

(Rev. April 2019)

# **BONE DENSITOMETER SAFETY MANUAL**

**The University of Texas at Tyler  
Office of Environmental Health and Safety**

## EMERGENCY TELEPHONE NUMBERS

### LIFE-THREATENING EMERGENCIES

UTT POLICE from UTT phone..... 7300

POLICE from cell phone.....903-566-7300

### ROUTINE OFFICE HOURS

RADIATION SAFETY ..... 903-877-7902 or 903-530-6465 or 903-566-6168

### AFTER HOURS

RADIATION SAFETY OFFICER ..... 903-566-7300

### Routine Contact

In case of incidents involving unusual radiation exposure, all personnel are required to notify the Radiation Safety Officer immediately.

After 5:00 pm and on weekends, UTT Police will assist in contacting Radiation Safety Personnel.

Radiation Safety Officer

Tim Ochran

Occupational Health

Dr. Neil Dong

UTT Police

Police Dispatch

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## I. OVERVIEW

This manual reviews the standards established by the state and the federal governments for protection against ionizing radiation resulting from the use of bone densitometer radiation machines.

The requirements are designed to control the receipt, possession, use, and transfer of radiation machines by any person with the end result limiting the total dose to an individual, including doses resulting from all sources of radiation (other than background radiation), does not exceed the standards for protection against radiation prescribed in this manual. However, nothing in this manual shall be construed as limiting actions that may be necessary to protect health and safety in an emergency. A person who receives, possesses, uses, owns, or acquires radiation machines at University of Texas at Tyler (UTT) is subject to the requirements of the Texas Administrative Code.

## II. SCOPE

Except as specifically provided in other sections of this chapter, this manual applies to persons who receive, possess, use, or transfer bone densitometer radiation machines. The dose limits in this manual do not apply to doses due to background radiation, to exposure of patients to radiation for the purpose of medical diagnosis or therapy, to exposure from individuals administered radioactive material or to voluntary participation in medical research programs. However, no radiation may be deliberately applied to human beings except by or under the supervision of an individual authorized by and licensed in accordance with Texas' statutes to engage in the healing arts. Medical research programs must also be approved by the Institutional Review Board (IRB) and documented with the Texas Department of State Health Services (TDSHS).

UTT researchers and employees who receive, possess, use, and transfer a bone densitometer must comply with the requirements of Texas Administrative Code (25TAC)

- **§289.203** Notices, Instructions, and Reports To Workers; Inspections
- **§289.204** Fees for Certificates of Registration, Radioactive Material Licenses, Emergency Planning and Implementation, and Other Regulatory Services
- **§289.226** Registration of Radiation Machine Use and Services
- **§289.227** Use of Radiation Machines in the Healing Arts
- **§289.231** General Provisions and Standards for Protection Against Machine-Produced Radiation ,and

## III. DEFINITIONS AND ACRONYMS

ALARA	<p>The acronym meaning <b><i>As Low As Reasonable Achievable</i></b>. It is a requirement in the regulations, meaning all facilities possessing radioactive materials or equipment must have a formal ALARA program. It may be defined as a professional standard of excellence, and is practiced by keeping all doses, releases, contamination and other risks as low as reasonably achievable utilizing engineering and administrative controls.</p> <p>Three primary means of eliminating or reducing radiation exposures are time, distance, and shielding.</p>
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	<p><b>Time:</b></p> <p>Minimize the time that radioactive materials are handled. Since the amount of exposure occurs as a function of duration of exposure, less time means less exposure. This may be achieved by conducting “dry runs” (practicing the procedures to be performed, with all of the steps and manipulations performed without the hazardous materials). Conduct the work quickly and efficiently, but do not rush.</p> <p><b>Distance:</b></p> <p>Maximize the distance from the radioactive materials. Dose is inversely proportional to the distance; therefore, greater distance means less dose. Do not increase the distance to the point wherein dexterity or control of the materials is jeopardized. A way to calculate the proper distance is to use the inverse square law. The “inverse square law” states that radiation intensity from a point source varies inversely as the square of the distance from the source.</p> <p><b>Shielding:</b></p> <p>Use shielding wherever it is necessary to reduce or eliminate exposure. By placing an appropriate shield between the radioactive source and the worker, radiation is attenuated and the exposure may be completely eliminated or reduced to an acceptable level. The type and amount of shielding needed to achieve a safe working level varies with the type and quantity of radioactive material used.</p>
Bone densitometer	A device intended for medical purposes to measure bone density and mineral content by x-ray transmission measurements through the bone and adjacent tissues.
EHS	The Department of Environmental Health and Safety at The University of Texas at Tyler
Licensed medical physicist	An individual holding a current Texas license under the Medical Physics Practice Act, Texas Occupations Code, Chapter 602, with a specialty in diagnostic radiological physics.
Patient	An individual subjected to healing arts examination, diagnosis, or treatment.
RSO	Radiation Safety Officer
TAC	Texas Administrative Code

## **IV. PERIODIC REVIEW**

The contents of this manual will be reviewed whenever relevant sections of the Texas Administrative Code on the use of radiation-producing machines are changed and whenever internal policies decisions mandate a review but no less than once a year. The last section in this manual, Section VIII, may be used to document this review. Any changes or updates made to this manual shall be summarized in Table Two of Section VIII.

## **V. RESPONSIBILITIES**

The following sections outline responsibilities for “roles” at UTT. Depending on one’s role at UTT, an individual may be required to adhere to more than one of the following sections.

### ***A. RESPONSIBILITIES OF THE RADIATION SAFETY OFFICER INCLUDE:***

1. Reviewing all proposals for use of radiation-producing machines; and approving or disapproving them in conjunction with the Radiation Safety Committee.
2. Inspecting facilities and equipment.
3. Prescribing special conditions and requirements as may be necessary for safe and proper use of all radiation sources.
4. Acting as consultant in the design of all new facilities using radiation sources, or constructed for the purpose of providing protection against radiation exposure.
5. Preparing and disseminating information on radiation safety for the use of and guidance of staff and students.
6. Supervision of the UTT training course on radiation safety.
7. Maintain records on the receipt, transfer, and disposal of radiation-producing machines. Maintain an annual inventory.
8. Performing radiation surveys and monitoring all facilities in which radiation sources are used, or radiation-producing equipment resides. Surveys include, but are not limited to radiation level, record checks and interlock tests.
9. Providing personnel monitoring services, including the reviewing and recording of commercially processed dosimeter reports as required by the regulations or deemed advisable by university policy.
10. Ensuring that radiation safety guidelines and requirements are followed in the laboratories utilizing radioisotopes or ionizing radiation.
11. Preparing registration applications, amendment applications, and required reports as well as acting as the contact point for all correspondence with State and Federal radiation health agencies.
12. Investigating unusual radiation exposures, incidents, and accidents and reporting corrective action to the principal investigator, supervisory personnel, and Radiation Safety Committee.

## ***B. RESPONSIBILITIES OF PRINCIPAL INVESTIGATORS AND SUPERVISORY PERSONNEL***

Members of the faculty or staff supervising the work of others, either in a teaching capacity, as a principal investigator, or in an administrative supervisory position, are responsible for ensuring that those under their supervision:

1. Discharge the individual responsibilities as listed in this manual.
2. Receive appropriate orientation and training as to the proper and safe use of radiation producing equipment before operation. This will require adequate planning. Before an experiment is performed, the supervisor should determine the types and amount of radiation to be used. This will generally give an indication of the protection required. Operating and safety procedures must be written and followed. In many cases, before the procedure is actually performed, it should be rehearsed in an attempt to preclude slip-ups or unexpected circumstances. In any situation where there is appreciable radiation hazard, the Radiation Safety Officer should be consulted before proceeding.
3. Have knowledge of the harmful effects of radiation to which they may be exposed specific to the equipment and project.
4. Are instructed in safe techniques, the application of approved radiation safety practices and the proper use of radiation detection instruments.
5. Have thorough knowledge of this manual and the regulations the manual requires.
6. Ensure all radiation sources under their control have been properly approved and that all potential hazards are brought to the attention of the Radiation Safety Officer.
7. Conduct radiation surveys when required.
8. Maintain all necessary records required by this manual and associated regulations.
9. Notify the EHS Office when new personnel are added or (in advance) when personnel under their supervision resign or their employment terminated (or, in the case of students, conclude activities that involved radiation).
10. Establish local written laboratory operating and safety procedures, with the assistance of the Radiation Safety Officer if necessary.
11. Properly post and label with warning and notice signage areas where radiation-producing machines are located and ensure this equipment is secured against unauthorized use and removal.
12. Prepare and maintain a written laboratory procedure for operating any radiation-producing machine particular to their lab and provide a copy to the Radiation Safety Office.
13. Provide equipment and training to those directly or indirectly under their supervision, as required for their specific location and use.
14. Ensure equipment is not modified from original manufacturer configurations. Notify RSO if a variation to the equipment is necessary.

### ***C. RESPONSIBILITIES OF INDIVIDUAL LABORATORY USER***

Individuals are responsible for:

1. Ensure that a full training and certificate are issued
2. Following generally accepted procedures of safe practice such as those specified in this manual.
3. Knowing and adhering to the sections of this manual that is applicable to their work.
4. Knowing and adhering to the specific laboratory procedures as documented in the initial proposal submitted to the Radiation Safety Officer for evaluation and approval.
5. Keeping exposures to radiation as low as possible.
6. Wearing appropriate dosimetry if required and strictly following the regular badge change schedule.
7. Immediately reporting to the Radiation Safety Officer any suspected exposure in excess of permissible limits.
8. Furnishing information to the Radiation Safety Officer concerning new activities in their area, particularly alterations of operations that might lead to personnel exposures.
9. Performing appropriate surveys for external radiation if required, and maintaining records of results or requesting assistance from the Radiation Safety Officer.
10. Contacting the Radiation Safety Officer at least ONE WEEK before terminating employment or association with The University.
11. Assuring that acquisitions and transfers of radiation-producing machines are made in accordance with the provisions of this manual.
12. Read and be knowledgeable about the lab procedure for operating radiation-producing machines particular to the lab they work in.
13. Ensure to log all uses of radiation-producing machines.

## **VI. THE USE OF RADIATION PRODUCING MACHINES**

### ***A. REGULATIONS***

All radiation producing machines are regulated by state and federal laws (e.g. the Texas Regulations for Control of Radiation and the Food and Drug Administration). The UTT will comply with the required regulations.

### ***B. REGISTRATION***

All radiation-producing machines must be registered with the Texas Department of State Health Services, Radiation Control if used, stored or owned by the University of Texas at Tyler. All units are to be registered within thirty days of initial use except a mammographic unit must be registered and approved before use.

Administration of any radiation to human beings at UTT for medical research purposes requires approval of the Radiation Safety Committee, the Institutional Review Board, and submission of IRB approval documentation to the Texas Department of State Health Services. Review of a human research protocol may require several months. Administration of radiation to living vertebrate animals requires approval of the Institutional Animal Care and Use Committee.

Contact the EHS Office when planning to purchase, receive, transfer, and/or install a new unit. Relocating a unit, major repairs or replacement of tube head requires notification of the EHS Office. Disposal, transfer or sale of an x-ray unit must be reported to the EHS Office so the unit may be deleted from the Texas Department of State Health Services registration list, UTT inventory, and responsibly transferred or disposed. When working units that are transferred or sold, the name of the individual or company receiving the equipment is required when notifying the Texas Department of State Health Services of the equipment transfer or removal from UTT.

Copies of assembler's installation reports are to be sent to the EHS Office. If possible, arrangements should be made to have the Radiation Safety Officer present at the time of installation and first generation of x-rays so that any questions about the operation of the machine and any safety issues identified and resolved.

Registration of the individual units will be by the EHS Office ([safety@uttyler.edu](mailto:safety@uttyler.edu), 903-566-7011).

### ***C. COMPLIANCE FOR TECHNICAL STANDARDS OF BONE DENSITOMETERS***

All radiation producing machines will comply with the technical standards of 25 Texas Administrative Code §289.227 unless an exemption has been requested and received from the Texas Department of State Health Services. Most importantly equipment must comply with the ALARA (as low as reasonably achievable) regulatory requirement to control radiation exposure. The initial equipment survey to identify leakage and document measurements of radiation exposure is the foundation of determining a plan to comply with ALARA after installation of equipment. Copies of the regulations are located online at: <https://www.dshs.state.tx.us/radiation/laws-rules.aspx>.

Principal Investigator having primary responsibility for the bone densitometer shall have and implement written operating and safety procedures. The procedures shall be made available to each individual operating a bone densitometer, including any restrictions of the operating technique required for the safe operation of the particular x-ray system. The Principal Investigator shall document that each individual operating a radiation machine has read the operating and safety procedures and shall maintain this documentation for inspection by the State agency. The documentation shall include the following:

1. name and signature of individual;
2. date individual read the operating and safety procedures; and
3. initials of the RSO.

Principal Investigators, supervisors or employees operating bone densitometers shall not make, nor cause to be made, any modification of components or installations of components on the equipment. Alteration in any manner that could cause the installations or the components to fail to meet the requirements of the applicable parts of the standards specified in Title 21, CFR, Part 1020, except where a variance has been granted by the Director, Center for Devices and Radiological Health, FDA. A copy of the variance shall be maintained by the equipment's responsible party for inspection by the State agency.

## ***D. RADIATION SAFETY SURVEYS & MONITORING***

Radiation safety surveys will be performed annually by the EHS Office in accordance with 25 TAC §289.227. Surveys must be performed on new equipment before use begins especially to determine the requirements for any shielding in the area of installation. A survey may be required after major repair is performed or a tube head is replaced; contact the EHS Office when performing major repairs to a unit.

Radiation survey instruments and equipment used for qualitative and quantitative radiation measurements must be calibrated at intervals not exceeding 12 months, when used, and perform within an accuracy of 20% of the true radiation level.

## ***E. PERSONNEL DOSIMETERS***

Any person likely to receive greater than 10% of the annual occupational limit (500 mrem for adults) will be required to wear a personnel dosimeter while utilizing x-ray units, refer to Section IV- A – 9 Responsibilities of the RSO and Section IV – C – 5 Responsibilities of Individual Laboratory. The dosimeter may be a monthly, bimonthly, or quarterly badge according to exposure levels. Dosimeters are provided to anyone likely to receive a significant dose above background. Note that special limits and conditions apply to declared pregnant women, minors, and members of the general public (see §289.231(n)(1) and §289.231(o).) However, no minors are allowed in the area by UTT Laboratory Policy.

The dosimeter:

1. is to be worn between the neck and the waist at the unshielded portion of the whole body likely to receive the highest dose.
2. is to be worn at the neck **outside** of the apron, if a lead apron is worn.
3. is to be worn only by the individual assigned the dosimeter.
4. is to be kept in a safe, low radiation area when not being worn.
5. is to be exchanged and the old badge returned for readout promptly.
6. is never to be exposed deliberately or willfully damaged.

A fetal/embryo badge will be issued to a woman who has declared her pregnancy in writing to the EHS Office. This is to be worn on the mother's lower torso regions under a lead apron if provided. Written declarations are available from the EHS Office.

## ***F. OCCUPATIONAL EXPOSURE LIMITS FOR ADULTS***

1. **The Maximum Permissible Dose Limits** as per 25 TAC §289.231(m) are specified below:
  - a. The total effective dose equivalent being equal to: 5 rem
  - b. a shallow dose equivalent to the skin or to any extremity of: 50 rem
  - c. c. an eye (lens) dose equivalent of: 15 rem

**2. Additional recommended limits for special considerations for “Declared” Pregnant Workers include:**

<b>Situation / Condition</b>	<b>Limit</b>
a Fetus during entire pregnancy not to exceed	0.5 rem
b Minors (under 18 years old) are not to exceed 10% of the annual adult dose limits.	See Section 1 above

A pregnant radiation worker may voluntarily declare her pregnancy, but is not required to do so. The declaration automatically reduces the regulatory limit for the woman to 500 mrem for the entire nine months. Any “declared” pregnant worker likely to receive greater than 100 mrem in the nine months must use a personal dosimeter. The form “Pregnancy Declaration” is located in Appendix. It is to be completed and returned to EH&S in order to forward the information to the Radiation Safety Officer to initiate the necessary actions.

The limits for the Declared Pregnant Worker is 500 mrem for the entire nine months with a recommended limit of 50 mrem per month.

Should a radiation worker choose not to declare, the regulatory limit for an undeclared worker stays at the same level as any radiation worker: 5 rem per year.

***G. DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC***

For consistency with UTT exposure limits to radioactive material, no member of the general public may be exposed to more than 0.1 rem in a year and no more than 0.002 rem (2 millirem) in any one hour. Area monitoring may be required to confirm that these limits are being maintained. For medical applications, a special exemption may be requested to allow up to 0.5 rem per year exposure to a member of the general public.

***H. PERSONNEL DOSIMETER RECORDS***

The EHS Office is responsible for the occupational dose records and issuing the individual dosimeters to the various departments. Occupational dose histories are maintained by the Radiation Safety Officer with copies of the dosimeter report issued to individuals and their supervisors as required by the state or deemed advisable by the Radiation Safety Officer.

If you also work for another employer and receive or have received an occupational dose in any year while working with radiation at UTT, you should promptly report your other employment to the EHS Office so that arrangements can be made to include the dose from your other employment in your annual records of occupational dose.

***I. REQUIREMENTS FOR PERSONNEL***

The Texas Legislature has passed acts that require specific qualifications for x-ray technologists and medical physicists. These requirements are reflected in the Texas Regulations for Control of Radiation and briefly listed below.

## **1. OPERATOR REQUIREMENTS**

Each operator shall meet the appropriate credentialing requirements of rules issued pursuant to §140.521. Bone Densitometry Training. Title 25, Texas Administrative Code, Chapter 140 (Medical Radiologic Technologist Act). Individuals who operate medical radiation machines shall be instructed in able to demonstrate competence with the facility's operating and safety procedures.

X-ray machines that do not involve medical use or medical training still have specific requirements for operator training and use. In all cases a record of specific training approved by the Radiation Safety Officer and a log of users must be kept.

A person who operates a bone densitometry unit(s) which utilizes x-radiation must be a certified densitometry technologist in good standing with the International Society for Clinical Densitometry (ISCD), or have successfully completed the ARRT bone density exam or has completed at least 20 hours of training as follows):

1. 16 hours of specific training using bone densitometry equipment utilized x-radiation, presented by a medical radiologic technologist (MRT) or an equipment applications specialist knowledgeable of the specific equipment to be utilized; and
2. 4 hours of radiation safety and protection training for the patient, operator and others. The training shall be presented by an MRT or a licensed medical physicist. A person must complete the 4 hours of radiation safety and protection training every 2 years.

Documentation of operator training must be kept on site.

## **2. PHYSICIST QUALIFICATION**

The person performing evaluation of diagnostic and mammographic system performance in accordance with these regulations shall hold a current Texas license under the Medical Physics Practice Act, Article 4512n in the appropriate discipline.

## **VII. REQUIREMENTS FOR PROTECTION**

The fundamental objective of the medical use of radiation is to obtain optimum diagnostic information or therapeutic effect or medical data with minimum exposure of the patient (subject), the personnel concerned, and the general public.

Additionally, the PI having ownership of radiation producing equipment must ensure this equipment is secure from unauthorized removal, at all times. The responsible PI must also use devices and/or administrative procedures to prevent unauthorized use of radiation producing machines.

### ***A. RADIATION SAFETY OFFICER***

A Radiation Safety Officer is required to be designated and to have the responsibility and authority to assure safe radiation practices and serves as the contact person between UTT and the Texas Department of State Health Services/Radiation Control. [§289.226(s)(2)].

## RESTRICTED AREAS

All medical radiographic rooms and areas containing control consoles are considered to be "restricted" areas. These are areas into which access is controlled by the registrant for purposes of protection of individuals from exposure of radiation. The restriction must be maintained by the operator of the x-ray device within the area.

### ***B. POSTING REQUIREMENTS***

Documents, notices, or forms must be conspicuously posted and appear in a sufficient number of places to permit individuals engaged in work under the certificate of registration to observe them on the way to or from any particular work location to which the document applies. All posted documents listed here shall be replaced if defaced or altered.

1. Signs bearing the standard radiation symbol and the words "CAUTION, RADIATION AREA." must be posted in each radiation area. The standard radiation symbol shall use the colors magenta, or purple, or black on yellow background.
2. Each radiation machine must be labeled in a conspicuous manner that cautions individuals that radiation is produced when it is energized. This label shall be affixed in a clearly visible location on the face of the control unit.
3. Post certificate of registration, conditions or documents incorporated into the license or certificate of registration by reference and amendments, as well as the operating procedures applicable to work under the certificate of registration.
4. Post RC Form 203-1, "Notice to Employees," as contained in 25 TAC 289.203.

### ***C. PROTECTIVE DEVICES***

If required, protective devices such as leaded aprons, gloves, gonadal shields, thyroid shields, or shin shields are to be visually inspected annually for defects such as holes, tears or cracks. A record of the inspection listing the devices, the results and the name and signature of the individual conducting the inspection shall be maintained. Any device found defective will be removed from service until repaired or discarded. Labels of inspection should be placed on the lead aprons, vests, skirts and gloves. Do not use a lead apron, vest, etc, if a label is not on the device. Remove from service and call Radiation Safety to inspect and label the device.

[§289.227(e)(4)]

The thickness of the protective device is to be as follows:

- 0.5 millimeter thickness of lead equivalent material is required for protective devices that will be used to shield for direct beam radiation such as the gonadal shield and when using fluoroscopic units in sterile fields.
- 0.25 millimeter thickness of lead equivalent material is required for protective devices that will be used to protect for primary (once-scattered) scatter radiation.

#### ***D. EXPOSURE OF THE INDIVIDUAL (STAFF)***

Reduction of radiation exposure to an individual from external sources of radiation may be achieved by any one or any combination of the following measures:

1. Increasing the distance of the individual from the source.
2. Reducing the duration of exposure.
3. Using protective barriers between the individual and the source (shielding, barriers, and personal protective equipment).

Shielding and distance are the factors most readily controlled. Protective shielding includes that incorporated into the equipment, mobile or temporary devices are used, such as moveable screens, or lead impregnated aprons and gloves; or it may be permanent protective barriers and structural shielding, such as walls containing lead or concrete.

The University of Texas at Tyler's regulations for the control of x-rays may be found in the following sections.

#### ***E. EXPOSURE OF THE PATIENT (SUBJECT)***

Individuals (patients or subjects) shall not be exposed to the useful beam except for healing arts purposes and unless such exposure has been authorized by a licensed practitioner of the healing arts. This provision specifically prohibits deliberate exposure for the following purposes:

1. Exposure of an individual for training, demonstration, or other non-healing arts purposes.
2. Exposure of an individual for the purpose of healing arts screening except as authorized by the Texas Department of Health to the institution for a specific procedure requested.
3. Exposure of an individual (subject) for medical research except research protocols that have been reviewed and approved by the Institutional Review Board and the Radiation Safety Committee.

Gonadal shielding shall be used on patients when the gonads are in or within 5 cm of the useful beam. This requirement does not apply if the shielding will interfere with the diagnostic procedure. Gonadal shielding shall be of at least 0.5 mm lead equivalent material.

#### ***F. HOLDING OF PATIENT (SUBJECT) OR FILM***

When a patient (subject) or film must be provided with auxiliary support during a radiation exposure, use mechanical holding devices when the technique permits. Patients (subjects) should be held only after it is determined that available restraining devices are inadequate.

The human holder will be protected with appropriate protective lead garments properly positioned. The holder should be positioned so the useful beam does not strike their body. To assist in minimizing exposure, it is important for the radiologic technologist to collimate carefully to the area of clinical interest.

In selecting a holder, no pregnant woman or possibly pregnant woman or individual under 18 years old will be considered. No individual shall be used routinely to hold film or patients. The individual should have seldom held a person during x-ray examinations. [25TAC §289.227(i)(8)]

### ***G. EXPOSURE OF INDIVIDUALS OTHER THAN THE PATIENT***

Only the staff and ancillary personnel required for the medical procedure or training or medical research shall be in the room during the radiation exposure.

**All individuals, other than the patient (subject) being examined, shall be positioned such that no part of the body will be struck by the useful (direct) beam** unless protected by an apron, gloves, or other shielding having 0.5 millimeter lead equivalent material.

Staff and ancillary personnel shall be protected from primary scatter by protective aprons or whole body protective barriers or not less than 0.25 millimeters of lead equivalent material.

### ***H. RADIATION EXPOSURE INCIDENTS***

Radiation overexposures or possible incidents involving patients (subjects) or staff are to be reported to your supervisor immediately who will contact the Radiation Safety Officer and the Occupational Health & WCI Coordinator.

### ***I. POSTING NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; AND POSTING A RADIATION AREA***

1. Read the "Notice to Employees" sign posted in the control booth and the dark room.
2. Read this manual on operating and safety procedures and operating procedures specific to your machine.
3. The Certificate of Registration for UTT and any notices of violations involving radiological working conditions are available from EH&S
4. Your rights and obligations as a radiation worker are found in §289.203(c), (d), (e), (f), (g), and (i) of the regulations.

The rooms in which permanent open beam x-ray machines are located and operated are Radiation Areas and are restricted. §289.202(aa). The radiation area is designated by "Caution Radiation Area".

### ***J. TECHNIQUES EMPLOYED IN RADIOGRAPHY***

Techniques employed in radiography should be those which achieve the desired objectives with minimum dose to the patient. Persons performing the x-ray procedures should follow the guides listed below, to reduce the patient (subject) exposure:

1. The useful beam should be limited to the smallest area practical, and consistent with the objectives of the radiological examination or treatment.

2. The voltage and the source-skin distance (SSD) employed in medical radiological examinations or research should be as great as is practical and consistent with the diagnostic or research objectives of the study.
3. Protection of the embryo or fetus during radiological examination or treatment of women known to be pregnant should be given special consideration.

**Note:** Ideally, abdominal radiological examination of a woman of childbearing age should be performed during the first ten (10) days following the onset of a menstrual period to minimize the possibility of irradiation of an embryo. In practice, medical needs should be the primary factors in deciding the timing of the examination.

4. Suitable protective devices to shield the gonads of patients who are potentially procreative should be used when the examination or method of treatment may include the gonads in the useful beam or be within 5 centimeters of the useful beam. This requirement does not apply if the shielding will interfere with the diagnostic procedure. Gonadal shielding shall be of at 0.5 millimeter lead equivalent material.
5. X-ray film, intensifying screens, and other image recording devices, should be as sensitive as is consistent with the requirements of the examination.
6. Film processing materials and techniques should be those recommended by the x-ray film manufacturer. Film should be stored away from sources of radiation and handled as specified in §289.227(p) to assure the quality of the film, chemicals and development. Digital techniques of imaging shall utilize quality control as specified in §289.227(r).
7. For medical or veterinary exposures, use of a technique chart aides in reducing the exposure to the operator and patient (subject). A techniques chart must be used for all exposures and must be displayed in written, electronic, or graphic format in the vicinity of the machine control panel.

### ***K. TECHNICAL STANDARDS FOR RADIATION PRODUCING MACHINES***

All radiation producing machines will comply with the technical standards of 25 Texas Administrative Code §289.227 unless an exemption has been requested and received from the Texas Department of State Health Services. Copies of the regulations are available in the EHS Office or downloadable from <http://www.dshs.state.tx.us/radiation/rules.shtm>.

## **VIII. DOCUMENT RECORDKEEPING**

This Bone Densitometer Safety Manual has been reviewed for regulatory compliance and best management practices by the undersigned individuals and is hereby adopted for use and compliance by all employees at The University of Texas at Tyler.

**Table One:** Audit Record Table:

<b>PRINTED NAME</b>	<b>SIGNATURE</b>	<b>TITLE</b>	<b>DATE</b>
Tim Ochran	signature on file	RSO	10/30/2019
Paula Tate	signature on file	Director, EHS	10/30/2019
Chris Frydenlund	Signature on file	Safety Specialist	10/30/2019

(Rev. April 2019)


The following table lists the chronological changes made to the document: (oldest to newest).

**Table Two:** Document Change Summary:

Date	Section Changed:	Summary of Change:	Author

## **Appendix A: Pregnancy Declaration Form**

University of Texas at Tyler  
Radiation Safety Program

**PREGNANCY DECLARATION, INSTRUCTION & DOSIMETRY EVALUATION**

**Section 1 – Voluntary Pregnancy Statement**

I, \_\_\_\_\_, voluntarily declare my pregnancy to the University of Texas at Tyler, as stated in 25 Texas Administrative Code (TAC) Section 289.202(c)(3) and Section 289.202(rr). The estimated date of conception for this pregnancy is \_\_\_\_\_.

(Month) (Year)

Signed:

\_\_\_\_\_  
Signature of Individual Declaring Pregnancy

Date: \_\_\_\_\_

\_\_\_\_\_  
Campus Mailing Address

PI: \_\_\_\_\_

**Section 2 – Instruction to Employee**

Oral and written information about prenatal occupational radiation exposure has been provided to the individual declaring pregnancy at this time. This information includes:

1. The risk associated with prenatal radiation exposure and methods available for minimizing risk.
2. A review of previous personnel monitoring results for the individual, if available.
3. The fetal dose limit of 0.5 rem during the gestation period for occupationally exposed declared pregnant workers.
4. The U.S. NRC *Regulatory Guide 8.13 Instructions Concerning Prenatal Radiation Exposure*.
5. An opportunity to ask questions and receive answers concerning the information provided.

[Fetal dose limits and time period information are taken from TAC §289.202(m)(1) – (4).]

**Section 3 – Dosimetry Evaluation<sup>H</sup>**

Additional fetal dosimetry devices are available for those individuals likely to receive fetal doses in excess of 10% of the established fetal dose limit, as proscribed in the 25 TAC §289.202(q)(1)(A) and §289.202(m)(1) – (m)(4). The utilization and application of such devices has been discussed with the individual declaring pregnancy at this time.

	Yes	No
1. Likely to exceed 10% of fetal dose limits?	Γ	Γ
2. Fetal dosimetry devices offered?	Γ	Γ
3. Fetal dosimetry devices accepted?	Γ	Γ

<sup>H</sup>Note: Fetal dosimetry service is issued for the duration of the declared pregnancy.

**Section 4 – Acknowledgments**

I acknowledge that the above information relating to occupational exposure to radiation has been discussed and an opportunity to ask questions was available.

Declarer: \_\_\_\_\_

Date: \_\_\_\_\_

Radiation Safety Representative: \_\_\_\_\_

Date: \_\_\_\_\_