

PERSONNEL MONITORING AND DOSIMETRY POLICIES

All individuals who are required to have their exposure to ionizing radiation monitored must be trained prior to using the source(s) of radiation. The radioactive materials permit holder, the supervisor of the individual, or the equipment registrant is responsible for assuring that training is completed and, if applicable, that appropriate personnel dosimeters are obtained before assigning the individual to work with sources of ionizing radiation.

A. U.S. Nuclear Regulatory Commission (NRC) and State of Minnesota Requirements

Federal radiation protection standards and State of Minnesota ionizing radiation rules both require that individuals who use sources of ionizing radiation be monitored for radiation exposure if their potential for exposure from external and/or internal radiation sources exceeds the following specified levels:

1. Monitor external exposure of individuals likely to receive a radiation dose from external sources in excess of 10% of the applicable yearly occupational dose limit:

Total effective dose equivalent	50 mSv
Lens of the eye	150 mSv
All other organs including skin and extremities	500 mSv
Declared pregnant worker	5 mSv/gestation
Minors	5 mSv

2. Monitor internal exposure of individuals likely to receive in one year an intake in excess of 10% of the applicable Annual Limit of Intake (ALI). For a declared pregnant worker or a minor, the requirement applies if they are likely to exceed 1% of the applicable ALI(s).

The dose limit for members of the general public is 1 mSv per year under both NRC and State of Minnesota rules.

B. External Radiation Exposure Monitoring

If required, appropriate radiation dosimeters must be requested and obtained from the Department of Radiation Safety (DRS) before an individual is allowed to use a radiation source. Use the following guidance to determine what, if any, dosimeters are required.

If an individual will use a licensed radiation source(s), and the external exposure potential exceeds 10% of the applicable limit(s) listed in A.1 above, the individual must be provided with and wear the appropriate external radiation dosimeter(s).

If the radiation source is unsealed, the individual may also be required to be monitored for internal radiation exposure if the potential for uptake exceeds the applicable limit. Contact the DRS if you have questions.

In the case where an individual will work only with X-ray equipment or other ionizing radiation producing machines, the State of Minnesota requirement applies. The individual must be provided and wear the appropriate external radiation dosimeter(s) if they are likely to receive greater than 25% of the applicable limit(s) listed in Item A.2 above.

The DRS, under the guidance of the All-University Radiation Protection Committee (AURPC), may assign dosimeters to certain individuals or categories of radiation users who do not require a radiation dosimeter under NRC and/or State requirements (e.g., self-shielded gamma irradiator users, radiotracer radioisotope users, etc.). Because individuals in these categories are not required to be monitored, it will not be necessary to obtain past exposure histories or to provide termination reports at the end of the period during which an individual is monitored.

C. Dosimeters Needed for Ionizing Radiation Sources in Research or Medical Environment

1. Radioactive Material Used in Research

The University of Minnesota has monitored radioactive material users in the research community for decades and dosimetry records have established that this group does not require monitoring under the federal and state guidelines listed above. However, the All-University Radiation Protection Committee has chosen to monitor certain members of this community based on the guidelines listed below. The DRS will review each research protocol and assess dosimetry needs on an individual basis.

Material category	Criteria for dosimeter
a. H-3, C-14, P-33, S-35, Ca-45	No external radiation dosimeter necessary
b. Sr-90, Y-90	Body dosimeter if ≥ 0.5 mCi/stock vial Body & ring dosimeter if ≥ 1.0 mCi/stock vial
c. P-32, Cl-36, Cr-51, I-125	Body dosimeter if ≥ 1.0 mCi/stock vial Body & ring dosimeter if ≥ 2.0 mCi/stock vial
d. Na-22, Sc-46, Fe-59, Co-60, Sr-85, Rb-86 Sr-89, Nb-95, I-131, Cs-137, Ce-141	Body dosimeter if ≥ 0.1 mCi/stock vial Body & ring dosimeter if ≥ 0.25 mCi/stock vial
e. Gamma irradiators (Cs-137)	Body dosimeter
f. Soil moisture probes and density gauges	Body dosimeter
g. Cf-252 neutron irradiation facility	Body and ring dosimeters

For radioisotopes or sources not listed here, please contact the DRS for guidance.

2. Radioactive Materials Used in Medical Applications

a. Nuclear Medicine and LDR brachytherapy	Body and ring dosimeters
b. Radioisotope therapy patient care	Body dosimeter

3. Ionizing Radiation Producing Equipment

a. Electron microscopes/microprobes	No external radiation dosimeter necessary
b. Cabinet x-ray (Faxitron, etc.)	No external radiation dosimeter necessary
c. DEXA (dual energy x-ray scanner)	No external radiation dosimeter necessary
d. Dental diagnostic x-ray	No external radiation dosimeter necessary
e. X-ray diffraction & fluorescence	Ring dosimeters
f. Radiographic diagnostic x-ray	Body dosimeter
g. Fluoroscopic diagnostic x-ray	Body and collar dosimeter
h. Medical accelerators	Body dosimeter
i. X-ray irradiators	Body dosimeter
j. Particle beam accelerators	Body dosimeter Body neutron dosimeter if voltage > 1 MV

It is the University's policy that all Declared Pregnant Radiation Workers and minors who have authorized access to radioactive material use areas be issued a body dosimeter. Please see the relative policy statements for these two categories of radiation workers.

D. Procedures to Obtain and Use a Radiation Dosimeter

- See Items B & C above for help in determining if an individual is required to have a dosimeter. Contact the DRS at 612-626-6002 if assistance is needed.
- If dosimeter is required, contact the DRS to obtain a radiation dosimeter request card. An example of the front and back of the request card is shown below.

Front

Be sure to provide your employee ID #.

If you use an ionizing radiation producing machine provide the name of the machine's registrant on the "Permit Holder" line.

UNIVERSITY OF MINNESOTA		RADIATION DOSIMETER REQUEST CARD																					
Name: _____		Female <input type="checkbox"/> Male <input type="checkbox"/>																					
Last,	First	MI																					
Employee ID #: _____	Date of Birth : _____ (MM/DD/YYYY)																						
Permit Holder: _____ <small>(Principal Investigator)</small>	Department: _____																						
Lab Supervisor: _____	Lab Address: _____ <small>(or mail code)</small>																						
Lab Phone Number: _____																							
List the sources of ionizing radiation you will use: _____ <small>(Individual radioisotopes and/or radiation producing machines.)</small>																							
List the maximum quantities you will handle (in mCi): _____																							
Dosimeters are not required for H-3, C-14, P-33 or S-35 use. Continue on back.																							
<table border="1"> <thead> <tr> <th colspan="4">RPD Use Only</th> </tr> </thead> <tbody> <tr> <td>Temp Acct.: _____</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Series Code: _____</td> <td>Body No.: _____</td> <td>Collar No.: _____</td> <td>Ring No.: _____</td> </tr> <tr> <td>ID Number: _____</td> <td>Film Date: _____</td> <td>Film Date: _____</td> <td>Ring Date: _____</td> </tr> <tr> <td>Start Date: _____</td> <td>Start Date: _____</td> <td>Start Date: _____</td> <td>Start Date: _____</td> </tr> </tbody> </table>				RPD Use Only				Temp Acct.: _____				Series Code: _____	Body No.: _____	Collar No.: _____	Ring No.: _____	ID Number: _____	Film Date: _____	Film Date: _____	Ring Date: _____	Start Date: _____	Start Date: _____	Start Date: _____	Start Date: _____
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Back

If you have been monitored for ionizing radiation exposure at another institution, be sure to provide its name, address and phone number.

Sign and date the request card before you send it to the address indicated.

If you have used sources of ionizing radiation at a different institution or company during the current year, **AND** your exposure was monitored and documented, please provide the requested information so that we may obtain a copy of your exposure history.

Institution or Company _____

Department _____

Street Address _____

City _____ State _____ Zip _____

Monitored from (date): _____ to (date): _____ Phone Number _____

Have you been issued a dosimeter at the University of Minnesota before? Yes No

"I confirm that the information provided is complete and accurate. I also authorize the release of my past radiation exposure histories to the University of Minnesota."

Signature _____ Date: _____

RPD Use Only		Cumulative Totals in mRem	
Body Deep: _____	Collar Deep: _____	Ring Dose: _____	
Body Shallow: _____	Collar Shallow: _____	End Date: _____	
End Date: _____	End Date: _____		

- After receiving the completed card and verifying training, a DRS staff member will issue the appropriate dosimeters.
- Do not allow an individual to begin using radiation sources until they have received their dosimeter(s), and they have received applicable radiation safety and operations training.
Note: Personnel dosimeters do not protect an individual from the effects of radiation, but only record the radiation dose an individual has accumulated.
- Wear the dosimeter(s) in the proper location and orientation.



Body dosimeter. Wear on trunk of body at chest level with name plate facing outward.



Ring dosimeter. Wear on finger closest to the radiation source with name label rotated toward the source.



Body dosimeter with lead apron. Wear the body dosimeter at the collar outside of the lead apron.



Dual dosimeters (body & collar for X-ray fluoroscopy). Wear the body dosimeter at belt or chest level under the lead apron, and wear the collar dosimeter at the collar on the outside of the lead apron.

- Wear dosimeter(s) while working with radiation sources.
- Store the dosimeter(s) in a designated work site area away from radiation sources and excessive heat and/or moisture.

- Do not take a dosimeter home or wear it during non-job related radiation exposures such as medical or dental x-ray examinations.
- Do not intentionally expose the dosimeter to a radiation source, or damage it in any way.
- It is the responsibility of the wearer to change his or her dosimeter during the designated monthly or quarterly change period. Information on the time periods for changing dosimeters will be provided when a dosimeter is issued.
- If a dosimeter is lost or damaged (broken clip, lost filter, etc.), call the DRS immediately for a replacement.
- Monthly or quarterly radiation dosimetry reports are sent by the DRS to each monitored group. It is the responsibility of the permit holder or registrant to review these reports with the monitored staff.

E. Internal Dose Assessment (Bioassay)

When quantities of radioactive material used by personnel present a potential for internal contamination, the DRS will require bioassay procedures to determine the quantity of the internal deposition and the resulting dose. In general, three bioassay procedures may be used: urine analysis, thyroid count, and whole body count.

- Any individual who uses more than 100 millicuries of tritiated water, gas, sodium borohydride, or ^3H -labeled nucleotide precursors per experiment must, within one week of use, have an assay performed on his or her urine. If these quantities of radioactive material are used routinely, a weekly analysis of the urine must be made.
- Individuals who use greater than 1 mCi of ^{125}I or ^{131}I in procedures where volatilization is likely (e.g., protein labeling, column separation, dialysis) must have a thyroid count within ten working days following the procedure. For continuing operations, monthly thyroid counts are required.
- The DRS may require a whole body count of an individual when appreciable internal contamination is suspected, or when the potential for internal contamination warrants the procedure.

All bioassay procedures will be performed by University Health and Safety personnel or by persons or organizations approved by the DRS. The DRS will maintain the permanent radiation dose records on all personnel requiring bioassay for assessment of possible internal deposition.

F. Special Considerations

1. Occupationally Exposed Pregnant Women

To assure compliance with Nuclear Regulatory Commission (NRC) and State of Minnesota regulations pertaining to declared pregnant radiation workers, the following policy has been adopted by the All-University Radiation Protection Advisory Committee:

- At the time of employment and on an annual basis thereafter, all personnel who work with sources of ionizing radiation will be informed of the requirements of the NRC and the State of Minnesota relative to the control of radiation exposure received by declared pregnant women (see Appendix S – NRC Regulatory Guide 8.13). The supervisor (permit holder, registrant or designate) will be responsible for conducting this training which should include an explanation of the category of "declared" pregnant radiation worker. In the event that a worker declares pregnancy (in writing to her supervisor), the supervisor or his/her designate shall contact the Department of Radiation Safety (DRS) to arrange for the completion of specific training.

2. Minors

It is the policy of the University of Minnesota that minors will not be allowed to be employed in or to occupy an area where ionizing radiation is used. An exception to this policy will be the allowance for minor students to be present or work in such an area as part of an educational program, provided the following conditions are met:

- The permit holder or registrant is responsible for complying with the Guidelines on Minors in Laboratories established by the University of Minnesota Committee on Occupational Health and Safety (http://www.dehs.umn.edu/ressafety_labminors.htm).
- The minor must satisfactorily complete the required radiation safety training for employees which includes viewing the radiation safety training tapes, and reviewing the relevant sections of the radiation safety manual by the designated trainer for the laboratory or use area to which the minor will be assigned.
- The minor must be assigned a dosimeter prior to working in the laboratory or use area. The permit holder or registrant is responsible for obtaining the dosimeter for the minor. Contact the Department of Radiation Safety at 612-626-6002 for a dosimeter request card or for assistance. The dosimeter must be changed on the required schedule, and the used dosimeter returned to the DRS for processing. Prior to leaving the University, the minor must be instructed to turn in their dosimeter to the permit holder for return to the DRS.
- The minor(s) shall not be allowed to handle any radioactive materials or operate ionizing radiation producing machines. They may handle non-radioactive material and perform only non-radioactive procedures.
- If a radioactive materials spill occurs when a minor is present in a laboratory, the DRS staff must be contacted immediately and arrangements made to perform appropriate bioassay monitoring.

3. Human Subject Volunteers

The Human Use Subcommittee of the AURPC must approve any project involving radiation doses to human volunteers. In addition, the Human Use Subcommittee will require special documentation and permanent records on all projects where exposure would exceed 5 mSv and will require that exposure be maintained as low as reasonably achievable. All human volunteers must sign a consent form that has been reviewed and approved by this committee.