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| UT Health Science Center: RSP14 - Use of X-Ray Equipment | |
| Version 1 | Publication Date: 08/03/2023 |

Objective

To promote the safe use of x-ray equipment and comply with the Tennessee Department of Environment and Conservation regulations for the use of x-ray apparatus (Chapter 0400-20-06).

Scope

This procedure applies to the use of medical, dental, veterinary, and analytical x-ray systems located on the Memphis campus of UTHSC.

Roles

Department chairs, deans or operational unit directors are responsible for:

- Ensuring owners of x-ray equipment comply with regulatory requirements and the requirements of this procedure.

Custodians, owners, principal investigators, or supervisors of x-ray equipment must:

- Inform the Radiation Safety Officer (RSO) of the acquisition of new x-ray equipment.
- Comply with RSP08 – *Registration and Inspection of X-ray Units*. Custodians of x-ray equipment must inform the RSO of x-ray equipment acquisition as necessary to facilitate the registration of this equipment with the state within 10 days of equipment installation and inspection within 90 days.
- Notify the RSO of new employees that will operate x-ray equipment and require dosimeters or who will be listed as workers on Radiation Safety Committee approved research protocols involving x-ray equipment.
- Maintain equipment records, calibration, and service records for x-ray equipment under their oversight.
- Perform research involving x-ray producing equipment only as described by a protocol approved by the Radiation Safety Committee, if applicable.
- Ensure x-ray users comply with the requirement of this procedure.
- Inform the RSO of the removal or disposal of x-ray equipment so the equipment can be removed from the state registration.

Users of x-ray systems:

- Comply with the requirements of this procedure.
- Complete training in the use of x-ray equipment and x-ray safety
- Use x-ray equipment only as instructed.
- Wear radiation dosimeters as directed by the RSO.

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- Participate in investigations intended to maintain radiation exposures as low as reasonably achievable (ALARA).

Definitions

Custodian: The individual responsible for the acquisition, installation, or operation of x-ray equipment. Examples of individuals considered custodians include but are not limited to equipment owners, principal investigators, work area supervisors.

X-ray system: An assemblage of components for the controlled production of x-rays. It includes minimally an x-ray high-voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device and the necessary supporting structures. This includes Fluoroscopic imaging equipment, computed tomography (CT) equipment, orthovoltage and other forms of machine produced x-ray equipment.

Procedure

Use this Outline Format when possible:

I. GENERAL SAFETY PRECAUTIONS

- The owner or custodian of x-ray units must notify the RSO of the acquisition and installation of new equipment in accordance with *RSP08 – Registration and Inspection of X-Ray Units*. The RSO will confirm that the facility is appropriate for the use of x-ray equipment.
- The custodian, owner, principal investigator, or supervisor shall assure that all x-ray apparatus under their control is operated only by individuals instructed in safe operating procedures and competent in safe use of the x-ray equipment. This training must be documented by the department that owns the unit.
- X-ray producing devices and associated equipment must be maintained in such a condition to ensure that the patient and staff are not exposed to radiation unnecessarily.
- No x-ray equipment shall be left unattended or unsecured unless the control switch is turned “off”, the power to the control switch is disconnected, or the room that the x-ray equipment in is locked.
- If applicable, film development procedures recommended by the film manufacturer or other tested procedures shall be followed.
- Effectiveness of protective equipment shall not be impaired and shall be evaluated before each use.
- Personnel operating x-ray units must be trained in the safe operation of this equipment prior to the using this equipment.

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- The operator will provide and require individual personnel monitoring of external occupational dose via a whole-body dosimeter and extremity dosimeters for both the right and left hands to all persons who may operate the hand-held device. The operator may be relieved of the requirement of this subpart after one year of personnel monitoring if the results of the personnel monitoring demonstrate that the operator of the hand-held device is not likely to receive a dose more than 10 percent of the limit.

II. MEDICAL AND DENTAL X-RAY INSTALLATIONS

- Treatment rooms shall be constructed so that individuals within the room may be able to escape if needed.
- When x-rays are in use, a visible signal must be located near each door of that treatment room.
- A device shall be on the control panel which indicates to the operator whether the tube is energized.
- Check calibrations shall be made annually, and records shall be maintained by the custodian of that unit. The calibration shall be repeated if the x-ray generating equipment is adjusted in a way that could cause a change in x-ray output.
- X-ray apparatus shall be calibrated by a qualified individual.
- The custodian shall maintain records of all information provided by manufacturer.
- The custodian shall maintain a record of all maintenance and modifications performed on all systems.
- Protective gloves and aprons with at least 0.25 millimeters of lead and shall be required at the time of use. This is protection for the staff and patients from direct scatter of radiation.
- The following requirements shall be met by individuals securing individuals or holding film:
 - No individual under 18 years of age and no pregnant women will be used.
 - No individual shall be used on a consistent or routine basis.
 - Protective gloves and aprons with at least 0.25 millimeter of lead equivalency shall be provided and their use required of everyone used for this purpose.
 - No part of the body of the individual utilized, for this purpose shall be in the primary beam unless protected by 0.5 millimeters lead equivalent material.
 - If occupationally exposed persons are utilized their exposure shall be monitored with the monitoring device place on the collar outside the leaded apron.
 - The operator shall provide and require individual personnel monitoring of external occupational dose via a whole-body dosimeter and extremity dosimeters

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for both the right and left hands to all persons who may operate the hand-held device. The operator may be relieved of the requirement of this subpart after one year of personnel monitoring if the results of the personnel monitoring demonstrate that the operator of the hand-held device is not likely to receive a dose in excess of 10 percent of the limits.

- Operators shall implement security and accountability procedures to prevent unauthorized use, misuse, or unauthorized removal of the hand-held device from the storage location.
- The operator shall maintain training records of the initial and recurring training provided to the facility staff. The record shall include the date the training was provided, the name of each individual trained and their signature, the name and dated signature of the individual providing the training, the topics covered during the training, and the duration of the training.

III. VETERINARY X-RAY INSTALLATIONS

- Use of x-ray equipment shall be described in a protocol approved by the IACUC and Radiation Safety Committee. Protocols shall include the name of individuals using or working in the vicinity of x-ray producing equipment.
- A timer shall be provided that will terminate the exposure after a preset time.
- If the operator is required to be in the room during exposures, the operator shall be required to stand at least 2 meters from the animal for all exposures and outside of the primary beam.
- The following requirements shall be met by individuals securing animals or holding film:
 - No individual under 18 years of age and no pregnant women will be used.
 - No individual shall be used on a consistent or routine basis.
 - Protective gloves and aprons with at least 0.25 millimeter of lead equivalency shall be provided and their use required of each individual used for this purpose.
 - No part of the body of the individual utilized, for this purpose shall be in the primary beam unless protected by 0.5 millimeters lead equivalent material.
 - If occupationally exposed persons are utilized their exposure shall be monitored with the monitoring device place on the collar outside the leaded apron.
 - A log shall be created listing the name of the individual holding the film or animal and shall include the date of the examination and it shall be possible to determine the procedure for which the animal or film was held.
 - The operator shall provide and require individual personnel monitoring of external occupational dose via a whole-body dosimeter and extremity dosimeters

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for both the right and left hands to all persons who may operate the hand-held device. The operator may be relieved of the requirement of this subpart after one year of personnel monitoring if the results of the personnel monitoring demonstrate that the operator of the hand-held device is not likely to receive a dose in excess of 10 percent of the limits.

- Operators shall implement security and accountability procedures to prevent unauthorized use, misuse, or unauthorized removal of the hand-held device from the storage location.
- The operator shall incorporate specific information regarding hand-held devices into any initial and recurring training provided to the facility staff.
- The operator shall maintain training records of the initial and recurring training provided to the facility staff. The record shall include the date the training was provided, the name of each individual trained and their signature, the name and dated signature of the individual providing the training, the topics covered during the training, and the duration of the training.

IV. ANALYTICAL X-RAY INSTALLATIONS

- A sign or label shall be placed on or adjacent to each x-ray tube housing and shall be located to be clearly visible to any individual who may be working in close proximity to the primary beam path.
- The operator shall be in immediate attendance at all times when the equipment is in operation except when the area is locked to protect against unauthorized or accidental entry.
- When not in use, the equipment shall be inoperable by unauthorized personnel.
- The operator shall not permit any individual to operate or maintain analytical x-ray equipment until such individual has received instruction in and demonstrated competence as to identification of radiation hazards associated with the use of equipment, significance of the various radiation warning and safety devices incorporated into the equipment, proper operating procedures for the equipment, symptoms of an acute localized exposure, and proper procedures on contacting the Radiation Safety Officer for reporting an actual or suspected exposure.
- Written operating procedures and emergency procedures pertaining to radiation safety shall be established and posted in a location near each unit of analytical x-ray equipment.
- Only trained personnel shall be permitted to install, repair, or make modifications to the x-ray generating apparatus and the tube housing apparatus complex.
- All operators possessing open-beam, hand-held, analytical devices shall have available for review by the Division operating policies and procedures that contain measures ensure that

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radiation protection is provided and should be in the form of an operating procedure that contains, at a minimum:

- The operator's hands will not approach the primary beam.
- The operator will not hold the sample during operation of the hand-held x-ray device.
- The operator will not aim the primary beam at him/herself or at any individual during operation of the device; and
- Before energizing the device, the operator will ensure that no person is within two meters of the device or sample being tested.
- Administrative controls should be put in place in the form of an operating procedure and shall include the discussion of the warning lights safety mechanism on the device, the absence of the fail-safe design on the device, and the potential risks to the operator should the warning lights fail.
- Training should be given that verifies that the warning lights are correctly working when the device is known to be generating x-rays.
- Operator radiation exposure is as low as reasonably achievable.
- The operator shall provide individual personnel monitoring with extremity dosimeters for all operators of the hand-held device. Extremity monitoring may be discounted after one year if the results of the personnel monitoring demonstrate that the operator of the hand-held device is not likely to receive a dose more than 10 percent of the limit.

Penalties/Disciplinary Action for Non-Compliance

Instances of non-compliance with this procedure shall be reviewed by the UTHSC Radiation Safety Committee with corrective or disciplinary action enforced by the Radiation Safety Officer. Enforcement of this procedure shall be in accordance with *RSP01-Enforcement of the Radiation Safety Program*. Disciplinary action may include suspension of an individual's ability to use x-ray producing equipment on campus.

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Responsible Official & Additional Contacts

| Subject Matter | Office Name | Telephone Number (xxx) xxx-xxxx | Email/Web Address |
|---|--------------------------|------------------------------------|---------------------|
| Policy Clarification and Interpretation | Radiation Safety Officer | 901-448-6114 | radsafety@uthsc.edu |
| Policy Training | Radiation Safety Officer | 901-448-6114 | radsafety@uthsc.edu |
| Radiation safety | Radiation Safety Officer | 901-448-6114 | radsafety@uthsc.edu |

Related Policies/Guidance Documents

- [RSP01 - Enforcement of the Radiation Safety Program](#)
- [RSP08 - Registration and Inspection of X-Ray Units](#)