Quality Assurance and Radiation Protection Manual for Non-Human Use Radiation Generating Equipment
## RECORD OF REVISION PAGE

<table>
<thead>
<tr>
<th>Revision #</th>
<th>Date of Revision</th>
<th>Change Entered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original</td>
<td>9/15/1998</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2/18/2004</td>
<td>Incorporated new or revised ODH regulations; added an audit function for the Radiation Safety Office.</td>
</tr>
<tr>
<td>2</td>
<td>2/15/2006</td>
<td>Added statement University of Cincinnati issued dosimeters cannot be used outside the RCSP. Statement added to section 9.6. Added this record of revision page. Updated Notice to Employees sample.</td>
</tr>
<tr>
<td>3</td>
<td>6/17/06</td>
<td>Incorporated updated forms and ODH notice to employees. The documents are attachments to the manual and were approved by the RSC for The University Hospital leaving the RCSP.</td>
</tr>
<tr>
<td>4</td>
<td>1/1/08</td>
<td>Corrected typographical error in Appendix B. Corrected collar multiplication factor in footnote from 0.4 to 0.04.</td>
</tr>
<tr>
<td>5</td>
<td>8/20/08</td>
<td>Modified Appendix B, ALARA Investigational Levels, to deleted special investigational level for the head.</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

1. **General** ......................................................... 1
2. **Purpose** .......................................................... 2
3. **Definitions and Abbreviations** .................................. 2
   3.1 Definitions .................................................. 2
   3.2 Abbreviations ............................................... 3
4. **QA Program** ..................................................... 3
5. **Audits** .......................................................... 4
6. **RGE Operator Requirements** ..................................... 4
7. **Training Requirements** .......................................... 5
   7.1 Radiation Worker (e.g., operators) .......................... 5
   7.2 Ancillary Worker ............................................ 7
   7.3 Documentation ............................................... 8
8. **Radiation Safety Procedures** ...................................... 8
   8.1 All Non-Human Use RGE ...................................... 8
   8.2 Additional Safety Procedures by RGE type ..................... 8
      8.2.1 Industrial radiographic RGE ........................... 8
      8.2.2 Industrial irradiation device .......................... 9
      8.2.3 Industrial analytical RGE ................................ 9
      8.2.4 Industrial particle accelerator ......................... 10
      8.2.5 Veterinary RGE - general ............................... 11
      8.2.6 Veterinary RGE – fluoroscopic ......................... 11
   8.3 Additional Requirements for Specific Workers .................. 12
      8.3.1 Pregnant worker ......................................... 12
      8.3.2 Minors .................................................. 13
9. **Radiation Monitoring Requirements** ............................. 13
   9.1 Exposure Limits ............................................... 13
   9.2 General Dosimetry Requirements ............................... 13
   9.3 Specific Dosimetry Requirement by RGE type .................. 13
      9.3.1 Industrial radiographic RGE ........................... 13
      9.3.2 Industrial irradiation device .......................... 13
      9.3.3 Industrial analytical RGE ................................ 13
      9.3.4 Industrial particle accelerator ......................... 14
      9.3.5 Veterinary use RGE .................................... 14
   9.4 Specific Dosimetry for Specific Types of Workers ............. 14
      9.4.1 Dosimetry for ancillary workers ....................... 14
      9.4.2 Dosimetry for declared pregnant workers ............... 15
   9.5 Care of Dosimetry ............................................ 15
   9.6 Dosimetry Analysis and Reports ................................ 15
   9.7 Dosimetry Exchange Procedures ................................ 16
   9.8 Lost, Late Return or Damaged Dosimeters ....................... 16
10. **ALARA and Overexposure Investigations and Notifications** .... 16
    10.1 ALARA Investigation and Notification ....................... 16
    10.2 Overexposure Investigation and Notification ................. 17
11. **Postings and Signs** ........................................... 18

(Revision 3)
12. Incident Action ................................................................. 18
13. Intervals and Procedures for Evaluation of RGE .......................... 19
14. Quality Control Tests .......................................................... 20
15. RGE Logs and Operation Manuals ........................................... 20
   15.1 Logs ........................................................................ 20
       15.1.1 Maintenance Log .............................................. 20
       15.1.2 Use Log .......................................................... 20
   15.2 Operation Manual ......................................................... 21
16. RGE Acquisition, Inventory, and Disposal or Transfer .................. 21
   16.1 Acquisition ............................................................... 21
   16.2 Inventory ................................................................ 22
   16.3 Disposal or Transfer .................................................... 23
17. RGE Room Construction - New or Remodeled ............................ 23

Appendix A - Minor Forms
Appendix B - ALARA Investigational Levels
Appendix C - Sample Posting
Appendix D - Transfer or Disposal Form
Appendix E – RS form 2.1 (x-ray non-human)
Appendix F – RS form 33 – Declaration of Pregnancy

(Revision 3)
1. General

1.1. The possession and/or use of radiation generating equipment (RGE) classified by the state of Ohio as industrial radiography, industrial irradiation device, industrial analytical or analytical particle accelerator and/or veterinary (i.e., on animals) RGE shall be conducted in accordance with policies, procedures and guidelines presented in this manual.

1.1.1. "Industrial radiography" RGE means any RGE which produces ionizing radiation to examine the macroscopic structures of material by nondestructive methods.

1.1.2. “Industrial irradiation device” means any RGE used to alter the chemical, biological or physical properties of materials or to sterilize materials. Industrial irradiation devices include, but are not limited to, electron beam processors, electron beam welders, electron beam coaters, cabinet irradiators and bomb detection units.

1.1.3. "Industrial analytical" RGE means a group or system of components which produce ionizing radiation as either a primary or secondary result and is used to determine or alter properties of materials being measured or analyzed. Industrial analytical RGE include, but are not limited to, gauging units, x-ray diffraction, x-ray spectrometry, and electron microscopes.

1.1.4. “Analytical particle accelerator” includes any group or system of components which produce particles that are used to determine or alter properties of materials being measured, modified or analyzed.

1.1.5. “Veterinary RGE” includes any radiographic or fluoroscopic unit used for the diagnostic imaging or real-time imaging of animals or to administer a radiation dose to an animal.

1.2. Each department possessing RGE and each contact person (CP) responsible for one or more industrial radiography, industrial irradiation device, industrial analytical, industrial particle accelerator and/or veterinary RGE under the University of Cincinnati Radiation Control and Safety Program (RCSP) shall maintain a copy of this manual.

1.2.1. The CP is responsible for ensuring a copy of this manual is readily available to personnel for consultation and information purposes.

1.2.2. The chair of each department possessing RGE is responsible for ensuring a CP is designated for each RGE possessed by the department and the designated CP is an individual currently employed by the institution with sufficient knowledge, time and authority to perform the duties of the CP.

1.3. This manual incorporates quality assurance (QA) and radiation protection policies, procedures and guidelines, as applicable to non-human use RGE. The Radiation Safety Committee (RSC) has reviewed and approved this manual. The manual shall be updated as necessary to reflect changes in policies, procedures, institutional equipment and/or regulatory changes.

1.4. All employees operating RGE for non-human use shall read and understand this manual prior to operating RGE.
2. Purpose

2.1. The purpose of this manual is to satisfy the requirements of the Ohio Administrative Code (OAC) regarding the provisions of quality assurance (QA), OAC 3701: 1-66-04, and radiation protection, OAC 3701: 1-38.

2.2. This manual also provides significant regulatory requirements that may impact day-to-day usage of non-human use RGE.

3. Definitions and Abbreviations

3.1. Definitions

3.1.1. Contact Person (CP)

3.1.1.1. An individual designated by a department, division or unit as responsible for ensuring compliance with policies, procedures and guidelines covered in this manual

3.1.2. RGE Radiation Worker (RW)

3.1.2.1. An individual who operates a RGE

3.1.3. Ancillary Radiation Worker (AW)

3.1.3.1. An individual who:

3.1.3.1.1. is not a RW

3.1.3.1.2. is in the restricted area (e.g., room) when the RGE is energized (e.g., x-ray is on) (and)

3.1.3.1.3. is performing a duty as part of their "job" (e.g., employee, student, volunteer)

3.1.4. Declared pregnant worker

3.1.4.1. An RW or AW who has declared their pregnancy in writing to the Radiation Safety Office (RSOf)

3.1.5. Direct supervision

3.1.5.1. Within eye sight of the individual providing the supervision

3.1.6. Minor

3.1.6.1. Any individual under the age of 18

3.1.7. Restricted area

3.1.7.1. For industrial radiography RGE, the restricted area is that area where the dose rate may exceed 2 millirem in any one hour

3.1.7.2. For industrial irradiation device, the restricted area is the RGE unit and associated shielding and/or housing, or any area where the dose rate may exceed 2 millirem in any one hour, whichever is larger

3.1.7.3. For industrial analytical RGE, the restricted area is the RGE unit and associated shielding and/or housing, or any area where the dose rate may exceed 2 millirem in any one hour

(Revision 3)
exceed 2 millirem in any one hour, whichever is larger

3.1.7.4. For industrial particle accelerators, the restricted area is that area delineated by interlock controls to prevent access to the accelerator when energized or any accessible area where the dose rate may exceed 2 millirem in any one hour, whichever is larger

3.1.7.5. For veterinary RGE, the restricted area is the room in which the RGE is present when energized or 6 feet from the x-ray tube, whichever is smaller

3.2. Abbreviations

3.2.1. AW: Ancillary Radiation Worker
3.2.2. CP: Contact Person
3.2.3. ODH: Ohio Department of Health
3.2.4. QA: Quality Assurance
3.2.5. RCSP: Radiation Control and Safety Program
3.2.6. RGE: Radiation Generating Equipment
3.2.7. RSC: Radiation Safety Committee
3.2.8. RSO: Radiation Safety Officer
3.2.9. RSOf: Radiation Safety Office
3.2.10. RW: RGE Radiation Worker

4. QA Program

4.1. The QA Program includes:

4.1.1. Intervals and procedures for evaluation of RGE (manual section 5 and 13)
4.1.2. Radiation monitoring requirements including surveys (manual section 5 and 13), occupational exposure limits and personnel monitoring (manual section 9)
4.1.3. ALARA and overexposure notification procedures (manual section 10)
4.1.4. Radiation safety procedures (manual section 8)
4.1.5. RGE operator requirements (manual section 6)
4.1.6. Training requirements (manual section 7)
4.1.7. Quality control tests (manual section 14)
4.1.8. Equipment logs (manual section 15)
4.1.9. Posting and signage (manual section 11)
4.1.10. Incident action (manual section 12)

4.2. Oversight and Maintenance of the QA Program

4.2.1. Oversight and maintenance of the QA program for non-human use RGE is the responsibility of the RSC.
4.3. Implementation of the QA Program

4.3.1. Implementation of the QA program for non-human RGE is the responsibility of the University of Cincinnati Radiation Safety Officer (RSO).

5. Audits

5.1. Each RGE shall be audited by the Radiation Safety Office (RSO) as deemed necessary by the RSO to ensure compliance with rules, regulations and/or good health physics practices.

5.1.1. The minimum frequency of RSO audits shall be annual.

5.1.2. The audits, at a minimum, shall include a review of significant regulatory and program requirements.

5.1.3. The CP shall ensure an operator is available to operate the RGE, as necessary, during RSO audits.

5.2. The QA program, as it applies to non-human use RGE, shall be audited at least biannually as part of the annual RCSP audit performed by the RSC.

5.2.1. RSC audits shall include, at least one of the following:

5.2.1.1. a review of RGE audits and/or surveys performed by the RSO

5.2.1.2. a review of RGE inspections performed by the ODH and the status of the implementation of corrective action

5.2.1.3. a review of QA policies and procedures

6. RGE Operator Requirements

6.1. Before operating any RGE, the operator shall ensure they are familiar with the RGE's operating characteristics, as well as the purpose and function of protective devices. Any operator who has questions concerning or doubts regarding the operation of a RGE shall immediately seek guidance from their supervisor or other appropriate individual.

6.2. Operators shall report promptly to their CP any condition they believe might lead to or cause a violation of rules or regulations, or unnecessary exposure to radiation. If the condition goes uncorrected the operator shall report the condition to the RSO.

6.3. Operators shall minimize their radiation exposure by:

6.3.1. Reducing the time in the restricted area.

6.3.2. Staying as far away as possible from the radiation beam (e.g., increasing distance).

6.3.3. Wearing any required protective shielding (e.g., lead apron).

6.3.4. Ensuring protective devices, such as interlocks and protective housing or shielding, are functioning as designed for the specific RGE.

6.4. RGE RW and AW who are minors shall:

6.4.1. Obtain written approval from their parents or guardians. (A copy of the form approved by the RSC is included in appendix A.)
6.4.2. Be limited to an occupational dose of 0.5 rem total effective dose equivalent per year.

7. Training Requirements

7.1. Radiation Worker (RW), e.g., operators

7.1.1. Prior to allowing an individual to operate a non-human use RGE, the CP shall ensure the individual has obtained sufficient training to operate the RGE competently and safely. At a minimum this training must include:

7.1.1.1. general radiation safety training

7.1.1.1.1. this training shall include:

7.1.1.1.1.1. possible health effects from exposure to radiation
7.1.1.1.1.2. general precautions and procedures to minimize exposure to radiation
7.1.1.1.1.3. instruction to watch for and report promptly any condition that may constitute or lead to or cause a violation of radiation protection or QA procedures, policies, rules or regulations (and)
7.1.1.1.1.4. applicable warning signage

7.1.1.1.2. the training may be obtained by:

7.1.1.1.2.1. viewing the general radiation protection training film available to be viewed at or signed out from the RSOf
7.1.1.1.2.2. attending the RSOf Basic training course (course session schedule available through the RSOf or on the RSOf website www.uc.edu/radsafety) (or)
7.1.1.1.2.3. the CP (or designee) providing equivalent instruction

7.1.1.2. area specific training - the CP (or designee) shall provide instruction that includes:

7.1.1.2.1. a review of the QA manual
7.1.1.2.2. the location and purpose of the restricted area
7.1.1.2.3. a description and location of RGE(s) in use (and)
7.1.1.2.4. appropriate response to warnings or unusual conditions

7.1.1.3. machine specific training - the CP or an approved machine operator designated by the CP shall provide instruction that includes:

7.1.1.3.1. machine operating instructions
7.1.1.3.2. unit specific safe operating procedures
7.1.1.3.3. location of and documentation requirements for maintenance and use logs (and)
7.1.1.3.4. additional training applicable to the RGE to be operated/used
7.1.1.3.4.1. industrial radiography RGE
   7.1.1.3.4.1.1. bomb detection units
      7.1.1.3.4.1.1.1. record-keeping requirements
      7.1.1.3.4.1.1.2. survey requirements
      7.1.1.3.4.1.1.3. restricted area control requirements, such as ropes, 
                       tapes and signs
   7.1.1.3.4.1.1.2. all other industrial radiographic RGE
      7.1.1.3.4.1.1.2.1. meet the training requirements listed in 3701:1-66- 
                          14(E) of the Ohio Administrative Code.

7.1.1.3.4.2. industrial irradiation device
   7.1.1.3.4.2.1. how to use a survey meter and perform a pre-operational 
                   check
   7.1.1.3.4.2.2. to check for obvious defects prior to each day the RGE is 
                   used
   7.1.1.3.4.2.3. to check control devices and/or alarm systems for high 
                   radiation areas at the beginning of each day the RGE is used

7.1.1.3.4.3. industrial analytical RGE
   7.1.1.3.4.3.1. x-ray diffraction and spectroscopy units
      7.1.1.3.4.3.1.1. view one of the films covering radiation safety for 
                         analytical units, which can be viewed at or signed out 
                         from the RSOf and include:
      7.1.1.3.4.3.1.2. The Double Edged Sword
      7.1.1.3.4.3.1.3. X-ray Diffraction Hazards, Howard Hughes Institute
   7.1.1.3.4.3.2. review machine alignment techniques
   7.1.1.3.4.3.3. discuss interlocks and safety controls and the importance of 
                   using them as intended (e.g., not overriding interlocks)

7.1.1.3.4.4. industrial particle accelerators
   7.1.1.3.4.4.1. meet the training requirements listed in 3701:1-66-17(D)(5) 
                   of the Ohio Administrative Code

7.1.1.3.4.5. all veterinary use RGE
   7.1.1.3.4.5.1. procedures for holding and/or stabilizing the animal
   7.1.1.3.4.5.2. where to stand during a procedure

7.1.1.3.4.6. veterinary fluoroscopy units, including C-arms
   7.1.1.3.4.6.1. review the fluoroscopy training manual
   7.1.1.3.4.6.2. pass the fluoroscopy test

(Revision 3)
7.1.2. **Annually, a competency assessment shall be performed which shall include:**

7.1.2.1.1. an assessment by the CP (or designee) of the individual’s ability to competently and safely operate each pertinent RGE; this assessment may be performed:

7.1.2.1.1.1. by the individual reviewing their skills with the supervisor (or)
7.1.2.1.1.2. the supervisor observing the individual operating the RGE

7.1.3. **New equipment - when new RGE is installed operators shall be trained in the operation by:**

7.1.3.1. the manufacturer
7.1.3.2. an operator or supervisor who was trained by the manufacturer (or)
7.1.3.3. an operator or supervisor who is skilled at using the RGE (e.g., individual trained by an individual who was trained by the manufacturer)

7.1.4. **Changes to operating procedures shall be communicated to operators by:**

7.1.4.1. written and/or verbal communication (e.g., memo to operators, discussion at departmental meeting) (and)
7.1.4.2. addition of revised procedure in the RGE operations manual

7.2. **Ancillary Worker (AW)**

7.2.1. All AWs shall receive:

7.2.1.1. **general radiation protection training**

7.2.1.1.1. the minimum training shall include:

7.2.1.1.1.1. possible health affects from exposure to radiation
7.2.1.1.1.2. general precautions and procedures to minimize the exposure
7.2.1.1.1.3. instruction to watch for and report promptly any condition that may constitute or lead to or cause a violation of radiation protection or QA procedures, policies, rules or regulations (and)
7.2.1.1.1.4. applicable warning signage

7.2.1.1.2. the training may be obtained by:

7.2.1.1.2.1. viewing the general radiation protection training film available to be viewed at or signed out from the Radiation Safety Office
7.2.1.1.2.2. attending the RSOf Basic training course (course session schedule available through the RSOf or on the RSOf website www.uc.edu/radsafety) (or)
7.2.1.1.2.3. the CP (or designee) providing equivalent instruction

7.2.1.2. **area specific training** - the CP (or designee) shall provide instruction that includes:

7.2.1.2.1. the location and purpose of the restricted area (and)
7.2.1.2.2. a description and location of the RGE in use

7.3. Documentation

7.3.1. All training shall be documented and the documentation shall be maintained by the CP. If the individual to be monitored (i.e., issued a dosimeter) copies of the documentation shall be forwarded to the RSO, along with the dosimeter application (i.e., “dosimeter application” = RS form 2.0, which is available on the RSO website www.uc.edu/radsafety).

7.3.1.1. RS form 2.1(x-ray non-human), or its equivalent, may be used to document the training (a copy of RS form 2.1(x-ray non-human) is included in appendix E)

8. Radiation Safety Procedures

8.1. All Non-Human Use RGE

8.1.1. All individuals shall wear their assigned dosimeters as required (see radiation monitoring requirements, section 9).

8.1.2. All individuals must operate the RGE in accordance with manufacturer’s operating procedures or procedures approved by the RSO.

8.1.3. All individuals must abide by the machine operating instructions and the unit specific safe operating procedures.

8.1.4. All RGE must be secured from tampering and unauthorized use.

8.2. Additional Safety Procedures by RGE type:

8.2.1. Industrial radiography RGE

8.2.1.1. bomb detection units

8.2.1.1.1. an operable calibrated survey instrument must be available at each use site

8.2.1.1.2. appropriate barriers must be used to keep out unauthorized individuals and ensure exposure to radiation from the RGE does not exceed regulatory limits

8.2.1.1.3. a readily visible failsafe warning light must be present on or near the source housing that notifies individuals the x-ray is on

8.2.1.1.4. when not in use, the RGE must be secured within a locked area

8.2.1.1.2. all other industrial radiographic RGE

8.2.1.1.2.1. whenever the RGE is energized,

8.2.1.1.2.1.1. two individuals must physically be present at the job site and at least one of the individuals must be an approved operator

8.2.1.1.2.1.2. an approved operator must be physically present to ensure security of high radiation areas or any high radiation area must be protected by interlocked failsafe safety mechanisms
8.2.1.2.2. an operable calibrated survey instrument must be available at each use site

8.2.1.2.3. each operator or individual within the restricted area must wear an appropriate direct reading personnel dosimeter, along with dosimetry described in 9.3 of this manual

8.2.1.2.4. appropriate barriers and signage must be used to warn individuals, keep out unauthorized individuals and ensure exposure to radiation from the RGE does not exceed regulatory limits

8.2.1.2.5. a readily visible failsafe warning light must be present on or near the source housing that notifies individuals the x-ray is on

8.2.1.2.6. a survey must be performed after each use to ensure the beam is “off”

8.2.1.2.7. when not in use, the RGE must be secured within a locked area

8.2.2. Industrial irradiation device

8.2.2.1. non-enclosed system

8.2.2.1.1. a check for obvious defects must be performed prior to each day or shift of RGE use

8.2.2.1.2. a survey meter must be readily available for use by the operator(s) and a pre-use operation check performed of the survey meter prior to the beginning of each day of RGE use and at the beginning of each work shift

8.2.2.1.3. a check of control devices and alarm system to high radiation areas must be performed prior to the beginning of each day of RGE use

8.2.3. Industrial analytical RGE

8.2.3.1. cabinet units

8.2.3.1.1. the cabinet must be interlocked to ensure the beam is shut off if the cabinet is breached

8.2.3.1.2. the cabinet must ensure dose rates outside the cabinet are less than 0.25 millirem per hour at 5 centimeters

8.2.3.1.3. any temporary alteration of safety devices must be approved in advance by the RSO; this approval shall be:

8.2.3.1.3.1. documented and documentation must include the RSO’s signature

8.2.3.1.3.2. posted in the area of the RGE when applied (and)

8.2.3.1.3.3. maintained with RGE records for at least 3 years

8.2.3.1.4. radiation leakage surveys must be performed after non-routine operations, such as maintenance, repair or alignment; the surveys
shall be:

8.2.3.1.4.1. performed by

8.2.3.1.4.1.1. the CP (or)

8.2.3.1.4.1.2. upon request, the RSO

8.2.3.1.4.2. documented and documentation maintained with RGE records for at least 3 years

8.2.3.2. open beam units

8.2.3.2.1. an interlocked failsafe device must be present to prevent entry of any portion of an individual’s body into the primary beam

8.2.3.2.2. all unused ports must be secured in the closed position

8.2.3.2.3. a readily visible failsafe warning light must be present on or near the source housing that notifies individuals the x-ray is on

8.2.3.2.4. any temporary alteration of safety devices must be approved in advance by the RSO; this approval shall be:

8.2.3.2.4.1. documented and documentation must include the RSO’s signature

8.2.3.2.4.2. posted in the area of the RGE when applied (and)

8.2.3.2.4.3. maintained with RGE records for at least 3 years

8.2.3.2.5. radiation leakage surveys shall be performed after non-routine operations, such as maintenance, repair and alignment; the surveys shall be:

8.2.3.2.5.1. performed by

8.2.3.2.5.1.1. the CP (or)

8.2.3.2.5.1.2. upon request, the RSO

8.2.3.2.5.2. documented and documentation maintained with RGE records for at least 3 years

8.2.4. Industrial particle accelerator

8.2.4.1. an interlocked failsafe device must be present to prevent entry of workers into high radiation areas

8.2.4.2. safety instrumentation, readouts and controls must be clearly labeled

8.2.4.3. an audible and visual warning device, which activates for at least 15 seconds, must be present in each area that may become a high radiation area during operation of the industrial particle accelerator

8.2.4.4. an operable and calibrated survey meter capable of reading from 2 millirem per hour to 100 millirem per hour shall be:

8.2.4.4.1. readily available for use by the operator (and)
8.2.4.4.2. checked for operability at the beginning of each day the accelerator is energized

8.2.5. Veterinary RGE - general

8.2.5.1. individuals whose presence during an exam is not required shall not stay as an observer unless required as a part of the clinical learning process

8.2.5.2. reasonable efforts shall be made to avoid holding animals during radiologic examinations; immobilization devices and restraint devices shall be used whenever possible to avoid holding the animal being x-rayed

8.2.5.3. individuals in the restricted area (i.e., within 6 feet of the x-ray tube) shall minimize their radiation exposure by:

8.2.5.3.1. minimizing the time spent in the room when the RGE is on

8.2.5.3.2. staying as far away as possible from the radiation beam (e.g., increasing distance)

8.2.5.3.3. wearing appropriate protective shielding

8.2.5.3.3.1. aprons of at least 0.5 mm lead equivalence in front shall be worn by all individuals in the restricted area

8.2.5.3.3.2. gloves of at least 0.25 mm lead equivalence shall be worn by all individuals whose hands are in or close to the "primary beam" because of the need to hold an animal

8.2.5.3.3.3. collar shields (i.e., thyroid shields) of at least 0.5 mm lead equivalence shall be worn by individuals who risk significant exposure to the head and neck (e.g., within a few feet of an energized fluoroscopic unit or C-arm)

8.2.5.4. the holding of film cassettes shall be minimized; if a film cassette must be held then lead-lined gloves shall be worn

8.2.6. Veterinary RGE - fluoroscopic, including C-arms

8.2.6.1. individuals who must be in the room during a procedure shall stand as far away from the tube as practical

8.2.6.2. individuals who must work in the radiographic room or within 6 feet of the RGE when activated shall wear protective apparel,

8.2.6.2.1. under no circumstances shall less than a lead apron, 0.5 mm lead equivalent, be worn

8.2.6.2.2. lead gloves shall be worn when the hands must be placed in the primary x-ray beam

8.2.6.2.3. lead thyroid shields, lead eyeglasses and protective barriers should be used as applicable

8.2.6.3. portable protective shields shall be used when possible

8.2.6.4. for permanent installations, a table apron shall be installed and used unless
it interferes with the procedure or compromises a sterile field

8.2.6.5. avoid unnecessary fluoroscopic exposure
  8.2.6.5.1. use image freeze capabilities when possible
  8.2.6.5.2. utilize pulsed fluoroscopy techniques if the machine is so equipped
  8.2.6.5.3. conduct examinations with as little fluoroscopy time as possible

8.3. Additional Requirements for Specific Workers

8.3.1. Pregnant worker:
  8.3.1.1. pregnant individuals are not considered declared pregnant workers until they declare the pregnancy in writing to the RSO
  8.3.1.2. the declaration must include the following information; RS form 33 (copy included in appendix F) may be used to declare a pregnancy
    8.3.1.2.1. the name of the individual
    8.3.1.2.2. the date of declaration
    8.3.1.2.3. the type of radiation exposed to in the workplace (and)
    8.3.1.2.4. the estimated date of conception
  8.3.1.3. the radiation dose limit to the fetus/embryo of a declared pregnant worker is 0.500 rem total effective dose equivalent over the term of the pregnancy
  8.3.1.4. declared pregnant workers may request a meeting with the RSO and during this meeting the RSO will:
    8.3.1.4.1. review the individual's exposure record
      8.3.1.4.1.1. if the record indicates an exposure to the embryo/fetus greater than 500 millirem may occur, the RSO will initiate steps to move the individual to a position of lower radiation exposure and one that the exposure can be maintained less than 500 millirem
    8.3.1.4.2. review procedures to minimize exposure to the embryo/fetus (and)
    8.3.1.4.3. answer any questions the individual may have
  8.3.1.5. pregnant individuals may continue to operate and work around RGE unless deemed otherwise by the RSO
  8.3.1.6. pregnant individuals shall not enter or be in a restricted area unless they are wearing a lead protective apron
    8.3.1.6.1. pregnant individuals should consider wearing the wrap-around type apron whenever possible as they provide the best protection
  8.3.1.7. pregnant individuals should review NRC regulatory guide 8.13; this guide
    8.3.1.7.1. covers the effects of radiation to the embryo and fetus
    8.3.1.7.2. is available on the NRC website (www.nrc.gov) or from the RSO

(Revision 3)
8.3.2.  **Minor**

8.3.2.1.  minors shall have written authorization from their parent(s) or guardian(s) authorizing their potential exposure to radiation (a copy of the form approved by the RSC for this purpose is included in appendix A)

8.3.2.2.  minors, who are RWs or AWs, are limited to a radiation dose that is 10% of the limits for other workers

9.  **Radiation Monitoring Requirements**

9.1.  **Exposure Limits**

9.1.1.  In accordance with regulations at a minimum dosimetry shall be worn by all personnel who may receive greater than 10% of the annual limit. However, under the University of Cincinnati Radiation Control and Safety Program additional dosimetry may be required as outlined in this manual, or as deemed necessary by the RSC.

9.1.2.  Annual limits are:

9.1.2.1.  Whole body effective dose - 5 rem

9.1.2.2.  Any individual organ or tissue, other than the lens of the eye - 50 rem

9.1.2.3.  Lens of the eye - 15 rem

9.1.2.4.  Skin - 50 rem

9.1.2.5.  Extremity - 50 rem

9.2.  **General Dosimetry Requirements**

9.2.1.  Dosimetry used for individuals exposed to RGE shall be able to detect photon radiation.

9.2.2.  Dosimetry shall be provided by and applied for through the RSOf.

9.3.  **Specific Dosimetry Requirements by RGE**

9.3.1.  **Industrial radiographic RGE**

9.3.1.1.  one dosimeter at waist or collar, whichever location would result in the highest exposure

9.3.2.  **Industrial irradiation device**

9.3.2.1.  one dosimeter at waist or collar, whichever location would result in the highest exposure

9.3.3.  **Industrial analytical RGE**

9.3.3.1.  electron microscopes

9.3.3.1.1.  no dosimetry required

9.3.3.2.  diffraction and spectrometry RGE

9.3.3.2.1.  one dosimeter at waist or collar, whichever location would result in the highest exposure

(Revision 3)
9.3.4.  **Industrial particle accelerator**

9.3.4.1.  one dosimeter at waist or collar, whichever location would result in the highest exposure

9.3.5.  **Veterinary use RGE**

9.3.5.1.  **diagnostic units**

9.3.5.1.1.  one dosimeter at the collar, outside any lead apron worn

9.3.5.2.  **mammography units**

9.3.5.2.1.  if behind area shielding

9.3.5.2.1.1.  one dosimeter at the collar, outside any lead apron worn

9.3.5.2.2.  if not behind area shielding

9.3.5.2.2.1.  two dosimeters, as labeled.

9.3.5.2.2.1.1.  one dosimeter outside the apron, at the collar (labeled neck or collar)

9.3.5.2.2.1.2.  second dosimeter under the apron, at waist level (labeled waist or chest)

9.3.5.2.2.2.  if an individual’s hands are frequently (e.g., weekly) in the x-ray beam hand dosimetry is also required

9.3.5.2.2.2.1.  a ring dosimeter shall be worn on each hand frequently in the x-ray beam

9.3.5.3.  **fluoroscopy units, including C-arms**

9.3.5.3.1.  two dosimeters, as labeled

9.3.5.3.1.1.  one dosimeter outside the apron, at the collar (labeled neck or collar)

9.3.5.3.1.2.  second dosimeter under the apron, at waist level (labeled waist or chest)

9.3.5.4.  **hand dosimetry**

9.3.5.4.1.  if an individual’s hands are frequently (e.g., weekly) in the x-ray beam hand dosimetry is also required

9.3.5.4.1.1.  a ring dosimeter shall be worn on each hand frequently in the x-ray beam

9.4.  **Specific Dosimetry for Specific Types of Workers**

9.4.1.  **Dosimetry for ancillary workers (AW)**

9.4.1.1.  dosimetry is required if the AW is frequently (i.e., weekly or 10 hours/month with x-ray on) in the restricted area

9.4.1.2.  dosimetry requirements for frequently exposed AW are equivalent to that for RW

(Revision 3)
9.4.2. **Dosimetry for declared pregnant workers**

9.4.2.1. declared pregnant workers who frequent the restricted area shall be assigned two dosimeters and shall wear the dosimeter at the location indicated on the label.

9.4.2.1.1. if lead apron is worn

9.4.2.1.1.1. one dosimeter worn outside the apron, at the collar (labeled neck or collar)

9.4.2.1.1.2. second dosimeter worn under the apron, at waist level (labeled waist or chest)

9.4.2.1.2. if lead apron is not worn

9.4.2.1.2.1. one dosimeter worn at waist level

9.5. **Care of Dosimetry**

9.5.1. Assigned personnel dosimetry must be worn whenever there is a potential for occupational radiation exposure.

9.5.2. Personnel dosimeters issued by the University of Cincinnati are limited for use to monitor radiation exposure from radiation sources covered by the RCSP.

9.5.3. Personnel dosimeters are for use by a single individual and shall not be shared, reassigned or discarded.

9.5.4. Personnel dosimetry does not provide protection from radiation; it only provides an "after the fact" assessment of radiation to which it (and presumably the wearer) was exposed.

9.5.5. Dosimeters shall be worn at the position appropriate for the work being performed (see personnel monitoring, section 9.3).

9.5.6. Radiation dosimeters are very sensitive to environmental conditions such as heat, light and moisture. Dosimeters should be used properly, should not be taken home or stored in cars or on window sills.

9.5.7. Radiation dosimeters shall be stored in low background areas (e.g., offices, non-RGE area) when not being worn.

9.5.8. Radiation dosimeters are for occupational exposure only and are NOT to be worn during personal medical or dental procedures.

9.5.9. Radiation dosimeters are to be exchanged in a timely manner (see section 9.7).

9.5.10. If a dosimeter is lost, damaged or left in an area of high radiation exposure the RSOft must be notified immediately (see section 9.8).

9.6. **Dosimetry Analysis and Reports**

9.6.1. Personnel dosimetry must be returned in a timely fashion to the RSOf for analysis per section 9.7 of this manual.

9.6.2. Dosimetry analysis reports are sent by the vendor to the RSOf. Copies are forwarded as follows:
9.6.2.1. **monthly series analysis reports:**

9.6.2.1.1. are forwarded to CPs who request, in writing, copies of the monthly report

9.6.2.2. **individual analysis reports:**

9.6.2.2.1. monitored personnel are issued copies of the previous year's exposure as an individualized report during the second quarter of the year (generally with the April or May dosimeters)

9.6.2.2.2. monitored personnel are issued copies of individual dosimetry reports upon request

9.6.2.2.2.1. requests must be made to the RSOf

9.6.2.2.2.1.1. reports will be provided within 30 days after the request is made or within 30 days after receipt of the data for the last dosimeter, whichever is later

9.7. **Dosimeter Exchange Procedures**

9.7.1. To prevent unmonitored exposure, before used dosimeters are returned, new dosimeters are picked up.

9.7.1.1. all dosimeters shall be picked up in the RSOf during the first 3 working days of the month

9.7.1.2. all dosimeters shall be returned to the RSOf during the first 10 days of the month

9.7.1.3. all late returned and non-returned dosimeters require completion of a radiation dosimetry follow-up form

9.7.1.3.1. the RSOf shall issue the form upon receipt of a report indicating a dosimeter was not returned as required

9.8. **Lost, Late Return or Damaged Dosimeters**

9.8.1. Lost or damaged dosimeters shall be reported immediately to the RSOf.

9.8.2. Temporary replacement dosimetry will be issued if dosimeters are lost or damaged prior to the return exchange.

9.8.3. A radiation dosimetry follow-up is required to be completed for all lost, late return and damaged dosimeters.

9.8.3.1. the RSOf shall issue the form upon receipt of a report indicating a dosimeter was not returned or was damaged

10. **ALARA and Overexposure Investigations and Notifications**

10.1. **ALARA Investigations and Notification**

10.1.1. The basic rule for ALARA investigations is ALARA investigations shall be performed when individuals exceed 10% and 30% of the applicable regulatory limits for occupationally exposed individuals. However, to ensure timely ALARA review and implementation of corrective action, reviews are performed

(Revision 3)
on a “quarterly fraction”, which is the annual limit divided by 4. The 10% and 30% is applied to the quarterly fraction. The current investigational level doses are listed in appendix B.

10.1.1.1. **ALARA I** (greater than 10% but less than 30% of regulatory limit)

10.1.1.1.1. the RSO, or designee will:

10.1.1.1.1.1. provide a written report of the exposure to the individual

10.1.1.1.1.2. request the individual submit an explanation of radiation exposure during the time period in question

10.1.1.1.1.3. review the exposure and the explanation, then investigate if deemed necessary

10.1.1.1.1.4. report the results to the RSC at the next meeting

10.1.1.2. **ALARA II** (greater than or equal to 30% of regulatory limit)

10.1.1.2.1. the RSO, or designee will:

10.1.1.2.1.1. provide a written report of the exposure to the individual

10.1.1.2.1.2. request the individual submit an explanation of radiation exposure during the time period in question

10.1.1.2.1.3. investigate the cause(s) of the exposure

10.1.1.2.1.4. implement corrective action as deemed necessary

10.1.1.2.1.5. report the results to the RSC at the next meeting

10.2. **Overexposure Investigation and Notification**

10.2.1. When an exposure in excess of regulatory limits is suspected the RSO shall be notified.

10.2.2. The RSO, or designee shall:

10.2.2.1. investigate the possible overexposure

10.2.2.2. notify the Director of the ODH within 30 days; the notification shall:

10.2.2.2.1. describe the extent of the exposure and include:

10.2.2.2.1.1. an estimation of the individual's dose

10.2.2.2.1.2. the levels of radiation involved

10.2.2.2.1.3. the cause of the exposure

10.2.2.2.1.4. any corrective action taken or planned to assure against recurrence

10.2.2.2.2. and on a separate page list:

10.2.2.2.2.1. the individual’s name

10.2.2.2.2.2. social security number

10.2.2.2.2.3. date of birth

(Revision 3)
10.2.2.3. provide written notification to the individual. The written notification shall include:

10.2.2.3.1. nature and extent of the exposure

10.2.2.3.2. the following statement

"This report is furnished to you under provisions of rule 3701:1-38-10 of the administrative code. You should preserve this report for future reference."

11. Postings and Signs

11.1. All doors to the room where RGE is stored or housed shall be posted with a sign that contains the radiation trefoil and states “caution - equipment in this room may produce radiation when energized” or equivalent.

11.2. Each room where RGE is stored or housed shall post in conspicuous locations the following (a sample posting is included in appendix C).

11.2.1. ODH notice to employees.

11.2.2. Location(s) where this manual, applicable audit(s) and applicable inspection report(s) are maintained.

11.2.3. Location(s) where applicable rules and regulations are maintained. (and)

11.2.4. Method for contacting the RSO.

11.3. Each non-human use RGE shall have a label near any switch that energies the RGE (e.g., the x-ray tube) that states "caution-this equipment produces radiation when energized" or equivalent.

11.4. Each industrial radiographic RGE shall have a label on or near the source housing that states “caution – high intensity x-ray beam”.

11.5. Each open beam industrial analytical RGE shall have a label on or near the source housing that states “caution – high intensity x-ray beam”.

12. Incident Action

12.1. Any problems with the operation of RGE shall be reported immediately to the CP.

12.1.1. Any problems reported to the CP that are not corrected in a reasonable amount of time shall be reported to the RSO.

12.2. Any problems with the operation of RGE that an individual suspects may result in an overexposure to personnel shall be reported immediately to the CP and RSO.

12.2.1. The RSO, in conjunction with the CP, shall investigate the problem and implement corrective action.

12.3. Any suspected or known overexposure shall be immediately reported to the RSO.

12.3.1. The RSO shall investigate the overexposure and submit required reports to the ODH in accordance with section 10.2 of this manual.

(Revision 3)
13. Intervals and Procedures for Evaluation of RGE

13.1. All industrial analytical RGE must be surveyed by the CP or arrangements made for a survey by the RSOf.

13.1.1. Surveys must be performed:

13.1.1.1. following any change in the initial system arrangement or type of local components
13.1.1.2. following any maintenance requiring disassembly or removal of a local component
13.1.1.3. during the performance of maintenance or alignment procedures requiring activation of the RGE
13.1.1.4. any time a visual inspection of local components reveal an abnormal condition

13.1.2. Surveys must be performed with an appropriate calibrated survey meter.

13.1.3. The surveys results must be documented.

13.1.3.1. the documentation must be readily available for inspection by the RSC, RSO or ODH
13.1.3.2. the survey results must be maintained with RGE records for 3 years

13.2. All operable non-human use RGE shall be surveyed by the RSOf upon installation and by the CP in accordance with the following schedule thereafter, unless the RSO determines more frequent surveys are required.

13.2.1.1. industrial radiography:
13.2.1.1.1. bomb detection units – annually
13.2.1.1.2. all others – quarterly

13.2.1.2. industrial irradiation device - quarterly

13.2.1.3. industrial analytical:
13.2.1.3.1. electron microscopes – annually
13.2.1.3.2. all others - semiannually

13.2.1.4. industrial particle accelerator – annually
13.2.1.5. veterinary RGE – annually

13.2.2. RSOF surveys, at a minimum, shall include a radiation survey of the RGE and a review of RGE safety features, as required by regulations.

13.2.3. The CP must ensure an operator is available to operate the RGE, as necessary, during RSOF surveys.

13.3. Each CP for veterinary fluoroscopy RGE shall arrange for a radiation expert (e.g. medical physicist) to evaluate the RGE to ensure compliance with machine specifications regulations.
13.3.1. These evaluations shall be performed prior to first use and annually thereafter.

13.3.2. These evaluations shall include:
   13.3.2.1. tests to determine compliance with spot film device limits
   13.3.2.2. evaluation of fluoroscopic image quality
   13.3.2.3. tests to determine entrance exposure rates

13.3.3. The results of the evaluation shall be documented.
   13.3.3.1. the documentation must be readily available for inspection by the RSC, RSO or ODH
   13.3.3.2. the documentation must be maintained with RGE records for 3 years

13.4. All non-human use RGE shall be evaluated by the ODH in accordance with the inspection schedule of the ODH.
   13.4.1. The CP must ensure an operator is available to operate the RGE, as necessary, during ODH inspections.
   13.4.2. In accordance with Ohio Revised Code, the ODH may inspect RGE without advanced notice. If advanced notice is provided to the RSO, the RSO will inform the affected CP(s).
   13.4.3. The CP is responsible for the cost associated with any fee assessed by the ODH for an inspection of their RGE.

14. Quality Control (QC) Tests
   14.1. No QC tests are required for non-human use RGE.

15. RGE Logs and Operation Manuals
   15.1. Logs - each RGE will have a separate maintenance log and use log.
      15.1.1. Maintenance log - the maintenance log shall include:
         15.1.1.1. identification of the piece of equipment
         15.1.1.2. incidents and actions
         15.1.1.3. maintenance performed
         15.1.1.4. repair information
         15.1.1.5. incident summaries
      15.1.2. Use log - the use log shall include:
         15.1.2.1. RGE identification
         15.1.2.2. date of operation
         15.1.2.3. operator’s name
         15.1.2.4. brief description of use
         15.1.2.5. for fluoroscopic units, including C-arms
15.1.2.5.1. fluoroscopy on time
15.1.2.6. for industrial radiography RGE and industrial irradiation device
  15.1.2.6.1. the kVp
  15.1.2.6.2. the mA
  15.1.2.6.3. the on time
15.1.2.7. for industrial radiography RGE and industrial irradiation device used at temporary locations
  15.1.2.7.1. date the RGE is removed from storage
  15.1.2.7.2. date the RGE is returned to storage
  15.1.2.7.3. result of any surveys performed

15.2. Operation Manual - each RGE shall have an operation manual which includes, at a minimum:
  15.2.1. a list of operators
  15.2.2. a copy of this manual (and)
  15.2.3. machine operating procedures and unit specific safe operating procedures
    15.2.3.1. for industrial radiography RGE and industrial irradiation device the procedure(s) must also include:
      15.2.3.1.1. emergency procedures
      15.2.3.1.2. methods and occasions for conducting radiation surveys
      15.2.3.1.3. methods for controlling access to radiation areas
      15.2.3.1.4. methods for securing the RGE from unauthorized use
15.3. RGE maintenance logs, use logs and operation manuals shall be:
  15.3.1. maintained in the area (e.g., room) where the RGE is housed
  15.3.2. readily available for use by the operator(s)
  15.3.3. available for inspection by the RSC, RSO or ODH

16. RGE Acquisition, Inventory, and Disposal or Transfer

16.1. Acquisition
  16.1.1. The CP (or individual who will be the CP upon RGE receipt) is responsible for reporting the anticipated acquisition of RGE to the RSO.
    16.1.1.1. new purchases - reporting shall be within 30 days of order placement, and at least 30 days prior to the anticipated date of receipt of the RGE
    16.1.1.1.1. additional notification time is required for analytical particle accelerators and all veterinary (radiographic and fluoroscopic) RGE
    16.1.1.1.1. the notification must be sufficient for the RSO to review, modify if necessary, and approve any facility design associated
with the RGE purchase

16.1.1.1.1.2. facility design reviews involve a minimum of 30 days (see section 17)

16.1.2. replacements - reporting shall be within 30 days of order placement and at least 5 working days prior to the anticipated date of receipt of the new RGE

16.1.3. loaners - reporting shall be as soon as possible, but within 5 working days prior to the anticipated date of receipt of the loaner RGE

16.1.2. Information provided to the RSO shall include, but is not limited to:

16.1.2.1. CP's name
16.1.2.2. department
16.1.2.3. machine's application (e.g., veterinary radiographic, industrial radiographic, electron microscope)
16.1.2.4. description of machine (make, model)
16.1.2.5. number of tubes
16.1.2.6. expected delivery date
16.1.2.7. planned location

16.1.3. The RSO will ensure the state of Ohio registration allows for the acquisition. If the acquisition will result in the number of tubes exceeding the number listed on the registration, the RSO shall amend the registration.

16.1.4. Upon install and prior to use, the CP shall arrange for and ensure:

16.1.4.1. acceptance testing is performed by the manufacturer and/or installer

16.1.4.1.1. the CP shall provide the RSO a copy of the manufacturer's and/or installer's acceptance testing

16.1.4.2. a post installation survey is performed by the RSO

16.2. Inventory

16.2.1. The RSO shall maintain an inventory of RGE.

16.2.2. CPs shall review the inventory quarterly.

16.2.2.1. by the 15th day of the second month of each calendar quarter (i.e., February, May, August, November), the RSO shall distribute copies of the current inventory to appropriate CP

16.2.2.2. each CP (or designee) shall review all information included in the inventory report, indicate changes or corrections, then sign and return the inventory to the RSO by the end of the second month of each calendar quarter

16.2.2.3. the RSO will review the results of the quarterly submissions and ensure the inventory is in accordance with the applicable registration; if
necessary, the RSO shall amend the registration

16.3. Disposal or Transfer

16.3.1. At least 5 working days prior to disposal or transfer of RGE, the CP shall inform the RSO about the disposal or transfer.

16.3.2. Information provided to the RSO shall include:
   16.3.2.1. name and location (e.g., address of the facility) where the RGE will be disposed or transferred
   16.3.2.2. the make, model and serial number of the RGE being transferred or disposed
   16.3.2.3. the anticipated date of disposal or transfer

16.3.3. A form that can be used for disposal or transfer of RGE is included in appendix D.

16.4. From the information provided, the RSO shall provide any necessary quarterly reports to the ODH covering the installation, disposal or transfer of RGE.

17. RGE Room Construction - New or Remodeled

17.1. Prior to construction of a new RGE room or remodeling of an existing RGE room

17.1.1. The CP (or individual who will be the CP upon RGE receipt) must inform the RSO regarding new construction or remodeling. The name of the project manager shall be provided to the RSO at this time.

17.1.2. The RSO shall perform shielding analysis of the design to ensure the room meets the requirements for exposure to members of the public.

17.1.3. Any design documents shall require acceptance approval by the RSO prior to start of construction.

17.2. During construction:

17.2.1. The project manager shall keep the RSO informed of the status of the project and obtain approval for any changes that may effect shielding.

17.2.2. The RSO shall review, as necessary, the construction to ensure shielding is being installed in accordance with the design specifications.

17.3. After construction, but prior to use:

17.3.1. The RSO shall perform all necessary surveys to ensure the room meets the requirements for exposure to members of the public. (and)

17.3.2. If applicable, room safety feature evaluation testing (e.g., interlocks, remote visuals).
Appendix A
Minor Forms
## Associated Radiation Safety Forms

<table>
<thead>
<tr>
<th>Form</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS FORM 37A</td>
<td>RELEASE OF LIABILITY AND WAIVER CLAIM FOR MINORS</td>
</tr>
<tr>
<td>RS FORM 37B</td>
<td>SUPERVISOR’S STATEMENT FOR MINORS</td>
</tr>
</tbody>
</table>

Forms Available on Radiation Safety Office Website

[www.uc.edu/radsafety](http://www.uc.edu/radsafety)
Appendix B

ALARA Investigational Levels
### ALARA Investigational Levels

<table>
<thead>
<tr>
<th>AREA</th>
<th>ALARA I (10%) LEVEL</th>
<th>ALARA II (30%) LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Dose*</td>
<td>125 mrem</td>
<td>375 mrem</td>
</tr>
<tr>
<td>Any organ, other than eye</td>
<td>1250 mrem</td>
<td>3750 mrem</td>
</tr>
<tr>
<td>Eye</td>
<td>375 mrem</td>
<td>1125 mrem</td>
</tr>
<tr>
<td>Skin</td>
<td>1250 mrem</td>
<td>3750 mrem</td>
</tr>
<tr>
<td>Extremity</td>
<td>1250 mrem</td>
<td>3750 mrem</td>
</tr>
</tbody>
</table>

*Effective dose based on “Webster Formulas”. If two dosimeters are worn the effective dose = 0.04 (collar dosimeter reading) + 1.5 (waist dosimeter reading). If one dosimeter is worn the effective dose = 0.3 (whole body or collar dosimeter reading)
Appendix C
Sample Posting
The University of Cincinnati
Radiation Control and Safety Program (RCSP)

The RCSP covers licensed sources of radioactive material used and registered radiation generating equipment (RGE) used or possessed at University of Cincinnati campuses (East, West, RWC, OCAS, GRI and Center Hill), Cincinnati Children’s Hospital Medical Center and associated Ohio outpatient clinics, and Cincinnati Shriners Hospital for Children. The radioactive material medical broad scope license (license# 02110310010), the source material license (license# 01129310010), the RGE registrations and the license/registration inspection reports may be examined at the Radiation Safety Office (RSOf). Copies of policies and procedures are available at the RSOf and are posted on the RSOf website www.uc.edu/radsafety. Current applicable rules are posted on the Ohio Department of Health (ODH) website www.odh.state.oh.us.

University of Cincinnati Radiation Safety Office
(513) 558-4110, ML 0591
Office-Hours 8:00 am – 5:00 pm standard university business days

OHIO DEPARTMENT OF HEALTH
NOTICE TO EMPLOYEES

In radiation protection rules adopted under Chapter 3748 of the Ohio Revised Code, the Ohio Department of Health has established standards for your protection from radiation sources which are required to be licensed/registered with the Ohio Department of Health (ODH).

YOUR EMPLOYER’S RESPONSIBILITY

Your employer is required to:
1) Inform you of the occurrence of radiation or radiation sources and the presence of a restricted area;
2) Instruct you in the safety problems associated with exposure to radiation and in precautions or procedures to minimize exposure to radiation; instruct you in the applicable laws for the protection of personnel from exposure to radiation;
3) Post or otherwise make available to you a copy of the operating procedures applicable to work under the license/registration;
4) Apply the radiation protection rules to all work involving licensed/registered sources of radiation; and
5) Post notices of violation involving radiological working conditions.

ODH inspectors want to speak or talk with you if you are worried about radiation safety or have other safety concerns about licensed/registered activities. Your employer may not prevent you from talking with an inspector. ODH will make all reasonable efforts to protect your identity where appropriate and possible.

If you believe your employer has not corrected violations involving radiological working conditions, you may request an inspection. Your request should be addressed to the Ohio Department of Health, Bureau of Radiation Protection, and must describe the alleged violation in detail. It must be signed by you or your representative.

DISCRIMINATION

Your employer is prohibited from firing or otherwise discriminating against you for bringing safety concerns to the attention of your employer or ODH. You may not be fired or discriminated against because you:
- ask ODH to enforce the law against your employer;
- refuse to engage in activities that violate the law;
- provide information or are about to provide information to ODH or your employer about violations of laws or safety concerns;
- are about to ask for, or testify, help, or take part in an ODH or other state proceeding.

The ODH will investigate each alleged violation of harassment, intimidation, or discrimination.

CONTACT INFORMATION

Bureau of Radiation Protection
Ohio Department of Health
246 North High Street
Post Office Box 118
Columbus, Ohio 43216-0118

Radioactive Materials
Phone 614-644-2727
Fax 614-466-0381

Radiologic Technology Section (X-ray)
Phone 614-644-2727
Fax 614-466-0381

POSTING REQUIREMENTS

Copies of this notice must be posted in a sufficient number of places in every facility where employees are engaged in activities subject to the radiation protection rules of the Ohio Administrative Code to permit employees working in or frequenting any portion of a restricted area to observe a copy on their way to or from their place of employment. OSHA requires 29 CFR 24 Appendix A “Energy Reorganization Act” Poster be displayed when applicable.

ODH 4786.32 (Rev. 7/04)

If you have questions or concerns contact the Radiation Safety Officer or the certified radiation expert (CRE).
Radiation Safety Officer – Victoria Morris, CHP (513) 558-4110
CRE for CCHMC and SHC RGE – Stephen Thomas, PhD (513) 558-5476

CRE for CCHMC and SHC RGE – Stephen Thomas, PhD (513) 558-5476
Appendix D
Transfer or Disposal Form
Notice of Transfer or Disposal of Radiation Generating Equipment (X-ray)

[ ] TRANSFER [ ] DISPOSAL

UC Contact Person:
Name________________________________________________________
Mail Location:________________________________________________
Phone Number:_______________________________________________

Recipient of Equipment:
Name:_______________________________________________________
Address:_____________________________________________________

Equipment Identification:
Manufacturer:________________________________________________
Model No.:___________________________________________________
Serial No.:____________________________________________________
Last Location (Bldg. And Room#):_______________________________
Date of Transfer or Disposal:___________________________________

[] Terminate Contact Person Status, all x-ray units have been disposed of, transferred, or sold, or:____________________________

[] Retain Contact Person Status, I still possess other devices:

This information is furnished in accordance with Rule 3701:1-38-03(H) of the Ohio Administrative Code and UC Radiation Control and Safety Program.

_______________________________________________________
Signed                                                      Date

Return this form to:  Radiation Safety Office
Mail Location 0591
513/558-4110 – FAX: 513/558-9905
Appendix E
RS FORM 2.1 (x-ray non-human)
Radiation Safety Training for Non-Human Use RGE

Worker's Name ___________________________________  SS#________________________________ 
Department________________ Division________________ CP/Supervisor________________________ 

The above individual will be a [ ]Radiation Worker (RGE Operator)  [ ]Ancillary Worker

General Radiation Safety Training covering possible health effects from exposure to radiation, general precautions and procedures for minimizing exposure to radiation, instruction to watch for and report promptly any condition that may lead to a violation and signage was provided by:

[ ]viewing University of Cincinnati’s General Radiation Safety video on ______________(date) ______________
[ ]attending University of Cincinnati’s Basic Radiation Safety Training on ______________(date) ______________
[ ]other (as described) ______________

Area Specific Training

[ ] review of QA manual
[ ] description and location of RGE(s) in use
[ ] location of state notification (green form)

Provided by _______________________/_____________________________ on ______________________ ______________
(printed name of trainer)/(signature of trainer)     (date) ______________

Machine-Specific Training [ ] N/A - an ancillary worker  [ ]provided instruction on items checked below

Additional for Bomb Detection Unit
[ ] operating procedure
[ ] safety operating procedure
[ ] maintenance and use logs

Additional for X-ray Diffraction and Spectroscopy RGE
[ ] record-keeping requirements
[ ] survey requirements
[ ] restricted area control requirements

viewed ( [ ]Double Edged Sword or [ ]X-ray Diffraction Hazards) on ______________________ ______________
(date) ______________

[ ] machine alignment technique(s)
[ ] interlock(s) & safety control(s) and importance of using as intended

Additional for All Veterinary Units
[ ] animal holding procedure(s)
[ ] lead apron/thyroid shield/gloves
[ ] where to stand during a procedure

Additional for Veterinary Fluoroscopy Unit
reviewed fluoroscopy training manual ______________  & test score ______________
(date) ______________

Additional for Industrial Radiographic and Particle Accelerators
[ ] regulatory required training, documentation attached

Provided by _______________________/_____________________________ on ______________________ ______________
(printed name of trainer)/(signature of trainer)     (date) ______________

Training Certification

[ ] Radiation worker certification: As an operator of RGE, I verify that I have received the training noted above, have read and understand the Quality Assurance and Radiation Protection Manual for Non-Human Use Radiation Generating Equipment, and have received machine operation and safe operating procedure training for each RGE I will operate and/or will insist on training be provided before operating new RGE.

[ ] Ancillary worker certification: As an individual who will work in a restricted area for non-human use RGE, I verify that I have received the training noted above.

Signature of Worker ___________________________________________ Date ____________________ 

RS form 2.1(x-ray non-human) 2/04
Appendix F

RS FORM 33 – Declaration of Pregnancy

(See Radiation Safety Office website www.uc.edu/radsafety)