

Section 4

RADIATION SAFETY RULES AND REGULATIONS

A. Historical Perspective

Standards and regulations for radiation protection have been evolving ever since the first attempt to define radiation limits for x-ray workers based on skin erythema dose. The recommendation was that x-ray workers limit their exposure to 1/100 of the erythema dose within a 30-day period. This amounted to approximately 0.2 R/day.

The first nuclear materials assemblies at the Fermi Lab and at the Manhattan Project during World War II resulted in the establishment of the first radiation safety or health physics organizations. These organizations established guidelines based on the somatic effects of radiation, particularly those effects to the blood and blood forming organs of the body. Limitations to gonadal doses were developed later as animal and human epidemiological studies indicated a genetic effect. The threshold dose for the bone was also established as 1 microcurie based on the epidemiological studies of the radium dial painters.

In 1929, the Advisory Committee on X-ray and Radium Protection, consisting of leading scientists in the field of radiation, was organized. In 1946, it expanded and became known as the National Committee on Radiological Protection (NCRP). Along with the International Commission on Radiation Protection (ICRP), established in 1928, they published a series of reports on radiation protection and standards for dose limitations that laid the groundwork for federal regulations.

In the 1950s, as atomic energy began to be used in power reactors and for other peaceful uses, national safeguards were established through the Atomic Energy Act. The Act created the Atomic Energy Commission whose primary mission was the security and safety of atomic energy. This concern for security and safety evolved into the strong licensing control over fission material and radioactive substances that persists today.

B. Regulatory Organizations

1. National

The Atomic Energy Commission (AEC) was the first national organization given the power by Congress to control all radioactive material, with the exceptions of accelerator produced radionuclides and most of the naturally occurring radionuclides.

The AEC and its successor, the Nuclear Regulatory Commission (NRC), pre-empted all state laws and organizations in the regulatory control of radioactive material. However, the United States government licensed some states (called "Agreement States") to perform these regulatory functions. These states agree to comply with federal regulations and to ensure control and security of radioactive materials. Washington is one of the 26 "Agreement States" currently licensed by the U.S. government.

2. State

The Radiation Protection Division of the Washington State Department of Health (DOH) is the agency with responsibility and authority over the radiation activities within the state, including those at the University of Washington.

The state's regulatory code, WAC Title 246, establishes regulations for the use of radioactive materials and radiation emitting devices such as x-ray machines. These regulations require the presence of the Radiation Safety Committee and the Radiation Safety Office (RSO) at the University of Washington. The Statement of Philosophy of this regulatory code is embodied in Chapter 246-220. (See Appendix 4, Figure 1)

3. University

DOH licenses the University to use radioactive materials. This requires the establishment of the Radiation Safety Committee and a Radiation Safety Officer to ensure that license requirements are met. The Radiation Safety Committee is composed of faculty members appointed by the Executive Director of the Health Sciences Administration. The Radiation Safety Officer works closely with the Radiation Safety Committee in the approval of faculty and laboratories for radioactive material use.

C. Authorization Process for Users of Radioactive Material

1. Introduction

The UW license authorizes the University to receive, possess and use specific radionuclides designated by chemical and physical form as well as by maximum activities. One of the requirements of our license is to ensure we stay within these limits.

The license further specifies that we know the following:

- How much radioactive material is used.
- Where it is used.
- How it is used.
- How it is disposed.

It also states that the Radiation Safety Committee must authorize each program which uses radioactive material or radiation producing devices. Below is described the general application process including Authorized Investigator (AUI) and employee responsibilities.

2. Application Process

The first step in applying to be an Authorized Investigator of radioactive material is to secure an application packet from the RSO. This packet includes an instruction sheet plus all the necessary forms. Authorized Investigators must be faculty members, and if applying for use in human subjects, must also be licensed in the healing arts. In completing the application, the AUI lists the personnel working under his/her authorization. The list may include graduate students, research technicians and other faculty. These people will be listed on the authorization as research participants. The AUI also describes all facilities where radioactive material will be used or stored and how the radioactive material is to be used.

After the application is completed, it is submitted to the Radiation Safety Office (RSO). An RSO staff member reviews the application and schedules an appointment with the applicant to inspect the labs and clarify unclear aspects of the application. When this review is complete, an Authorization to Use Radioactive Material is prepared, reviewed by the Radiation Safety Officer and then approved. The Radiation Safety Committee has authorized the Radiation Safety Officer to approve non-human uses of radioactive material if the activities are within specified limits. Uses requiring amounts in excess of this and applications for research on humans must be reviewed by the Radiation Safety Committee.

3. Laboratory Certification

At the time of the lab inspection, each laboratory is posted with a Laboratory Certification. Laboratory survey requirements are found in the Radiation Safety Manual, Section 13, Laboratory Survey Procedures

4. Authorized Investigator's Responsibilities

In completing the application, the authorized investigator acknowledges the following responsibilities:

- a. To provide proper instruction to his workers, both in general laboratory practices and in any specialized radioactive material procedures.
- b. To ensure that radiation and radioactive materials are confined to clearly designated areas.
- c. To provide proper detection instruments and other equipment necessary to radiation safety in that area.
- d. To ensure radioactive material is secured when lab is unoccupied.

- e. To ensure proper labeling and posting of warning signs.
- f. To follow UW regulations regarding purchase, transfer and disposal of radioactive material.
- g. To post emergency procedures with phone number of AUI and RSO in a conspicuous place in each certified laboratory.
- h. To maintain inventory records so the amount of radioactive material on hand can be seen at any time.
- i. To perform and record lab surveys as determined by lab rating.
- j. To notify the RSO of any accidents involving radioactive material.
- k. To comply with:
 - State regulations published in WAC 246,
 - License conditions, and
 - Policies of the Radiation Safety Committee.

5. Radiation Worker Responsibilities and Rights

All radiation workers have the obligation to comply with State and University regulations and to follow good safety practices. They also have specific rights and responsibilities as designated in the Washington Administrative Code, Instructions to Workers (WAC 246-222) and the Notice to Employees, Form RHF 3.

D. University Regulations

1. Inventory Control

As part of the Authorization to Use Radioactive Material issued to the AUI, possession limits are set for each radionuclide used by the AUI. To ensure these limits are not exceeded, an inventory control program has been established which covers the purchase, receipt and disposal of radioactive material. This program is operated on a computer which keeps track of each individual order through its ordering, delivery, and disposal.

a. Purchasing of Radioactive Material

Orders for radioactive materials are first approved by the RSO and then placed by the Chemical-Radioactive Purchasing Desk at the University Purchasing and Stores Office. Items that must be included in any order request are the radionuclide, activity, catalog number, description,

Authorized Investigator (AUI), delivery location, technical contact person, and phone number.

1. Faxing an Order Request

The preferred method is to fax the order request using the “Rush Form for Purchases of Radioactive Materials” to the RSO (FAX 206-543-9726). A copy of this form is on the EH&S web page (<http://www.ehs.washington.edu/forms/rso/radioactivematerialorderform.pdf> , Printable Forms, Radiation Safety).

In order to be processed that day, “Rush” forms must be faxed to the RSO no later than 11:00 a.m.. This allows time for RSO approval and forwarding “Rush” forms to Purchasing so that the order can be placed with the vendor. Purchasing will not process any order that has not received prior approval by the RSO.

2. Stores On-Line Request

The order must also be entered into the Stores on-line form (PAS). It is extremely important to indicate that this is a “confirming order,” so that it does not get double ordered.

b. Receipt of Radioactive Material

All radioactive packages, including free samples or packages from other universities, are delivered initially to Radiation Safety. There, each package is checked by RSO personnel:

- 1) To ensure that it was approved originally by Radiation Safety and is in the computer;
- 2) To ensure that the person to whom the package is addressed is authorized to receive the material; and
- 3) To determine if the package was damaged during shipment or in some cases, whether there is contamination on the outside.

If you are receiving free samples or shipments from other universities, inform the shipper to use the following address:

Attn: (Authorized Investigator's Name)
University of Washington
Radiation Safety Shipping and Receiving Office
B122, Health Sciences Bldg.
Seattle, Washington 98195

Also contact the Radiation Safety Office before receipt so we will be aware of its arrival. This may prevent delays due to problems with inventory or unclear labeling of package, i.e. not being able to read the name of the AUI.

Most packages arrive on campus by 1:00 p.m. and are delivered to the lab the same day. Those arriving later in the day may not be delivered until the next day unless we are told of special needs. Contact us if you wish to expedite receipt of a package. Sometimes they can be picked up directly from our office instead of waiting for delivery.

Along with the package you will receive an RSO Form 160--Delivery and Usage Record (See Appendix 3, Figure 5). Radiation Safety personnel fill out the top portion of this form which pertains to the transport data and the condition of the package upon receipt. This sheet provides all the documentation required regarding receipt and disposal of the package. One of these requirements is for the user to perform a wipe survey of the inner vial when the package is first opened. There is a section on the Form 160 to record whether the vial was contaminated or not.

c. Disposal of Radioactive Material

Records must be kept of how much material is disposed and the disposal methods used. The Form 160 is used to record this information for each order received. The back of the Form 160 is provided to keep daily records of use and disposal. When the package is completely disposed (not necessarily removed from the lab, but in a waste container), the activity disposed is summarized for **each type** of disposal and recorded on the front of the Form 160. The Form is then sent back to the Radiation Safety Office where the data is entered into the computer. The computer program subtracts it from the AUI's inventory. A copy of the Form 160, if retained by the Authorized Investigator, meets all licensing documentation requirements for receipt and disposal.

d. Transfer of Radioactive Material

Sometimes it is desirable for one AUI to transfer radioactive material to another AUI. Such transfers must have **prior** approval by the Radiation Safety Office. The individual receiving the radioactive material must be properly authorized to handle the radionuclide and the activity must be within their possession limit. There is a space provided on the Form 160 to record transfer of radioactive material. A transfer RSO Form 160T must accompany the transferred material. (See the Radiation Safety Manual for instructions. Call the RSO at 543-0463 to obtain a copy of Memo 14.)

2. Off Campus Shipment of Radioactive Material

To meet the complex and stringent Department of Transportation shipping requirements, AUIs planning off campus shipments should contact the Radiation Safety Office for advice and assistance in packaging, labeling and preparing shipping papers.

Abbreviations

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| AEC | Atomic Energy Commission |
| AUI | Authorized Investigator |
| DOH | Department of Health (State of Washington) |
| ICRP | International Commission on Radiation Protection |
| NCRP | National Committee on Radiological Protection |
| NRC | Nuclear Regulatory Commission |
| RSO | Radiation Safety Office |
| WAC | Washington Administrative Code |

Appendix 4

Figure 1

**Chapter 246-220 WAC
RADIATION PROTECTION – GENERAL PROVISIONS**

WAC 246-220-007 Statement of philosophy. In accordance with the recommendations of the Environmental Protection Agency, formerly the Federal Radiation Council, approved by the president of the United States of America, persons engaged in activities under licenses issued by the Washington State Department of Health pursuant to the Atomic Energy Act of 1954, as amended, shall, in addition to complying with the requirements set forth in chapter 246-221 WAC, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. Such persons should make particular efforts to keep the radiation exposure of an embryo or fetus as low as is reasonably achievable during the entire gestation period as recommended by the National Council on Radiation Protection and Measurements. The term “as low as is reasonably achievable” means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other socioeconomic considerations, and in relation to the utilization of nuclear energy, ionizing radiation, and radioactive materials in the public interest.

[Statutory Authority: RCW 70.98.050. 94-01-073, § 246-220-007, filed 12/9/93, effective 1/9/94. Statutory Authority: RCW 70.98.050 and 70.98.080. 91-15-112 (Order 184), § 246-220-007, filed 7/24/91, effective 8/24/91. Statutory Authority: RCW 43.70.040. 91-02-049 (Order 121), recodified as § 246-220-007, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. 81-01-011 (Order 1570), § 402-10-010, filed 12/8/80; Order 1095, § 402-10-010, filed 2/6/76.]