

RPR 49

Personnel Radiation Dosimetry

University of Utah Radiological Health Department

1. PURPOSE

Describes requirements for assignment, wearing, handling, processing, and termination of personal radiation dosimeters for individuals occupationally exposed to radiation, including requirements for declared pregnant workers.

2. SCOPE

This policy applies to those, employees and visitors, who have the potential to be occupationally exposed to regulated sources of ionizing radiation while at the University of Utah.

3. DEFINITIONS

- A. ALARA:** ALARA is an acronym for As Low As Reasonably Achievable. This is a radiation safety principal for minimizing radiation doses and releases of radioactive materials by employing all reasonable methods.
- B. Declared Pregnant Worker:** A worker who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant worker withdraws the declaration in writing, or 60 days after the estimated date of delivery, or one year after the declaration is made.
- C. Dose Limits:** Regulatory radiation dose limits for occupational radiation exposure have been established by the U.S. Nuclear Regulatory Commission and the Utah Division of Radiation Control. Applicable dose limits are:

Receptor	Dose limit
Adult Workers:	
Whole body (deep dose equivalent)	5,000 mrem/yr
Lens of the eye	15,000 mrem/yr
Extremities/skin/individual organ or tissue	50,000 mrem/yr
Embryo/fetus	500 mrem over entire pregnancy
Member of public, minor, or non-radiation worker	100 mrem/yr

Source: State of Utah Administrative Code R313-15

- D. Dosimeter:** A device worn on the body that measures the amount of external penetrating radiation a person has been exposed to during the monitoring period (e.g., monthly, quarterly). These radiations include gamma radiation, x-radiation, and high-energy beta radiation. Types of dosimeters include whole body badges, waist badges, collar badges, fetal badges (for declared pregnant workers), and extremity dosimeters (finger rings).
- E. Occupational Dose:** The dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to sources of radiation. Occupational dose does not include doses received from background radiation, from any medical administration the individual has received, from exposure to individuals medically administered radioactive material and released in accordance with Utah Rule R313-32, or from voluntary participation in medical research programs.
- F. High Radiation Area:** High radiation area means an accessible area in which an individual could receive a dose equivalent in excess of one mSv (0.1 rem), in one hour at 30 centimeters from the source. Rooms or areas in which diagnostic x-ray systems are used for healing arts purposes are not considered high radiation areas.
- G. Very High Radiation Area:** An accessible area in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of five Gy (500 rad) in one hour at one meter from a radiation source or one meter from any surface that the radiation penetrates.

4. POLICY

- A.** Demonstration of compliance with occupational radiation dose limits is primarily accomplished through measurement of radiation doses, by direct instrument measurement, by assignment of personal radiation dosimeters to certain workers, and by placement of area dosimetry by the University of Utah Radiological Health Department.
- B.** The University complies with State regulations (R313-15) that require monitoring of the following individuals potentially exposed to radiation:
1. Adults likely to receive, in one year from sources external to the body, a dose in excess of ten percent of the dose limits (as listed in Section 3.C).
 2. Minors likely to receive, in one year, from radiation sources external to the body, a dose in excess of 100 mrem, a lens dose in excess of 150 mrem, or a shallow dose to the skin or to the extremities in excess of 500 mrem.
 3. Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a dose in excess of 100 mrem.
 4. Individuals entering a high or very high radiation area.

5. Individuals working with medical fluoroscopic equipment, unless a demonstration has been made that the working environment will not likely result in a dose in excess of ten percent of the limits and that the individual is neither a minor nor a declared pregnant woman.
- C. Any worker may request personal dosimetry. The determination of whether a dosimeter is issued is made by a health physicist, in consultation with the individual, taking into account the potential for radiation exposure, the criteria in Item 4.B, and the individual's level of concern. If a dosimeter is issued, the health physicist is responsible for determining the appropriate type of dosimeter and monitoring frequency (e.g., monthly, quarterly).
 - D. Individuals assigned a radiation dosimeter(s) are required to properly wear the dosimeter(s) at all University and University Hospitals and Clinics whenever exposure to regulated radiation sources is possible to ensure radiation protection limits are not exceeded and that all doses remain ALARA.

Dosimeters issued by the University of Utah should not be worn at facilities other than the University and University Hospitals and Clinics (such as the Veteran's Administration). Contact the Radiological Health Department if exposure to radiation is possible during work at other facilities.

- E. The personal dosimetry monitoring requirement may be waived for individuals or groups of individuals (including users of medical fluoroscopic equipment) provided it has been documented that individual doses will not exceed 10% of the regulatory limits and supporting documentation has been prepared (see item 5.G below).
- F. As specified in Utah Administrative Code R313-15-201, when radiation protection garments are worn by users of medical fluoroscopy equipment, correction of the measured dose is applied as follows:
 1. When only one dosimeter is used and it is located at the neck outside the protective apron, and the reported dose exceeds 25 percent of the whole body dose limit, the reported deep dose equivalent value multiplied by 0.3 shall be the effective dose equivalent for external radiation; or
 2. When two dosimeters are worn, one under the protective apron at the waist and the other outside the apron at the neck, the effective dose equivalent shall be assigned the value of the sum of the deep dose equivalent reported for the dosimeter located at the waist under the protective apron multiplied by 1.5 and the deep dose equivalent reported for the dosimeter located at the neck outside the protective apron multiplied by 0.04.

- G.** Formal declaration of pregnancy is voluntary. In order for lower dose limits for the embryo/fetus to be applied and additional control measures or supplemental dosimetry issued (if appropriate), the pregnancy must be declared in writing to the University Radiation Safety Officer.

5. IMPLEMENTATION

- A. REQUESTING DOSIMETERS:** Individuals potentially exposed to radiation sources shall request dosimetry through the University of Utah Radiological Health Department by completing a "RADIATION USER PERSONAL DATA" form (Form RPR1A, available at www.rso.utah.edu). If, during the current calendar year, the individual's radiation dose was monitored at any other institution or place of employment, then a "REQUEST FOR RADIATION EXPOSURE HISTORY" form (RPR 1B) shall also be completed and submitted.
- B. WEARING DOSIMETERS:** Individuals assigned dosimetry shall wear dosimeters whenever working with regulated sources of radiation, as follows:
1. Individuals assigned a single whole body dosimeter must wear the dosimeter on the front part of the body between the neck and waist most likely to be exposed to the greatest amount of radiation (generally at the collar). The dosimeter should be worn so that the name tag faces away from the body. The badge should be worn on the outside of any radiation protection garment, such as a shielded apron or thyroid shield.
 2. Some fluoroscopy users are issued two badges to account for the shielding effects of wearing radiation protection garments. Note that the dosimeters have small icons on the front indicating where they should be worn. The collar badge will have a red icon and must be worn on the **outside** of the shielded apron or thyroid shield. The waist badge will have a yellow icon and must be worn **under** the apron. Care should be taken to ensure they are worn correctly to prevent incorrect dose assignment.
 3. Individuals assigned a ring dosimeter shall wear the ring so that the label is facing toward the source of radiation. When work is performed that requires a glove be worn when the ring is also needed, the ring dosimeter must be under the glove to prevent contamination of the ring with radioactive material.
 4. Personal dosimeters must not be shared with other individuals or stored where they could be exposed to regulated radiation sources, such as on radiation protection garments stored in the use area.
- C. DECLARATION OF PREGNANCY/FETAL DOSIMETERS:** In order for the lower dose limits specified for an embryo/fetus to be applied, a worker must declare her

pregnancy voluntarily, in writing, and provide the month and year of conception. The lower dose limit can be invoked by providing the Radiological Health Department and the worker's supervisor with a written declaration of pregnancy (Form RPR 49B attached). The worker can "undeclare" her pregnancy and reinstitute the higher occupational annual limit by submitting a written statement to the Radiological Health Department.

Fetal dosimeters may be issued to workers who have declared their pregnancy in writing, depending on the potential for radiation exposure of the embryo/fetus. If issued, the fetal badge is to be worn in conjunction with all other assigned dosimeters. The fetal badge should be worn at the belly. If radiation protection garments are worn, the fetal badge is worn under the protective garment. If the worker is already double badged, the waist badge will be sufficient to monitor fetal dose.

- D. STORAGE OF DOSIMETERS:** Personal dosimeters should be properly stored in a safe place, at work, rather than at home, away from sources of radiation and heat sources (such as inside of a hot car). Badge racks are provided in some locations to facilitate badge storage and exchange – dosimeters should remain on the rack when not in use.
- E. DOSIMETER EXCHANGE:** Dosimeters are exchanged monthly or quarterly, depending upon the area of use. A dosimeter coordinator in each department will receive dosimeters a few days before the beginning of each wear period. Dosimeters must be exchanged promptly and returned to the Radiological Health Department within 5 working days after the monitoring period. It is each employee's responsibility to ensure dosimeters are returned on time.
- F. LATE AND LOST DOSIMETER FEES:** Dosimeters returned to the Radiological Health Department after the 5th working day of the monitoring period are considered late. Dosimeters returned more than 90 days late, damaged, knowingly misused, or never returned are considered lost. A fee of \$10 may be assessed for each late dosimeter. A fee of \$15 may be assessed for each lost dosimeter. The fees are billed to the department in which the individual works. The billed department is responsible for seeking reimbursement from the individual.
- G. EXEMPTIONS FROM DOSIMETRY REQUIREMENTS/OPTING OUT:** The personal dosimetry monitoring requirement may be waived for individuals or groups of individuals as follows:
 - 1.** Individuals may request to withdraw from the monitoring program by completing form RPR 49A (attached and available at www.rso.utah.edu). Termination of dosimetry is not automatic; each request is evaluated by the Radiological Health Department. Individuals must continue to wear dosimetry

until if and when the withdrawal request is approved by the supervisor/Responsible User and by the Radiation Safety Officer.

2. A determination of an exemption from the personal dosimetry requirement will be made by a health physicist and approved by the Radiation Safety Officer, based upon:
 - a. a review of the individual's job assignment to determine the potential to be exposed to regulated radiation sources, and/or
 - b. a direct measurement of the workplace, including results of area dosimeters, and/or
 - c. an evaluation of the individual's or co-workers' dose history.
3. Evaluations of dosimetry requirements for groups of individuals or work areas must be documented in a "Radiation Exposure and Dose Determination (REDD)" survey conducted by the Radiological Health Department. Each REDD survey must be reevaluated at least every 2 years or whenever major changes in the work environment occur.
4. REDD studies supporting monitoring exemptions for University of Utah Hospital and Clinic personnel must be presented to the Medical Use Radiation Safety Committee for final approval.
5. The personal dosimetry exemption no longer applies if work assignments change resulting in an increased potential for exposure to radiation sources.

H. CHANGES, TERMINATIONS, AND TRANSFERS: Any changes affecting the radiation source and exposure potential, including the amount, type, or location of work with radiation sources, require notification to Radiological Health. Dosimeters may be transferred to a new department if the user's work location changes by notifying Radiological Health of the new department and date of transfer.

Users who leave the University or discontinue all work with radiation sources can terminate dosimeters and radiation use status by filling out and returning form RPR 1C "User Termination Checklist" to Radiological Health. Individuals who fail to complete a RPR1C form will have dosimetry terminated through department or Radiological Health review of employment status.

I. ALARA INVESTIGATIONS: Dosimetry results are reviewed by Radiological Health Department personnel to ensure radiation doses remain both below regulatory limits and ALARA investigation levels. Doses that exceed defined investigation levels are formally investigated by Radiological Health Department personnel, per RPR 46 *Personal Exposure Investigations*.

- J. DOSIMETRY RESULTS:** Individuals are contacted directly if dose results during the monitoring period exceed ALARA investigation limits (as described in RPR 46). Otherwise, summaries of radiation dose are provided to all monitored personnel annually. Dosimeter results can be requested at any time by contacting the Radiological Health Department at 801-581-6141.

6. REFERENCES

1. Utah Department of Health, *Standards for Protection Against Radiation*, Utah Radiation Control Rules, Chapter R313-15
 - a. R313-15-201. Occupational Dose Limits for Adults
 - b. R313-15-207. Occupational Dose Limits for Minors
 - c. R313-15-208. Dose to an Embryo/Fetus
 - d. R313-15-301. Dose Limits for Individual Members of the Public
 - e. R313-15-502. Conditions Requiring Individual Monitoring of External and Internal Occupational Dose

HISTORICAL INFORMATION -

ORIGIN DATE: December 2007

REVIEW DATES: March 2016

REVISION DATES: September 2016

APPROVAL DATES: September 2016

RPR49A Request for Withdrawal from External Radiation Dose Monitoring Program

Name: _____	UNID: _____
Current Job Title: _____	Contact Phone: _____
Department: _____	
Supervisor: _____	Contact Phone: _____
What sources of radiation do you use or work around? ☐ Radioactive Materials ☐ Radiation Generating Machines	
Describe any duties you have involving potential exposure to radiation.	
Have there been changes to your duties that have affected your radiation exposure recently? ☐ Yes (Describe Below) ☐ No	
I hereby request to withdraw from the Radiation Dose Monitoring Program. I understand that my answers above will be reviewed and that if I fall into a category of workers who must participate in the dose monitoring program, I will continue to appropriately wear my issued dosimeter. However, if my request for withdrawal is granted, I understand that it is my responsibility to notify the Radiological Health Department or the Diagnostic Medical Physicist if there is a change in my job responsibilities that will affect my dose.	
_____ Signature	_____ Date

Radiological Health Department Use Only	
Reviewer: _____	
Comments:	
Recommendation: ☐ Approve Request ☐ Deny Request	
RSO Signature: _____	Date: _____

RPR49B DECLARATION OF PREGNANCY*

I, _____, in accordance with the State of Utah's regulations, R313-15-208
(Full Name)
regarding pregnant radiation workers, am declaring that I am pregnant. I would like to
continue my current work assignment in the _____ Department at the University
of Utah. I believe I became pregnant in _____. My estimated date of delivery is
(month/year)
_____.
(month/year)

I understand the radiation dose to my embryo/fetus during my entire pregnancy will not be
allowed to exceed 500 mrem (5 mSV). I also understand that meeting this dose limit may require
a change in my job responsibilities during pregnancy.

Signed _____

Date _____

Dept. Address _____

Phone _____

*The NRC and State defines a declared pregnant woman as "a woman who has **voluntarily**
informed her employer in writing of her pregnancy and the estimated date of conception." Only
the month and year need be provided.

Note that you may "undeclare" your pregnancy by notifying the Radiological Health Department
in writing

**The Radiological Health Department reserves the option to deem that this declaration of
pregnancy has lapsed and no longer is in effect on the earlier of either: 1) 60 days after the
estimated date of delivery designated by the declarant on the form of declaration; or 2) one
year after the date of receipt of the above Declaration of Pregnancy Form (RPR 49B) at the
Radiological Health Department office.**