X-Ray Protection Program

UNIVERSITY OF NEW HAMPSHIRE
OFFICE OF ENVIRONMENTAL HEALTH AND SAFETY

Approved by:  Michele C. Rust Date: May 2017

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### Revision History

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May 20, 2016

TO: All Laboratory Employees

FROM: Mark W. Huddleston, President

SUBJECT: Delegation of Authority for Radiation Safety Officer

Michele Arista has been appointed Radiation Safety Officer in the Office of Environmental Health and Safety and is responsible for ensuring the safe use of radioactive material, x-ray machines, lasers, and superconducting magnets. The Radiation Safety Officer is responsible for managing the radiation protection program; identifying radiation safety problems, initiating, recommending, or providing corrective actions; verifying implementation of corrective actions; and ensuring compliance with regulations for the use of radioactive material, x-ray machines, lasers, and superconducting magnets. The Radiation Safety Officer is hereby delegated the authority necessary to meet these responsibilities.

The Radiation Safety Officer has the authority to immediately stop any operations involving the use of radioactive material, x-ray machines, lasers, and superconducting magnets. The Radiation Safety Officer is hereby delegated the authority necessary to meet these responsibilities.
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4.0.0 INTRODUCTION

The University of New Hampshire (UNH) is committed to an X-Ray Protection Program (XPP) of the highest quality. Likewise UNH hereby commits to full and complete compliance with all relevant requirements in the State of New Hampshire Rules For The Control Of Radiation. This X-Ray Protection Program is designed to control operations conducted at UNH Research and Educational Facilities that may result in the potential exposure of UNH personnel, members of the general public and/or the environment to X-Ray radiation. The University of New Hampshire’s commitment to the XPP is based on the fundamental principle that levels of radiation to be used, and exposures to all sources of ionizing radiation, are to be maintained As Low As Reasonably Achievable (ALARA).

5.0 ORGANIZATIONAL OUTLINE FOR RADIATION PROTECTION

Superior, consistent performance in radiological control is achieved when: qualified personnel follow proven procedures; management actively monitors the workplace, and radiation safety personnel audit activities to assess the quality of work from a compliance and performance standpoint. Regular review and informed interest by senior management is required to achieve a superior X-Ray Protection Program.

The X-Ray Protection Program will be administered by the UNH Radiation Safety Officer and supported by the Office of Environmental Health and Safety (OEHS) and the UNH Radiation Safety Committee. The RSO reports to the Director of OEHS who in turn reports directly to UNH senior management and can bring any XPP concern to the attention of these senior managers.

Note: The term “radiation producing machine” refers to “ionizing radiation producing machines” throughout this document.
6.0 ADMINISTRATION

The use of X-Ray producing machines and radiation-producing machines at UNH falls under the jurisdiction of the Radiation Safety Officer and the Radiation Safety Committee. All radiation-producing machines must be registered with the Office of Environmental Health and Safety and the State of New Hampshire Radiological Health Section. The Radiation Safety Officer must approve all purchases of radiation-producing machines.

6.1 Purchase and Registration

If you need to purchase or transfer an X-Ray device to UNH, please inform the Radiation Safety Officer (RSO). The location where the machine will be installed must be posted prior to the arrival. The RSO will consult with the owner and complete a registration form to the State of New Hampshire. The registration is due within thirty days of the arrival of the machine. In addition to registration, diagnostic machines need to have a shielding review performed by a medical physicist licensed by the State of New Hampshire. Contact the Radiation Safety Officer for more information.

6.2 Training

All X-Ray and radiation-producing machine users are required to complete a training course upon hire. This training is available on-line. An annual refresher of this course is also required every September. Review the PowerPoint presentation and take the exam. A grade of 80% or better is necessary to pass the exam. Any visitors who have not received Radiation Awareness training must be supervised when the X-Ray device is on.

6.3 Standard Operating Procedures

All X-Ray users must be trained on the Standard Operating Procedures (SOPs) of the specific machine being used. SOPs should include how to power on and off the machine, function of interlocks, personal protective equipment, or other special safety procedures, and emergency contact information. See Appendix A for a Standard Operating Procedure template.
7.0 X-RAY PROTECTION PROGRAM

7.1 Relocation of X-Ray Producing Equipment

All radiation-producing machines must be registered with the State of New Hampshire’s Radiological Health Section (RHS). The registration process includes the location of the machine. If you wish to relocate a machine to another building or room, notify the RSO, and he/she will review the request. Upon approval of the relocation, the RSO will notify the State informing the RHS of the relocation. Do not relocate any X-Ray producing equipment without first receiving RSO approval. (The portable x-ray machine for vertebrate animals does not need RSO approval to relocate for use. Follow the standard operating procedure for use.)

7.2 ALARA

It is the University of New Hampshire’s policy for operators of radiation-producing machines to keep potential exposures “As Low As Reasonably Achievable” (ALARA). To keep doses ALARA, minimize the time spent in the vicinity of the radiation-producing machine, increase distance from the beam, and use shielding as required by your procedure. In addition, the following requirements should be followed:

7.2.1 Avoid exposure to the beam.
Always know where the beam ports are and cap off any unused beams. Never place your hand in the path of an x-ray diffraction beam. Always turn off the machine prior to placing or removing a sample in the beam path. If holding an animal in a beam path, try to keep your hands as far away from the beam as possible.

7.2.2 Always use interlock doors for shielding.
Do not override interlocks or beam shutters for x-ray diffraction units. If the X-Ray warning light does not go off when you turn off the machine, do not place your hand in the beam path. Unplug the machine, report the malfunction to your supervisor and the Radiation Safety Officer and secure the area from unauthorized access.

7.2.3 Maintain distance of diagnostic X-Ray equipment.
In general, do not be near X-Ray equipment when in operation. Remember that radiation exposure can be significantly reduced by distance. Remain at least six (6) feet away from an X-Ray source when possible. Do not hold the tube housing during exposure as there is a high voltage electric shock danger.
When taking X-Rays of large animals with a portable X-Ray device, maintain a minimum nine (9) foot distance from the beam, when not required to hold a cassette, subject, or operate the unit.

7.2.4 Wear appropriate personal protective equipment, PPE. Refer to your SOP for a determination of required PPE. A lead apron, thyroid shield, lead glasses, and lead gloves are required when positioning or holding animals during X-Ray or when operating a portable unit being held against an animal. PPE containing lead should be inspected at least annually for shielding integrity.

7.2.5 Use immobilizing devices for animals. Whenever possible use immobilizing devices to hold animals in place. When not possible be sure that hands and body parts are not in the beam path.

7.2.6 Learn about the UNH Declared Pregnant Worker program. Workers should be notified of their rights under the UNH DPW program and know how to enroll and participate in the plan as it may apply to their work.

8.3 Repairs

Authorized Users may perform simple repairs to an x-ray diffraction machine, such as changing x-ray tubes. Inform the RSO of the repair, so he or she may test the machine for radiation leakage after the repair. Other employees wishing to perform repairs on x-ray producing equipment should request permission from the Radiation Safety Officer and should be prepared to provide a summary of qualifications for such work. If one chooses a contractor for such repairs, the engineer must be a licensed individual or manufacturer. A list of individuals licensed by the State’s Radiological Health Section may be obtained by calling their main number at 603-271-4588.

8.4 Storage or Disposal

If you have a radiation-producing machine that is broken or no longer used, it is recommended to change the classification from “active” to “in storage.” Fees for units in storage are reduced and periodic inspections do not need to be performed on these machines. If you would like to designate a radiation-producing machine as “in storage”, please notify the Radiation Safety Officer. The main electrical supply should be disconnected and the machine should be secured from unauthorized access.
To dispose of an X-Ray machine, contact the Radiation Safety Officer. The X-Ray tube must be removed prior to disposal of the machine and any warning signs or symbols defaced. If the X-Ray tube was constructed prior to 1979, cooling oil containing PCBs may be present. If PCBs are present in the unit, the oil will need to be removed by the Hazardous Waste Coordinator of the Office of Environmental Health and Safety, prior to disposal of the machine.

9.0 SURVEYS

Surveys will be performed by the Radiation Safety Officer, or qualified designee:

- Upon installation,
- Bi-annually, (twice per year) or
- Whenever one or more of the following occurs:
  a. When there is a change in the number or type of local components in the analytical unit system.
  b. Following maintenance requiring the disassembly or removal of a local component.
  c. During the performance of maintenance and alignment procedures if the procedures require the presence of a primary x-ray beam when a local component in the system is disassembled or removed.
  d. When a visual inspection of the local component in the system reveals an abnormal condition.
  e. When the machine is operated in a manner other than the routine manner specified in the written operating manual.

10.0 POSTINGS

Areas in which radiation-producing machines are used or stored must have proper postings. State regulations require that a copy of the machine registration as well as a current “Notice to Employees” be visibly posted. In addition, a copy of the current Standard Operating Procedure must be posted near the unit and a “Caution X-Ray” hazard communication sign must be posted at each entrance to the area.

Areas in which portable X-Ray devices are used shall have a “Caution X-Ray, Do Not Enter” posting at each entrance while the machine is being operated.
11.0 DOSIMETRY

Dosimetry is not needed for x-ray diffraction, x-ray fluorescence, or electron microscopy laboratories due to the insignificant estimated dose. This determination is based on survey data collected outside of the machine when it is operating under normal conditions.

Dosimetry is currently required for X-Ray users in the Veterinary Technology Program. Whole body monitors are to be worn at the neck on the outside of the thyroid shield. Ring badges should be worn on the hand most likely to be near the beam with the detector facing the palm. All issued badges should be exchanged on the proper frequency.

Should you lose a dosimeter, please report the loss to the RSO immediately. Do not work with X-Ray producing equipment until you have filed a lost dosimeter report and received a replacement dosimeter. When notifying the RSO of a lost dosimeter, indicate how and when the dosimeter was lost, what will be done to prevent recurrence, and any activities that you performed that may have resulted in an exposure to radiation. Please recognize that lost dosimeters incur additional charges from the vendor and require an administrative burden for the RSO. Your efforts to assure that all dosimeters issued to you are carefully monitored and returned on schedule are appreciated.

12.0 SECURITY

All radiation-producing machines must be located in an approved area that can be secured when unattended. Please notify the Radiation Safety Officer in the event of unauthorized relocation or theft of a machine.
APPENDIX A

SAMPLE X-Ray Standard Operating Procedure
University of New Hampshire

Registrant/ Professor:                                Date:
Manufacturer:      Serial number:

Prior to operating the X-Ray diffraction unit one must be trained in x-ray safety and the operation of the unit.

1. Place your sample in the machine and close the sample door.

2. To turn on the instrument: INSERT SPECIFIC INSTRUCTIONS

3. Always turn off the X-Ray beam prior to removing your sample.

4. Never override the interlocks.

5. To turn off the instrument: INSERT SPECIFIC INSTRUCTIONS

6. Prior to leaving, lock the laboratory door to secure the machine.

7. For repair or servicing, contact a licensed professional.

8. In the event of theft or an accidental radiation exposure, contact the Radiation Safety Officer at 603-312-2500 (cell).

9. Before moving this unit to another location or taking out of service, contact the Radiation Safety Officer at 603-862-3607 (office).