vial (i.e., the radioactive material is used up or decayed), the usage sheet must be completed and returned to Radiation Safety (mail routing symbol (P2IMAG). Remember to retain a copy of the use sheet for your records.

Emergency Procedures
Spill Response

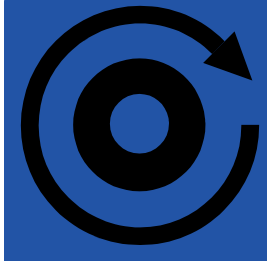
- Spills are categorized as Minor or Major Spills. Spills above the below listed activities are considered Major, all others are Minor

Radionuclide	Activity (mCi)
Sr-90	0.01
Na-22	0.1
Cl-36	0.1
Co-60	1.0
I-125	1.0
Fe-59	10
H-3	10
I-131	1.0
P-33	1.0
S-35	1.0
C-14	1.0
Ca-45	1.0
P-32	10
Co-57	100
Ga-67	100
Cr-51	100



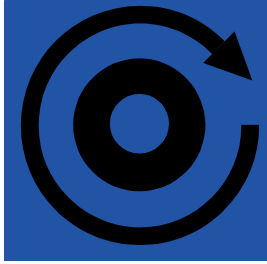
Emergency Procedures Minor Spills

- NOTIFY persons in the area that a spill has occurred
- PREVENT THE SPREAD, cover with absorbent material
- CLEAN UP, using disposable gloves and a detergent solution, wipe up the spill in a manner not to spread the material. Dispose of waste properly
- SURVEY with an appropriate meter or swipe
- REPORT the incident to the Radiation Safety Officer
- FOLLOW UP, the RSO should verify that the area has been cleaned up



Emergency Response Major Spills

- CLEAR THE AREA, notify all persons involved to vacate the room
- PREVENT THE SPREAD, cover the spill with absorbent pads. Confine the movement of all personnel potentially contaminated.
- SHIELD THE SOURCE, if it can be done without further contamination
- CLOSE THE ROOM, leave the room and lock the door to prevent entry
- CALL FOR HELP, call the Energy Center *20 immediately. Provide information on when and where, how much isotope, etc.
- PERSONNEL DECONTAMINATION, contaminated clothing should be removed and stored for further evaluation by the RSO. If the spill is on the skin, flush thoroughly and then wash with a mild soap and lukewarm water. NO SCRUBBING (For decontamination procedures see the Radiation Safety Manual)



Waste Management

There are two main methods for disposal of radioactive waste by research labs:

DOWN THE SINK: Radioactive liquids can be put down the sink provided:

1. There is no chemical or biological property (e.g., EPA hazardous wastes, such as ignitable, corrosive, reactive, toxic or specifically listed material) that would prohibit their disposal.
2. A separate record sheet is kept for each isotope, providing the date of disposal, the amount of activity disposed (in microcuries), the cumulative total for the year, and the identity of the person disposing of the material
3. All sinks for radioactive disposal are to be pre-approved by the RSO. They must be labeled as a “Hot Sink” with a sign provided by the RSO that includes the radiation symbol.

Note that no disposal is allowed down an unlabeled sink.

Waste Management (cont.)

SOLID WASTE TRANSFER TO THE RSO:
RSO Information Notice 99-1: “Transfer of Radioactive Waste to the RSO”. The purpose of this notice is to update personnel on the procedure for transfer of radioactive waste to the RSO. This notice should be on file in your Research Radiation Safety Manual.

All waste will have the approved radioactive “stickers” filled out in duplicate (one for the container, one for a logbook). These stickers are obtained from the RSO and must be filled out completely. Print the name of the Authorized user/PI. List the activity contained in "microcuries". DPM or CPM is NOT acceptable for activity. For liquids, specify the liquid.

Waste Management –Packaging and Sorting
Mixed Waste

Mixed waste is radioactive material that is mixed with EPA hazardous wastes (ignitable, corrosive, reactive, toxic or specifically listed material). You must consult Radiation Safety (x54483) and the Industrial Hygienist (x56330) before generating mixed waste, in order to receive proper instructions for disposal. Mixed waste disposal is very expensive.

Packaging must be sufficient to minimize breakage or spillage. Package material in a manner to prevent puncture of the “bag” (e.g., store pipettes vertically). Approved liquids should be in a plastic jug.

Waste Management –Packaging and Sorting (Half lives >120 days)

Radioactive waste must be segregated and packaged as follows:
Dry solid waste containing isotopes with half lives greater than 120 days:
These include isotopes such as H-3, C-14, Na-22, Cl-36, Cd-109, Co-57, and Ca-45. These isotopes will have to be shipped for burial or incineration.

- Pack in clear double plastic bags. We need to be able to examine contents. The bag may be placed in a box.
- You may combine any of these isotopes in the same bag. You are not to include any isotopes with half lives less than 120 days.
- Radiation labels are ok (i.e., they do not need to be defaced).
- **No scintillation vials, scintillation fluid or betaplates should be included.**
- **No liquids** or absorbed liquids (i.e., liquids absorbed into any medium that when compacted would leak out).

Waste Management –Packaging and Sorting
(Half lives >120 days)

- No lead or other hazardous material are to be included.
- Biohazardous material must have been treated (disinfected) to the fullest extent possible.
- No shielding is to be present inside the bag. However, you should appropriately shield the bag containing the material while you are storing/collecting it.

Waste Management –Packaging and Sorting (Half lives < 120 days)

Dry solid waste containing isotopes with half lives less than 120 days:

These include P-32, P-33, S-35, Cr-51, Fe-59, and I-125.These isotopes will be Decayed In Storage (DIS) in our waste facility. After an appropriate amount of time they will be surveyed (with no shielding interposed) to ensure radiation levels are indistinguishable from background and then disposed as non-radioactive trash.

- Pack in clear double plastic bags. We need to be able to examine contents. The bag may be placed in a box
- You may **NOT** combine any of these isotopes in the same bag. If you were to have P-32 and I-125 in the same bag, we would have to hold it for 594 days instead of 140 days if it were P-32 alone!
- Radiation labels **MUST** be defaced. The material after it has decayed goes in its appropriate trash pathway and anyone seeing it would appropriately believe it radioactive if intact radioactive stickers or labels were still visible.

Waste Management –Packaging and Sorting (Half lives < 120 days)

- **No scintillation vials, scintillation fluid or betaplates should be included.**
- No liquids. However, with the approval of the RSO you may have liquids absorbed into a medium (because the material will be DIS and then disposed as non-radioactive waste)
- No lead or other hazardous material is to be included.
- Biohazardous materials are be treated or sterilized (i.e.bleach) to the fullest extent possible.
- No shielding is to be used inside the bag. However, you should appropriately shield the bag containing the material while you are storing/collecting it.

Waste Management –Packaging and Sorting
Scintillation Vials

Scintillation vials containing H-3 or C-14 are collected according to a procedure established by the Safety Office. If you need assistance, call Justin Lee x51722 or Matthew Walter x56331.

Because H-3 and C-14 in **concentrations of 0.05 microcuries/mL or less** in scintillation fluid are considered non-radioactive, this fluid is treated as chemical waste only. Specify the name of the scintillation fluid used (e.g., Biosafe, Radisafe).

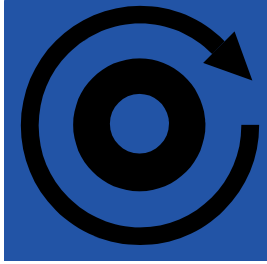
Scintillation vials containing isotopes other than H-3 & C-14 are to be picked up by Radiation Safety. Call and fill out a radioactive waste “sticker” in duplicate. We will also need to know the identity of the scintillation fluid/cocktail used.

Waste Management –Packaging and Sorting (cont.)

Betaplates:
These are to be stored and collected separately from all other waste. In addition to the other information on the radioactive waste “sticker”, you must tell us the type of scintillation “cocktail” used.

Other Liquid Waste:
Liquid radioactive waste, other than that contained in betaplates or scintillation vials, is to be disposed down a “Hot” sink unless the nature of the liquid prohibits such disposal. Prohibited liquids include EPA hazardous wastes (ignitable, corrosive, reactive, toxic or specifically listed materials). If you have radioactive material in a prohibited liquid, it becomes **mixed waste**, and you need to contact Radiation Safety before attempting to dispose of this material.

SURVEYS

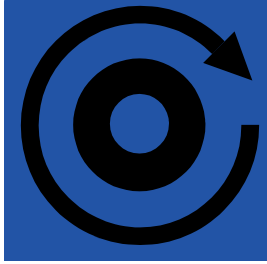


Surveys

Surveys can determine several things, such as the radiation level, the amount of contamination and whether the contamination is fixed or removable. Instrumentation for surveys includes survey meters with various probes and gamma or beta (liquid scintillation) counters.

The frequency of surveys that each lab using radioactive material is required to perform are as follows:
Each day of use: Before, during and after, using an appropriate survey meter or wipes as appropriate. There is no requirement to record this survey activity.

Monthly or weekly: See following pages.



Surveys

General Requirements

At any given time: If a spill is suspected, perform surveys as necessary to determine if there was a significant spill; and, if there was, to document the extent of the spill clean up.

Note that an initial assessment for suspected removable contamination can be performed by taking a wipe sample and placing it next to a survey meter probe for isotopes with a high enough energy. 3-H, 14-C, 35-S may need to be run through a scintillation counter.

Individual laboratories will perform and document surveys, using both wipe tests, for removable contamination, and meter surveys, for either radiation levels or fixed activity at a frequency determined by the RSO.

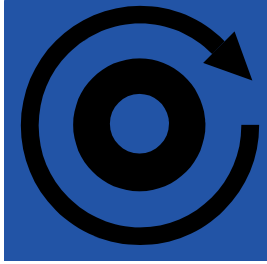
Documented surveys are required to be performed weekly if more than 200 microcuries are used at any one time. If less than 200 microcuries are used at any one time, only monthly surveys must be performed and documented.

Surveys
General Requirements (cont.)

Meter/wipe surveys are to be performed after each use of radioactive material and should be performed before and during use of radioactive material. However, unlike the required weekly or monthly surveys, these surveys do not have to be documented.

If you do not use radioactive material in a particular week, no survey is required. In your logbook or folder where your documented surveys are kept, you need to indicate **no survey** was performed because **you did not use** radioactive material that week.

If you have radioactive materials in storage a monthly survey of your storage facility is necessary.



Surveys
Specific Requirements

Documentation of surveys must meet the following requirements:

1. There must be a map of the area(s) surveyed that indicates the location where the wipes were taken.
2. The instruments used for counting and survey will be identified as to make, model and a serial number.
3. Each documented survey must be signed and dated.
4. Action levels must be specified. (>1000 mRem/100 cm^2)

The RSO can provide a spreadsheet file that has the format for this documentation.

Surveys
Records

Records: Individual labs will maintain records of radioactivity surveys.
Training: The RSO will provide training in radioactivity surveys as needed to all individual labs.
Note: Anyone who uses radioactive material must be able to demonstrate use of a survey meter. Exception: Users who handle only H-3

Materials required:

- Gloves
- Wipe papers
- Counting tubes (gamma) or vials (beta)
- Scintillation fluid for beta wipe

Instrument:

- Gamma counter (for gamma wipe)
- Scintillation counter (for beta wipe)
- Survey meter --NaI (gamma) or pancake (beta)

Surveys
Procedure

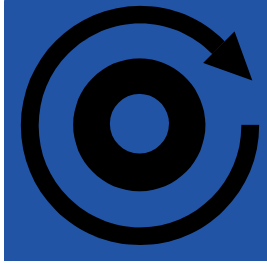
Frequency: Weekly or Monthly

Type: Gamma/Beta

Survey the entire lab with a meter, paying special attention to the areas of use and any other areas where contamination could be spread. You should also survey non-radioactive trash cans.

Note: Survey meters can not detect H-3 and are very inefficient for C-14, S-35 & P-33, wipe surveys should be used for these isotopes.

Use liquid scintillation counting for beta emitters such as H-3, C-14, & S-35. Use a gamma counter for Cr-51 and other higher energy gamma emitters. For I-125, you may use either.



Surveys
Procedure (cont.)

1. Wipe designated areas, using a minimum of 4 square inches (=100 cm x cm). Choose spots around the lab where contamination (if any) is most likely to occur(e.g., bench top where radioactivity is used; around the sink, hood, floor near use or disposal; refrigerator/freezer handle) and also a few representative locations (e.g., floor by exit door) where contamination would likely be “tracked”.
2. Fold the wipe and drop into a numbered tube or vial.
3. For beta wipes, fill the vials with scintillation fluid.
4. Count tubes or vials on appropriate counter.
5. Enter the counts on the survey form.

Surveys
Procedure (cont.)

6. If there are any wipe DPM count or survey readings exceeding **action levels**, clean the area(s), re-wipe and resurvey. The resurvey must also be recorded. Notify the RSO of the location and results of the clean-up. The **action levels** for *removable* contamination (wipes) and meter survey is **1,000 DPM**.
7. If there are any wipe DPM count or survey readings exceeding 4 times background, you should investigate these to insure there is not a problem.
8. If you have any questions, please contact Radiation Safety at **x54483**

Calculations: DPM = CPM / Efficiency For example, a meter that is 5% efficient for C-14 reads 100 CPM. The DPM is 100/0.05 = 2000 DPM, where 2200 DPM = one nanoCurie

Instruments and Equipment
Survey Meters

Each lab that uses radioactive material (other than H-3 exclusively) is required to have access to an appropriate survey meter. Although ideal, the meter is not required to be physically located in the lab. Appropriate probes are pancake/gm probes for C-14, P-32, P-33 and S-35. NaI probes for I-125 and Cr-51.

You should survey with the appropriate meter **Before**, **During** and **After** working with radioactive material. These surveys need not be recorded.

Before using a meter, you are to verify that:

- It has been calibrated (required annually),
- That the battery is ok (if the meter has that option), and
- That the probe registers the check source reading (if it has this feature).
- The information on date of calibration, check source reading, and efficiency is on a sticker attached to the meter.

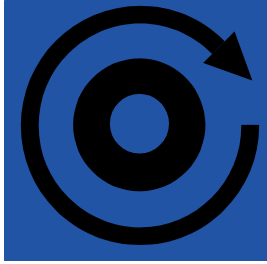
Instruments and Equipment
Survey Meters (cont.)

If you use a meter, you should be knowledgeable of the typical background reading. For Ludlum 3 meters, the pancake probe (44-9) typically reads 30-50 CPM and the thin NaI probe (44-3) reads 200-300 CPM.

You also should be aware of the efficiency (conversion CPM to DPM, and thus activity) of each of the probes.

For Ludlum 3 meters, the pancake probe (44-9) typically the efficiency is 25-33% for P-32 and ~ 2-5% for C-14, S-35. Thus if you detect 2200 CPM of P-32, you have about 6600 to 8800 DPM of P-32. 2200 DPM is one nanocurie.

Remember when using a meter, the probe should be approximately ¼ in from the surface you are measuring and should pass over the surface slowly, at the rate of approximately the width of the probe per second.



Instruments and Equipment

Turn In of Equipment

There is a policy and procedure for turn in of equipment and items that may contain **radioactive sources** (such as beta counters, survey meters, gamma camera) or **may be contaminated with radioactive material** (e.g., refrigerators, centrifuges, nuclear counting instruments). All such equipment and items must be approved for release by Radiation Safety.

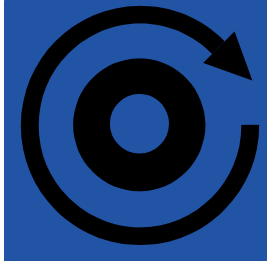
Equipment or items are suspect either by specific use or by the presence of the radiation symbol. Personnel are responsible for informing Radiation Safety when excessing such equipment, and personnel in A&MM-warehouse also will review such equipment items during pick up.

Please also note that even if you are only moving such equipment from one lab in the Portland VA to another, **Radiation Safety needs to know.**

Instruments and Equipment
Turn In of Equipment (cont.)

If you are **transferring such equipment** off station (to another VA or other institution) or receiving it from another institution, **you need permission from Radiation Safety first.**

There was an incident a number of years ago where a liquid scintillation counter (beta counter) with an embedded source was damaged in transfer to the Portland VAMC, excessed, and the source was detected (and recovered) by a scrap metal dealer. This was a serious event in the eyes of the NRC. A couple of other VAMCs have had similar incidents, resulting in unfavorable press.



Audits and Inspections

RSO Annual Review

The RSO, as part of the annual program review, will review the use of radioactive material in research laboratories. The audit may include, but not be limited to, some or all of the following:

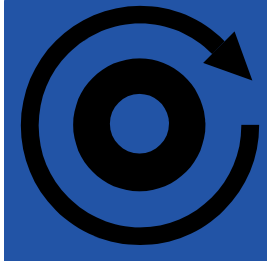
1. Ensuring that permit holders are using only the isotopes authorized, only in the amounts as authorized and only in the rooms authorized.
2. Ensuring security of materials (i.e., could someone unknown walk into a lab unquestioned, take something, and walk out?).
3. Ensuring that personnel are aware of their right to declare (or not) their pregnancy.
4. Ensuring that inventories are accurate, that the lab can demonstrate the disposition of material delivered to them, and that they can account for all material delivered to them.

Audits and Inspections

RSO Annual Review (cont.)

5. Ensuring that each lab has a meter available when working with isotopes, and that personnel know how to use the meter.
6. Ensuring that workers have received and documented the required initial and annual refresher radiation safety training.
7. Ensuring that Emergency Instructions and form NRC-3 are posted, and personnel know where they are located in the laboratory.

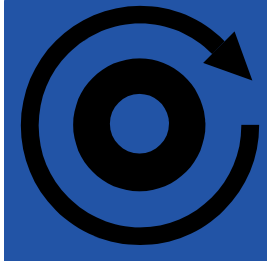
A performance-based aspect will also be included. This consists of asking radiation workers to demonstrate certain job requirements, such as how to perform a meter survey, and observing them to ensure gloves are worn, dosimetry is used, hands and floor are monitored, etc. This is in addition to asking them how they record waste disposed down the sink, who to contact in an emergency, where the isotope inventories are located, and if they have been told of their right to declare pregnancy, etc.



Audits and Inspections

Unannounced Outside Inspections

- The VA National Health Physics Program (NHPP) will inspect this Medical Center with unannounced visits approximately every two years. The level of detail and amount of time they spend in research is extremely variable. When they come, each person in Research Service must be prepared to answer questions appropriate to their involvement in use of radioactive material. If you do **not** know the answer to a question, please say so. If you failed to do something, be HONEST, admit your mistake.
- The ABSOLUTE WORST thing for an inspection is an attempt to “cover up” something.
- If you have been conscientiously reviewing the self-inspection forms, you will be prepared for an inspection. The current trend is less of a records review and more of a performance-based inspection.



Security

Radioactive material is to be secured (locked up) or “in attendance” at all times. “In attendance” in an unsecured area means that if the door is not locked, someone must be able to observe people going into the room or the room can be left open only for a minute. In the secured research areas it means that it is ok to leave the room unattended for several minutes (e.g., to go to the restroom or to another lab), but if you are going longer than 20 minutes or so (e.g., lunch) you should lock the room.

You are not to let anyone inside the keyed Research areas unless you recognize them as employees (research, engineering, environmental management, etc.). If you do not recognize someone ask them to wait at the door and have them call the person they are visiting or escort them to the person they wish to see (Do Not leave them alone in a lab).

Security (cont.)

If an alarm sounds or suspicious activity is noted in or around any room posted as using radioactive material, do the following:
For your personal safety:

1. Avoid confrontation with the person and immediately leave the area if the person makes threats or appears to have any potential for violence.
2. Do not attempt to restrain or use physical force to detain the person.
3. Comply with demands by the person for access to the room, if the person uses coercion or threats of violence.
4. Do not follow the person, if the person leaves the area.
5. Offer to provide assistance and request explanation of the apparent unauthorized access or suspicious activity.
6. Ask the unauthorized person to identify himself or herself and state their purpose for being in the area.

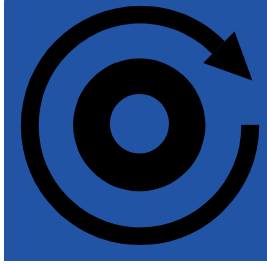
Security (cont.)

After you are comfortable about your personal safety:

7. Contact VA Police Service (*20 in an emergency), the ACOS for Research, and/or Radiation Safety Officer for assistance.
8. Note identifying information such as height, weight, gender, and clothing about the unauthorized person for later report to the VA Police Service.
9. Maintain constant visual surveillance of the unauthorized person, If the person remains in the area.
10. Provide assistance to the VA Police Service, the ACOS for Research, and/or Radiation Safety Officer who respond.

Radiation Emergencies

- In case of a radiation emergency, contact the Radiation Safety Office
- **Scott Finch** 503-220-8262 ext. 54483
  - Scott.finch@va.gov
- **Chris Duncan** 503-220-8262 ext. 52104
  - Christopher.duncan3@va.gov
- Emergencies can be :
  - Theft or loss of radioactive sources
  - Major radioactive spill
  - Skin contamination



You have now completed the Radiation Safety training.

Click here to take the Post-Test