Los Angeles City College
Radiologic Technology Program
2025 Radiation Protection Plan

Program Number: 1014 & 1076

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In California, all radiation (X-ray) producing machines and radioactive materials, are subject to State laws and regulations. The statutes are found in the Health and Safety Code, Division 104-Environmental Health. The regulations are found in the California Code of Regulations (CCR), Title 17, Div. 1, Chapter 5, Subchapters 4 and 4.5. 17 CCR 30253 incorporates by reference the federal regulations specified in Title 10, Code of Federal Regulations (CFR), Part 20. Requirements in 10 CFR 20 apply to all registrants.

The radiography program is required to develop, document, and implement a radiation protection program commensurate with the scope and extent of use of X-ray machines and sufficient to ensure compliance with the above regulations. Additionally, the radiography program shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as reasonably achievable (ALARA). The radiography program director will audit the radiation protection program on an annual basis to ensure it remains within the scope and extent of activities required to ensure compliance with the said regulations.

All components of the Radiation Safety and Protection Program do not have to be contained in one consolidated document. However, all components do have to be documented and identified as being part of the Radiation Protection Program and will be duly listed and described. Records of the Radiation Safety and Protection Program content, implementation and audits must be maintained for -inspection by the Department.

The regulatory agency for radiation safety is the California Department of Public Health and can be contacted at the following addresses and phone number:

California Department of Public Health Radiologic Health Branch, MS 7610
Certification Unit (X-Ray Schools)
P.O. Box 997414, Sacramento, CA 95899-7414

Email: RHBinfo@cdph.ca.gov (916) 327-5106
Website: www.cdph.ca.gov

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Overview/Purpose

1. Mission, Vision, Core Values of LACC and the Radiologic Technology Program, and RT Program Goals
2. The hierarchy at Los Angeles Community College District and Los Angeles City College
3. The hierarchy at Clinical Affiliates
4. ALARA – Principle
5. Radiation Safety Officer

Radiation Monitoring Guidelines

1. Radiologic Technologist
2. Student Technologist

Radiation Exposure Limits

1. Part 1: Occupational Exposure Limits
2. Part 2: Student Exposure Limits Policy
3. Part 3: Notification Warning Policy
4. Part 4: Pregnancy Policy

Radiation Protection Precautions for Personnel

1. Part 1: Diagnostic Areas Including Patient Holding Restrictions and Immobilization
2. Part 2: Fluoroscopic and Portable/Operating Room Considerations

Radiation Protection Guidelines for the Patient

1. Pregnancy Considerations (Patient)
2. Gonadal Shielding
3. Beam Restriction
4. Entrance Skin Exposure

Los Angeles City College's Mission

The mission of Los Angeles City College is to promote accessible and equitable learning to benefit the diverse local and global communities we serve. We empower students to achieve their educational and career goals by providing pathways to support their completion of associate degrees, certificates, transfer requirements, career and technical education, and foundational skills programs.

Los Angeles City College – Radiologic Technology Program's Mission

The mission of the Radiologic Technology program at Los Angeles City College is to provide an accessible and equitable learning environment to promote our radiologic technology students with the technical and interpersonal skills necessary to provide our diverse local and global communities with high-quality diagnostic medical images and patient care as professional diagnostic medical radiographers.

Radiologic Technology Program's Vision Statement

Transforming our students and graduates with effective skills and opportunities to grow in all innovative modalities of medical imaging to serve our communities.

Radiologic Technology Program's Core Values

In carrying our mission, vision, and goals, we maintain our core values of

- Compassionate Caregivers
- Excellence in Quality
- Inclusivity – Collegiality and Collaboration
- Commitment to Integrity and Accountability

Program Goals

Goal 1: Prepare students to be ethical, professional, and clinically competent entry-level Radiologic Technologists.

Goal 2: Cultivate Radiologic Technology students who utilize effective interpersonal skills with patients, peers, instructors, clinical partners, and the communities they serve.

Goal 3: Educate Radiologic Technology students to demonstrate critical thinking and problem-solving skills to adapt and perform job-related functions.

Goal 4: Empower Radiologic Technology students to grow, develop, and become members of professional organizations that foster career growth.

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Prepared by Amy Ho
Academic Affairs
As of August 26, 2024

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Dental Technology	Olga Ramadan	2501 2503	SCI TECH 324 A
Kinesiology / Health / Dance	Aykanush Gevanyan	2663	KINN 216
Nursing	Christine Sloat, Director	2533	SCI TECH 222 C
Nutrition & Dietetics	Gayle Stafsky, Director	2291	AD 200
Radiologic Technology	Julie Washenik	2941	RT 4

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English / ESL	Jeffrey Nishimura	2706	JH 301 A
Law / Administration of Justice	Wilhelm Vargas	2754	HH 200 H
Library	George Martinez	1395	MLK 324
Modern Languages / Civilizations	Yelgy Parada	2735	JH 111 D
Philosophy	Julio Torres	2763	HH 200 C
Psychology	David Seghi	2935	HH 100 G
Social Sciences	Carlos Guerrero	2506	FH 219 E

VI LY (CC 217/ EXT. 2060)
DEAN OF PERFORMING AND VISUAL ARTS / BUSINESS ADMISTRATION

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Cinema / Television	Krystle Klein	2632	CC 187
Music	Christine Park	2887	CH 146
Theatre Arts	John Bledsoe	2982	TA 208 A
Visual & Media Arts	Amarpal Khanna	1518	DH 202

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Also the following Programs: WIOA:AEFL (Districtwide) and Calif Adult Education Program

Name of Department	Name of Chairperson	Ext.	Location
Non-Credit	Martha Clayton	1233	CHEM 111 B

DAN WANNER (FH 306 / EXT. 2892)
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Also the following Programs: STEM Grants, Curriculum, Online Education and MESA

Name of Department	Name of Chairperson	Ext.	Location
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CSISA	Shawki Dakduk	2689	FH 203 B
Earth Sciences	Nathaniel (Nate) Lorentz	2691	SCI TECH 324 F
Life Sciences	Gregory Gonsalves	2796	SCI TEC 222 E
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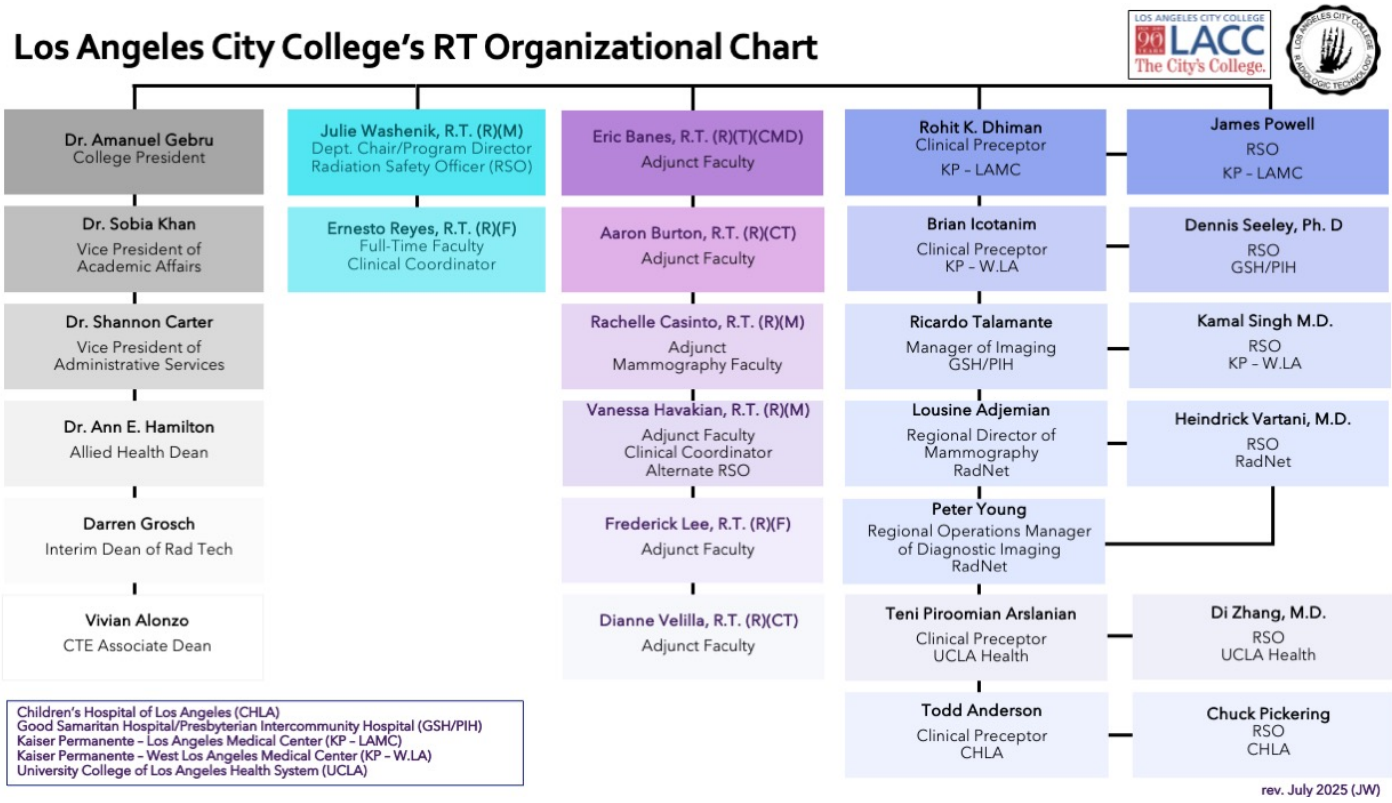

Duties

VP of Academic Affairs: oversees expenses for faculty and staff, approves purchase orders for radiation protection services (radiation monitors) and other perishable supplies.

Program Director/ Department Chair: receives requests from faculty regarding equipment needs and supplies. Performs duties such as communication with the California Department of Public Health, Radiologic Health Branch to ensure compliance with all laws pertaining to radiation utilization, contacts affiliate hospital training sites to obtain student performance and radiation monitoring reports, approves curriculum for radiography program, and interacts with JRCERT Accreditation to ensure the program complies with their rules and regulations.

RT Faculty: Develop and teach curriculum related to radiologic technology and observe students' performance in utilizing live radiographic exposure laboratories. Evaluate the students when performing laboratory exposures and report any students who fail to wear their radiation monitors or are not able to perform laboratory/positioning assignments utilizing Lucite phantoms safely. Report to the Program Director any problems with equipment or supplies. The faculty also teaches the didactic class of fluoroscopy (RT 243) and supervises laboratory experiments using radiographic/fluoroscopy equipment.

Clinical Preceptors: Teach the application of didactic theory to the students when imaging patients at the clinical affiliates. Document compliance to school standards, verify competencies, ensure radiation ALARA guidelines are being followed for the exposure of patients and the protection of visitors and occupationally exposed persons. Review student radiation exposure records with the hospital radiation

safety officer and report any high or excessive radiation exposures to the Program Director at Los Angeles City College.

The delegation and responsibility for each aspect of the radiation program and provisions for ensuring the enforcement of radiation safety policies and procedures are as follows:

School's Radiation Safety Officer, qualifications and responsibilities.
The school's designated Radiation Safety Officer is Julie Washenik, R.T. (R)(F)(M), CRT, ARRT
The designated alternate RSO is Vanessa Havakian, R.T. (R)(F)(M), CRT, ARRT

Clinical Affiliate	Staff and Title		Phone Number	e-mail
CHLA	Mario Pistilli	Administrative Director, Imaging Services	323-361-2589	mpistilli@chla.usc.edu
	Todd Anderson	Radiology Supervisor; Clinical Preceptor	323-361-2411	tanderson@chla.usc.edu
	Chuck Pickering	RSO		cpickering@chla.usc.edu
GSH/PIH*	Robert Kleinman, M.D.	Medical Director	562-698-0811 ext. 17028	Robert.kleinman@pihhealth.org
	Vacant	VP of Radiology	213-977-2210	
	Ricardo Talamante	Manager of Imaging; Clinical Preceptor	213-977-2121; 4020	ricardo.talamante@pihhealth.org
	Dennis Seeley, Ph.D.	RSO	470-580-5962	dennis.seeley@westphysics.com
Kaiser Permanente LAMC*	Dr. Anne Kosco	Chief Radiologist	323-783-5051	Anne.E.Kosco@kp.org
	James Powell	Director of Radiology and RSO	323-783-4197	James.R.Powell@kp.org
	Rohit K. Dhiman	Clinical Educator	323-783-7604	Rohit.K.Dhiman@kp.org
	Aaron Burton	Clinical Instructor	323-783-5429	aaron.m.burton@kp.org
Kaiser Permanente W.LA	Vijay Rao M.D.	Chief Radiologist	323-8573313	Vijay.A.Rao@Kp.org
	Ida Mae Maydanich	Assistant Director of Radiology	323-857-3766	IdaMae.X.Maydanich@kp.org
	Julian Walsh	Director of Radiology	323-857-3156	julian.a.walsh@kp.org
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	Kamal Singh M.D.	RSO	323-857-3739	Kamal.S.Singh@Kp.org
RadNet	Peter Young	Regional Operations Manager of Diagnostic Imaging		Peter.Young@RADNET.COM
	Lousine Adjemian	Regional Director of Mammography		Lousine.Adjemian@RADNET.COM
	Heindrick Vartani, M.D.	RSO		Hiendrick.Vartani@RADNET.COM
UCLA	Brenda Izzi, RN, MBA	Senior Director of clinical operations in the Department of Radiology at UCLA Health	310-481-7516	brael@mednet.ucla.edu
	Cecilia O. Ortiz	Radiology	310-794-1181	cortiz@mednet.ucla.edu

		Administrator; Interim Director, Acute Care Imaging, (Radiology)		
	Teni Piroomian	Clinical Coordinator-CSUN BSRS Program; Clinical Preceptor	310-267-3216	tpiroomian@mednet.ucla.edu
	Di Zhang, M.D.	RSO		diz@mednet.ucla.edu.

Please see the RSO designation letter and CV's of each individual above for qualifications.

Responsibilities of the RSO:

Shall be responsible for:

a. Abiding by stated pertinent regulations concerning the application, notices, instructions and reporting duties of this position;
b. Reviewing dosimetry reports; following-up on suspicious readings; and ensure students have reviewed and initialed their dosimetry reports as evidence of oversight.
c. Verifying each clinical training site has a Radiation Protection Program in place and that each clinical training site will complete a verification of compliance to ensure a Radiation Protection Program is in place. Please see Appendix H for an example of the form used.

Hospital and Program Policies Clinical Affiliation

Below is a list of hospitals that have, through formal agreements, agreed to act as the clinical affiliates for our program. To maintain continuity in clinical education, students will have an equitable opportunity to intern at the clinical sites. A copy of the agreement between Los Angeles City College and its affiliate hospitals is kept on file in the Program Director's computer in the Radiologic Technology department.

*LAMC: Los Angeles Medical Center
*GSH: Good Samaritan Hospital; PIH: Presbyterian Intercommunity Hospital
*UCLA: University College of Los Angeles

ALARA Program

The radiography program uses, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA) and documents procedures addressing this requirement.

Didactic Coursework

Course Numbers: RT 202, RT 240, RT 243

- RT 202 is a prerequisite course that introduces Radiation Protection principles to students.
- RT 240 is our one semester Radiation Protection class. The entire 16 week semester is dedicated to radiation biology, radiation units, and radiation protection methods.
- RT 243 is our 40-hour State Fluoroscopy Permit class that follows the ARRT Fluoroscopy revisions. (Please see Addendums Section for Course Outlines)

Student instruction includes methods to reduce radiation exposure to patients and occupational workers by collimating to the area of interest when performing fluoroscopic and radiographic procedures, using the highest kVp and lowest mAs practicable for the exam, using the principles of keeping exposure times to a minimum, performing laboratories to demonstrate the effects of radiation exposure and the inverse square law, and utilizing shielding to protect themselves.

As part of the classroom experience, students are oriented to using radiographic equipment and ancillary radiation protection devices such as a bucky slot cover, mobile barriers, lead aprons, drapes, and thyroid shields as part of their training. Clinical competencies require students to collimate and select the correct technical factors for each exposure.

When a student is accepted to the Radiology Program at Los Angeles City College, they are required to attend a mandatory orientation program where the student manual is reviewed. In the area of radiation protection, the student is given the department policy for radiation exposure while on campus and in the clinical training facility.

1. Excerpts of the Student Policies & Procedure Handbook, page 16, contains the information on the program's Clinical Radiation Protection Rules (See Appendix Section).
2. Excerpts of the Student Policies & Procedure Handbook, page 17, contains information on the program's Policies on Supervision of Radiography Students during radiography and fluoroscopy (See Appendix Section).
3. Students are evaluated continuously to ensure they are abiding by the principles of ALARA (see Appendix Section Student Clinical Performance Evaluation # 1, 4 & Clinical Competence Form Section # 1 Questions # 1, #6, #9, #10 and Section 4 Questions # 1-4. These evaluation tools are utilized by the Clinical Instructors, Clinical Supervisors and LACC Clinical Coordinator to assess how well the student are following the principles of ALARA. A student's clinical grade is partially derived from this evaluation tool.
    a. 30423 Radiologic Technologist Fluoroscopy Equipment Orientation Check-Off Form (See Appendix Section)

Dosimeter Report

Radiation Safety and Monitor Policy

It Is Required by Law That All Persons Working with or Around X-Ray Equipment and/or Radioactive Materials Wear Current Radiation Monitors.

Radiation monitors are furnished to students in accordance with existing state and federal regulations, which require that students wear them when working in areas where potential radiation exposure may occur. The reports regarding exposure become a part of the individual's permanent record and are open for inspection. When students or technologists leave the institution, it is imperative to request a copy of their exposure record.

In order to utilize radiation, monitor it most effectively, and to have the most accurate records possible, the following regulations must be observed:

- Students must wear the hospital radiation monitors and OSL badge at the hospital site.

- Additionally, the students must wear the OSL badge at the college when performing energized labs.
- Students must be supervised by a licensed Radiographer, or the x-ray tube needs to be deactivated when using the energized lab at the college.
- The radiation monitors must be worn at the **collar, on the left side, and outside the apron.**
- Any student not wearing a radiation monitor will not be allowed in radiation areas, and the time missed will be considered a clinical absence.
- Students must wear a lead apron and thyroid shield during fluoroscopy, mobile C-arm procedures, and portable radiography.
- Students will never hold a patient or image receptor during a procedure while ionizing radiation is used.
- Students will never take an exposure while a Radiographer holds a patient and or an Image Receptor (IR).
- Students will properly shield all patients while performing procedures as long as the shield does not obscure the anatomy of interest. Failure to do so will result in failure during a competency exam.

Notice: Students will be instructed in the as low as reasonably achievable (ALARA) philosophy. The Program Director, Clinical faculty, Chief Radiologist, Radiation Safety Officer, Radiation Physicist, or all five, will investigate all instances in which dose limits are exceeded. The student will then be counseled as to the appropriate course of action and review of radiation safety practices. Actual dose limit is any single quarterly reading of 100 mrem or above. Accidental exposures due to badges left on aprons, etc., will be documented where proven.

Notice: Failure to adhere to this policy may result in dismissal from the program.

All registrants are responsible for the protection of individuals that enter the registrants' controlled areas. The registrant is also responsible for ensuring that the public is protected and that the public dose does not exceed the limits found in 10 CFR 20.

Each facility must evaluate whether or not personnel monitoring for occupational exposures is required. If a facility chooses to or is required to monitor, then those who are occupationally exposed to radiation should be instructed in the following:

1. Types of individual monitoring devices used and exchange frequency.

   Students are issued an OSL radiation monitor at no charge. The results of the monitors are uploaded the first of each month effective when the students begin their clinical training.

2. Use of control badges.

   A control badge is not utilized because. A control badge is typically used to subtract background radiation exposure during transit and while the badge is stored at our facility. This exposure is accounted for and removed through the proprietary algorithm of the OSL.

3. Instructions to students on proper use of individual monitoring devices, including consequences of

deceptive exposure of the device.

Below is the policy on the proper usage of individual monitoring devices. A questionnaire to ascertain potential deceptive information is provided for this section as well.

Radiation Protection Program – Policies and Procedures

A. Procedure

The following safety rules have been established for the protection of the patient, other personnel, and you from ionizing radiation during your hospital observation, clinical education, and laboratory experience. These rules are a combination of international, state, and federal regulations and/or laws learned from human experience with ionizing radiation. These rules are mandatory and any exception must be reported to the Department Manager/Clinical Instructor and/or Clinical Coordinator/Program Director as soon as possible.

B. Policy

1. Regarding dosimetry badges and reports while enrolled in the program:
   No charge will be required to cover the cost of providing radiation dosimetry services for the student (including fetal badge)
   a. An OSL dosimetry badge, properly placed, must be worn at ALL times during laboratory or clinical practice, including anytime you are completing your laboratory experiments.
      i. In other words, any time you are in a designated radiation area.
   b. When protective aprons are used, the OSL dosimetry badge must be placed above the apron, at collar level.
   c. It is the student's responsibility to turn in their OSL badge by the 1st day of each new quarter.
      i. It is also the student's responsibility to review their badge reading each quarter.
      ii. The student's clinical grade may be affected if he/she does not comply within this timeframe. Points will be deducted for late submission of badges.
   d. The OSL dosimetry readings are available to students through the RT program. Readings are displayed in the RT building and kept indefinitely. The Program Director or Clinical Coordinator ensures all student and faculty data follows the FERPA privacy rules.
   e. The most current dosimetry report will be available at the hospital and campus on a quarterly basis.
   f. A copy of the dosimetry quarterly report is available with the Clinical Preceptor at each affiliate.
   g. Each monitored individual is responsible for reviewing his/her dosimetry report reading and documenting they have reviewed their reading by entering and initialing their reported dosimetry reading.
   h. Immediately inform the Program Director/RSO if you wash, accidently expose, or otherwise damage your dosimetry badge. In addition, a "Radiation Dosimetry Questionnaire" must be complete and submitted to the Program Director. Copies of this questionnaire are located in the classroom.
      i. If a dosimetry report reading exceeds the dose limits, the student will be required to complete a "Radiation Exposure Report Questionnaire" and "LA Community College District Supervisor's Report of Injury" to the program director to ascertain what factors might have attributed to the excessive exposure. You will receive a letter of concern and a copy of the letter will be placed in your file.

ii. If the "Questionnaire" does not identify any accidental radiation explanation for your excessive reading, a letter of concern will be forwarded to your Clinical Preceptor/Department Manager. The student's subsequent dosimetry report will be closely monitored to ensure that the problem has been resolved. If questions arise, a full investigation will ensue.

a. Past dosimetry badge reports are filed indefinitely in the file room of the RT Building.
b. Upon graduation, students will receive one free copy of his/her termination dosimetry report. Copy and file this final dosimetry report for future reference.
c. Landauer is the school's dosimetry provider. Student radiation exposures are monitored quarterly throughout the program and are maintained by the RT Program as part of the student's permanent file.

2. When an X-ray exposure is about to be made, you MUST:
    a. Leave the room, or
    b. Get behind the lead shield, or
    c. Be otherwise suitably protected for surgery, portable, and fluoroscopic work.
3. Specifically, you must not hold or support a patient or test phantom nor hold or support an imaging receptor during an exposure.
4. You may not observe the patient during exposure from an adjacent room or hall unless through a lead-glass protective window. You must NOT "peak" around a door nor through a crack between the door and wall.
5. When sitting to rest in the hall, do not sit in direct line with the tube or radiographic table, even if it is not being used.
6. During an exposure or procedure, do not place yourself in direct line to the primary beam, even though you are wearing a lead apron.
7. Under no circumstances will you permit yourself or any other human being to serve as "patients" for test exposures or experimentation.
8. If, during fluoroscopic procedures, you remain in the radiographic room, the following will prevail:
    a. A lead apron (preferably 0.5 mm lead equivalent) must be worn at all times, or you must remain behind an adequate lead protective screen and not in visible line with either tube, patient, or the X-ray phantom.
    b. The OSL dosimetry badge must be worn above the lead apron at collar level.
9. Do not, during the observation periods, actually make exposures on patients. You may assist by helping patients onto tables, etc., but only under direct supervision of a staff technologist.
10. With permission of the principal staff technologist, you may make test exposures on inanimate objects. In so doing, all radiation safety rules must be followed as well as tube safety factors, etc.
11. When observing radiologic procedures in surgery and bedsides portables:
    a. A lead apron must be worn.
    b. A dosimetry badge must be worn left side, above the lead apron at collar level.
    c. Stand as far from the patient and tube as practicable.
    d. Stand so that the central ray is pointing away from your body.
    e. Observe all regulations which apply to work in surgery, such as preserving the sterile fields, wearing surgical garments, etc. The staff technologist will provide details.
    f. In addition, when observing, you must step outside the room if you cannot stand at least 6 feet from the patient or behind the staff technologist during actual exposure.
12. Permission to make actual exposure on patients will be determined by:
    a. The opinions of the Radiologist/Department Manager/Clinical Preceptor.
    b. The opinions of the Program Director/Clinical Coordinator/Clinical Supervisor.

c. Your own feeling of security and competence.

13. Items pertinent to patient radiation safety include:
    a. Make sure careful collimation is used to restrict the X-ray beam to the area of clinical interest only. (The X-ray field must **never** be larger than the size of the image receptor used.)
    b. Use gonadal shielding where and when appropriate. Review your clinical facility's policies regarding the use of gonadal shielding.
    c. Make sure the X-ray room is cleared of all non-essential persons before an exposure is made.
14. Items pertinent to the technical aspects of the radiographic procedure and radiation protection **(if applicable)**
    a. Use the best image receptor/grid combination for the lowest dose practicable and commensurate with the objectives of the radiographic procedure.
    b. Know exactly what examination and which view or views are to be taken.
    c. Position the patient correctly for the required examination/position and view before the actual exposure is taken.
    d. Use high (optimum) kilovolt peak (kVp) and low milliampere-seconds (mAs) techniques for low-dose radiography, consistent with obtaining a diagnostic quality image unless otherwise indicated by facility protocol.
    e. Take steps to avoid patient motion by clearly instructing patients not to move, by using appropriate immobilization positioning aids, and by keeping the patient comfortable and under constant observation.
    f. Help keep image receptors clean.
    g. Place positioning markers correctly on the image receptor.
    h. No eating or drinking in the working area of the department.
15. Failure to obtain diagnostic quality radiographs with the least exposure to the patient for the radiographic procedure required means failure to meet the accepted standard of care.
    a. A copy of the Department of Public Health's NOTICE TO EMPLOYEES (RH 2364) is posted in the lab. Current copies of Title 17 "California Radiation Control Regulations" as well as 10 CFR Part 20 "Standards for Protection Against Ionizing Radiation" can be retrieved online. Steps how to access Title 17 are posted in the hallway.
16. Energized Labs- supervision: student utilization of energized laboratories **MUST** be under the guidance of a qualified practitioner; otherwise, the radiation exposure mechanism must be disabled.
    a. If ionizing radiation is being utilized during laboratory sessions, a radiation warning sign indicates one is entering a potential radiation area.
    b. The entrance to each x-ray lab suite is posted with an acceptable radiation warning sign indicating one is entering a potential radiation area.
17. The school's designated Radiation Safety Officer (RSO) is Julie Washenik, R.T.(R)(F)(M), the Alternate Radiation Safety Officer (ARSO) is Vanessa Havakian, R.T.(R)(F)(M).
18. Procedures for ensuring that the combined occupational total effective dose equivalent (TEDE) to any student/employee receiving occupational exposure at your facility and at other facilities does not exceed 5 rem per year.
    a. Students and faculty dosimetry reports are monitored frequently to ensure their combined occupational total effective dose equivalent does not exceed 5 rem per year and are below the ALARA Levels set by the LACC RT Program. A student's exposure is investigated further if their quarterly deep dose equivalent is greater than 125 mRem.

See Appendix *Dosimetry Letters & Questionnaire* for documentation of this process.

19. Procedures for obtaining and maintaining employees' concurrent occupational doses during that year.
    a. Faculty are required to self-disclose concurrent occupational doses received during the previous year in January of the subsequent year.
    b. Their doses are posted on campus and kept in the RPP Faculty Dosimetry section.
    c. If found to exceed the occupational annual dose limit, the employee will be coached and counseled concerning their radiation protection practices.
    d. Employees are asked to self-report back to any other concurrent employer(s) their annual radiation dose readings received while working as a college employee. Quarterly dosimetry reports are sent to each college employee.

Annual Radiation Exposure Limits			
Whole Body (Annual) Dose for Occupational Workers	50 mSv/yr. (5,000 mrem/ year) Stochastic Effects		
Lens of the Eye	150 mSv/yr.* (15,000 mrem/ year) Non-Stochastic Effects		
Extremities and Skin	500 mSv/yr. (50,000 mrem/year) Non-Stochastic Effects		
Fetal Entire Gestation	5 mSv/gestation (500 mrem/gestation)		
Fetal Monthly Dose Limit	0.5 mSv/month (50 mrem/month)		
General Population	1 mSv/yr. (100 mrem/year)		
Dosimeter	**ALARA Level I**	**ALARA Level II**	**ALARA Level III**
Whole Body (Monthly)	1.25 mSv (125 mRem)	2.5 mSv (250 mRem)	3.75 mSv (375 mRem)
Whole Body (Quarterly)	1.25 mSv (125 mRem)	3.75 mSv (375 mRem)	7.5 mSv (750 mRem)
Extremity (Monthly)	3.75 mSv (375 mRem)	7.5 mSv (750 mRem)	11.25 mSv (1,125 mRem)
Extremity (Quarterly)	3.75 mSv (375 mRem)	11.25 mSv (1,125 mRem)	22.5 mSv (2,250 mRem)
Declared Pregnant Worker (Monthly)**	0.0125 mSv (1.25 mRem)	0.025 mSv (2.5 mRem)	0.0375 mSv (3.75 mRem)

ALARA I	Radiation Safety Officer Notified. Report kept on file.
ALARA II	Badged Radiation Employee/Student receives a Report of Unusual Radiation Exposure (RURE)
ALARA III	Badged Radiation Employee/Student receives a Report of Unusual Radiation Exposure (RURE)
	RSO performs a Review of a Worker Exposure Conditions and Procedures

*Note: The International Commission on Radiological Protection (ICPR), National Institutes of Health (NIH), and Nuclear Energy Agency (NEA) reduced their occupational annual equivalent dose to the lens of the eye from 150 mSv to 20 mSv in 2021.
**The calculations used for the declared pregnant female's monthly gestation was 12 months instead of 9 months as a prudent measure.

- The ALARA concept imposes lower operational dose limits that are even more restrictive than the maximum Legal dose limits shown in Table I above.
- This ensures an enhanced safety factor for what are already considered to be safe annual doses for radiation workers.
- **What are the ALARA Investigation Levels?**
  There are two types of ALARA investigation levels for external occupational radiation exposure as indicated by a dosimeter. If a worker's dose for any calendar month (30 days), calendar quarter (3 months) or calendar year (12 months) exceeds these values, an investigation is conducted by the RSO to determine if there are reasonable ways to reduce the dose levels.

1. Procedures for ensuring that if minors are employed, their occupational TEDE does not exceed 5 mSv/year (500 mRem per year).

N/A

2. Procedures for addressing a declaration of pregnancy and procedures for a declaration of non-pregnancy.

Please see Policy Regarding Declared Pregnant Students

3. Procedures for maintaining documentation of dose to the embryo/fetus and associated documentation for the declared pregnant worker.

If a student declares a pregnancy, she will be required to wear a fetal badge at the waist level and her dosimetry badge at the collar level. The fetal badge will be submitted and processed once a month to ensure fetal readings do not exceed the set dose limits of 0.05 rem/month. The students' occupational dosimetry badges will be submitted quarterly. All dosimetry reports are evaluated by the RSO/Program Director to ensure compliance with state/federal regulations concerning dose limits.

Engineering Controls*:*

Room Design: Rooms 5A and 5B are live x-ray rooms. The control booths are placed to where only twice scattered radiation could reach the operator. The doors leading into the x-ray room contain $1/16^{th}$ lead shielding and have interlocks that prevent making an exposure if the door is not closed. The rooms have "Caution X-ray" warning signs on all doors as well as flashing light indicators above the doors when the equipment is energized. In addition, padlocks are inserted into the x-ray equipment circuit breakers so the equipment cannot be activated unless the lock is removed first by faculty member.

All equipment is periodically calibrated and may be verified during regular CDPH-RHB inspections. The primary barriers are $1/16^{th}$ thick lead to protect the students in the classroom. All clinical training facilities are The Joint Commission (TJC) approved and have regular inspections by the CDPH-RHB and their in-house radiation safety officer. Area monitors are placed in rooms 5 and 10 (See Appendix of *RT Floor Plan*).

Dosimetry Program
Students in the radiography program are instructed in the use of radiation monitoring and the detrimental effects of radiation on the body (RT 202, 240). The students are educated in the different types of patient and personnel protective devices as well (RT 202, 206, 207, 240, 280, 281, 282, 283, 103, 104).

Table. Types of individual monitoring devices, area monitors, and exchange frequency:

Types of Badges	*Radiation Detector Type*	*Exchange Frequency*
Personnel Monitor	OSL™ dosimeter	N/A
Area Monitor Room 5	OSL™ dosimeter	N/A
Area Monitor Room 10	OSL™ dosimeter	N/A

Instructions to employees/students on the proper use of individual monitoring devices are found under the Radiation Protection Plan (RPP) – Policies and Procedures. Students are instructed not to switch badges with other occupational workers, deliberately expose their badges to radiation except in the course of training or employment and understand the consequences of deceptive exposure to the radiation monitor.

Current instructions to students/employees about the use of OSL badges include:

a. OSL Badges shall be worn at all times when radiographic exposures are being made.
b. OSL Badges shall be read at the beginning of each quarter.
c. Any student making radiographic exposure while not wearing a radiation badge or wearing someone else's badge will be sent home.
    i. A formal disciplinary hearing with the radiology department staff and Dean of Academic Affairs will be convened to determine the seriousness and consequences to the student.
    ii. Using someone else's badge would be considered falsification of college records and would be grounds for dismissal from the college.
d. OSL Badges will be used at Los Angeles City College and the clinical training sites.

The students are provided radiation monitoring badges from Los Angeles City College during the fall Semester in which they are enrolled. The student uses that radiation monitor while on campus for laboratory experiments and at their clinical training site for two days a week in the RT 260 class. Once the student begins their clinical training in RT 280, the hospital or their radiation safety officer will provide students and faculty copies of their dosimetry reports. In addition, with OSL badges, the RT faculty are able to monitor the exposure students receive on a quarterly basis.

4. Procedures to ensure the combined TEDE doesn't exceed 5 Rem per year:

a. Review of quarterly dosimeter records for students on campus and at the clinical education training site.
b. There are no procedures for minors because any person under the age of 18 is not permitted to enroll or participate in the Radiology Program.
c. Procedures for addressing a declaration of pregnancy are found in the Radiology Program's Student Manual and are reviewed at the mandatory student orientation meeting prior to RT 260 Introduction to Clinical Education class beginning.

The student must:

- Read the voluntary declaration of pregnancy form provided (*). Be informed of radiation risks to the fetus/embryo.
- Read the appendix Regulatory Guide 8.13 of the U.S. NRC entitled: "Possible Health Risks to Children of Women Who are Exposed to Radiation During Pregnancy" and initial that they have read it.
- If a pregnant RT student declares she is pregnant, the Los Angeles City College and/or the clinical training site will provide an additional fetal monitoring badge to be worn at the waist level, under the lead apron.
- The student will then be given the option of whether or not they want to continue in the program.
- The procedure for maintaining documentation of dose to embryo/fetus and the declared pregnant worker is the same for maintaining documentation of all student radiation doses for all student and faculty workers. The radiation readings are kept on file in the Radiology Department of Los Angeles City College.

Radiation Protection Program

Overview/Purpose/ALARA

It has been well documented that ionizing radiation can cause damage to living cells. Therefore, it is imperative that everyone involved in the medical application of ionizing radiation have an accurate knowledge and understanding of the various safety guidelines in order to minimize the adverse effects of radiation exposure. We at Los Angeles Community College, Department of Radiologic Technology, are committed to this endeavor.

This Radiation Safety Policy is designed to inform and make available to each radiologic technology student, faculty, and staff member of the various radiation safety methods and guidelines established to limit unnecessary radiation exposure to the patient, operator, and public.

ALARA PRINCIPLE

"As low as is reasonably achievable" (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these regulations as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

RADIATION SAFETY OFFICER

Faculty and students shall be aware of the Radiation Safety Officer(s) at Los Angeles City College and hospital affiliates.

A current list of RSO's is posted in the Radiologic Technology building. This list is posted in the energized laboratories, non-energized laboratories, and hallway display cases along with current California State licensures for all faculty.

Faculty:

Program Director: Julie Washenik, MHA, R.T. (R)(F)(M), CRT, ARRT
Radiation Safety Officer: Julie Washenik, MHA, R.T. (R)(F)(M), CRT, ARRT
Alternate RSO: Vanessa Havakian, R.T. (R)(F)(M), CRT, ARRT

Additional information on state regulations for radiation safety can be obtained by contacting:

Radiological Health Specialist CADPH-RHB
PO Box 997377, MS 0500 Sacramento,
CA 95899-7377

General Information (916) 558-1784

Additional Radiation Monitoring Guidelines

1. Who Needs a Radiation Monitoring Badge – Because of the possible hazards when dealing with radiation, Federal and state Laws require all personnel to wear proper radiation monitoring devices (OSL badge) at all times while using energized radiographic equipment or near radioactive sources.

2. Proper Use of a Dosimeter – Dosimeters are issued and must be worn in accordance with CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20, Ionizing Radiation and are used to measure occupational exposure at LACC Energized Laboratories, and Hospital Affiliates.

3. Where to Wear the Dosimeter – Dosimeter should be clipped to an article of clothing at the collar level, however, when working in Fluoroscopy or on Portable procedures, the Dosimeter is to be worn outside the lead apron, clipped to the uniform collar, never on the lead apron.

4. Misuse of the Dosimeter – A Dosimeter that has been assigned to an individual may not be used by any other person. The participants' number is a lifetime assignment and is not transferable to another person. OSL badges must not be tampered with in any manner. Keep your radiation monitoring badge away from extreme hot or cold temperatures, and radiation sources when not in use. Do not leave your OSL badge on lab coats, uniforms, or lead aprons. If OSL badges are lost, misplaced, or damaged, the Radiation Safety Officer (RSO) or designee must be notified promptly in writing, and the individual will not be allowed to work in the radiation area until a new radiation monitoring badge issued.

5. Exposure Data – Exposure results are available for students to review via their own personal OSL account at: https://www.OSL.com/Login.aspx

   The OSL Badge is required to be uploaded on the first day of each quarter, so that the radiation exposure reports will be available for students so they can be aware of his/her exposure each quarter well within the 30 day requirement. In addition, the RSO's shall ask the clinical affiliates to provide copies of the Landauer reports so they copies can be kept in the LACC Radiologic Technology Room RT 3 under the designated Clinical Affiliate Dosimeter Binder. Students are required to report in writing any unusual exposure to self or dosimeter immediately to the LACC Radiation Safety Officer/designee. Written radiation exposure reports will be available for each dosimeter wearer upon request.

6. If applicable, monthly Replacement of OSL Badge (at the hospital) – At the beginning of each month, the OSL Badge must be returned and replaced with a current OSL Badge (no later than the first Thursday of each month). The changing of the OSL Badge is the ultimate responsibility of the student. Late changing of the OSL Badge will make accurate OSL Badge evaluation impossible. Please be prompt.

7. Quarterly USB Badges Data (for the school) – At the first day of each quarter, the OSL Badge must be displayed and kept in the RT Building. Late submission of the OSL Badge will make accurate OSL Badge evaluation impossible. Please be prompt!

Radiation Exposure Limits
Occupational Dose Limits

The following occupational dose limits are referenced in the California State CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the Occupational Dose Limits

Nuclear Regulatory Commissions (NRC) code of federal regulations – 10-CFR-20, effective January 1, 1994 :Adult Whole Body Deep Dose	
Total Effective Dose Equivalent (TEDE)	50 mSv/year (5 rem/year)
Total Organ Dose Equivalent	500 mSv/year (50 rem/year) (organs other than eye, gonads, and blood forming organs)
Dose Equivalent for Lens of the Eye	150 mSv/year (15 rem/year)
Extremities Dose Equivalent	500 mSv/year (50 rem/year)
Shallow Dose Equivalent to skin	500 mSv/year (50 rem/year)
Embryo/Fetus: Total Dose Equivalent	5 mSv/gestation (.5 rem/gestation period) .5 mSv/year (.05 rem/month

Note:

- Total Effective Dose Equivalent (TEDE) is the sum of the deep dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposures).Whole body is defined as the head and trunk, active blood forming organs, and gonads.
- Embryo/fetus – The developing human organism from conception until the time of birth
- Deep Dose – dose to internal body parts at a depth of 1000 mg/cm^2
- Eye Dose – dose to the lens of the eye at a depth of 300 mg/cm^2
- Shallow Dose – dose to the skin at a depth of 7 mg/cm^2

Radiation Exposure Limits – Student Exposure Limits Policy

Overview
California State Department of Public Health – Radiologic Health Branch (DPH-RHB), recommends that student diagnostic radiographer's whole body deep dose exposure for a given month should not exceed 1 mSv/quarter (100mrem per Quarter).

Procedure
If the student's whole body exposure totals or exceeds 1 mSv (100 mrem) in a given quarter, the Attached **"Radiation Protection Safety Notification Warning"** must be issued by the RSO/designee.

1993 Dose Limits Recommended by NCRP – Education and Training Exposures	
Effective dose limit 1 mSv (100 mrem)	50 mSv/year (5 rem/year)
Equivalent dose limit for tissues and organs	Lens of eye 15 mSv (1500 mrem) Skin, hands, and feet 50 mSv (5000 mrem)

Radiation Protection Safety Notification Warning

Overview
The Radiologic Technology Program at LA City College adheres to the California State Department of Health-Radiologic Health Branch recommendations on ALARA Policy. The Radiologic Technology Program is committed to maintaining radiation exposure levels *As Low As Reasonably Achievable* (ALARA) while still allowing each student to obtain all required clinical and didactic competencies. Student exposures will be maintained in compliance with NCRP Report N0. 105. Page 14: Education and training exposures (annual) for those under age 18; Effective dose equivalent (1 mSv, 0.1 rem); above age 18; educational dose is equivalent to Occupational exposures (annual) 5 rem (5000 mrem, 50 mSv.)

Procedure
If the student exposure totals or exceeds the aforementioned limits, the RSO/designee must meet with the student, complete and maintain the following record of notification.

Name of student_____ Date_____

The Radiologic Technology Program wishes to inform you that the Radiation Report for the month of _____, 20____, report reveal that you have received:

Student exposures per NCRP Report N0. 105	
Deep dose	_____ mR
Eye dose	_____ mR
Shallow dose	_____ mR

- The RSO/designee will review with the student the Radiation Protection Safety

- **To assure compliance:**
  ☐ Students will:
  ☐ Take the extra time to assure they are properly protected under all circumstances (portable, fluoroscope, etc.)
  ☐ Practice ALARA time, distance, and shielding concepts.
  ☐ Always wear their dosimeter badge at collar level and OUTSIDE the apron.
  ☐ Do not allow the body to be in the primary beam.
  ☐ NEVER hold patients or an Image Receptor during an exam under any circumstances.
  ☐ NEVER use fluoroscopy to position patients.
  ☐ Take proper precautions with Radiation Monitoring badges by not leaving them in the radiation area.
  ☐ Report lost or damaged badges to the RSO of record immediately.

Radiation Protection Safety Notification Warning

Report to the Program Director any event involving by-product, source, or special nuclear material used by the student that may have caused or threatens to cause any excess exposure to the student, staff, or the public.

Program Staff will:

☐ Order and monitor the badge reports.
☐ Counsel students should badges exceed allowable amounts within one (1) week of badge report review – Remediation Plan and Outcomes form to be used.
☐ Average Quarterly Dose less than 100 mrem Require no action
☐ Any dose above 100 mrem, discussion with student and possibly with the Clinical Instructor.
☐ Each case will be dealt with as necessary
☐ Should the reading continue be high after the discussion, a Remediation Plan and Outcome Form will be completed and required discussion with the Clinical Preceptor will be implemented.
☐ Maintain Dosimetry Audit Report
☐ Report all infractions (variances) to the RSO
☐ In the event an unusual occurrence happens where any student or staff member is either exposed to a high-dose of radiation in a single event or if the badge reading is exceptionally high, the CA DPH-RHB will be notified as in Program Reporting Responsibility.

Guideline

Analysis of Radiation Monitoring Badge Reading

- Hospital/affiliate:_____
- Radiographic Area(s) Assigned:_____
- Total Dose since the beginning of the program:_____
- Possible reasons for exposure received ☹ List specific exams, dates, room assignments, and other information that may have contributed to the exposure listed above, especially involvement with Fluoroscopic, portable, and special procedures.)

Pregnancy Policy

Overview

According to CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99) the pregnant student/employee has the right to decide whether to declare her pregnancy or not. This voluntary decision can be withdrawn at any time. Upon written declaration of pregnancy by the student/employee the following procedures are required:

Procedure

The student/employee will:

- Submit a statement from her physician verifying pregnancy and expected due date.
- The statement must include the physician's recommendation as to which of the following options would be advisable (check one).

1. Immediate withdrawal from the program for health reasons with a plan of return.

2. Continued full-time status with limited rotation in fluoroscopy and portable/operating room procedures, including appropriate Radiation Safety precautions.

3. Continue full-time status without modification in clinical /lab assignment. **The physician's statement shall be submitted to the RSO and attached to this copy of the Policy. The student should sign this copy as proof that she has read and understands the procedure.**

4. Revoke declaration of pregnancy. The lower dose limit for the embryo/fetus will no longer apply, and the student will return to previous clinical assignments. (USNRC Regulatory Guide 8.13, appendix item 16, June 1999.)

Options for continuance in the program

5. A declared radiologic technology student has the option for continuing in the program without interruption provided that one follows the established safety guidelines/restrictions listed.

- If a declared pregnant student withdraws for health reasons and the program will work with the student to be readmitted to the LACC RT program.
- This should be done within one year from the date of withdrawal.

Pregnancy Policy

A. Consultation with the College's Radiation Safety Officer prior to continuation in college laboratory/hospital clinical assignments.
B. The RSO and the declared pregnant student/worker will review the Program's Radiation Protection Safety Guidelines, the declared pregnant student/worker policy, and the potential risks involving ionizing radiation to the developing embryo/fetus.
C. The pregnant student/worker will be informed of the specific exposure limits as: the dose to the embryo/fetus during the entire pregnancy, due to occupational exposure should not exceed .5 rem (500 mrem).
D. The R.S.O. will review the past exposure history and may adjust working conditions to avoid a monthly exposure rate of .05 rem (50 mrem) to the declared pregnant worker. Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99)
E. Two radiation monitoring badges/dosimeters will be worn throughout gestation. One shall be worn at the uniform collar, over the lead apron, and the other shall be worn at the waist, under the lead protective apron to monitor the embryo/fetus exposure. Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99)
F. A monthly radiation exposure log will be established throughout the entire gestation period. Analysis of the monthly exposure totals will be reviewed by both the pregnant student/worker and the RSO. This log will also document the entire past radiation exposure history.
G. The faculty shall make every effort to schedule the declared pregnant student/worker, at least for the first 18 weeks of gestation, in areas which do not involve fluoroscopy and portable/operating room procedures.
H. Specific radiation protection measures are required when participating in fluoroscopic, portable / C-Arm operating room procedures. The pregnant student/worker is to wear a lead apron (preferably .5 mm pb/eq.) with one dosimeter worn outside the apron at the collar, and the other under the lead apron at the waist level. These procedures do not need to be restricted (especially after the first 18 weeks of gestation) as long as their monthly radiation dose falls below the established limits.
    i. Time, distance, and shielding principles must be utilized by the pregnant worker.
I. The completed radiation record is to remain on file in the LACC Department of Radiologic Technology File Room of Records (RT Room 2). However, the recorded radiation exposure dose to the embryo/fetus will not be forwarded to a new employer unless the declared pregnant worker requests this in writing.

A student/worker may revoke the declaration of pregnancy. The lower dose limit for the embryo/fetus will no longer apply, and the student/worker will return to previous clinical assignments. (USNRC Regulatory Guide 8.13, appendix item 16, June 1999.) NOTE: Undeclared pregnant student/employee

_____ _____

Student Signature Date

_____

Print Student Name

Radiation Protection Guidelines for Pregnant Students and Faculty

Should a student or faculty member become pregnant while employed/enrolled in the Radiography Program, the student is under NO requirement to declare her pregnancy status to any individual associated with the program. Should the student Voluntarily Declare Pregnancy Status, a "Form letter for Declaring Pregnancy" shall be submitted to the Program Director/Radiation Safety Officer. At any time after declaring pregnancy should the student wish to reverse that decision, she may do so by submitting their intent in writing to the Program Director/Radiation Safety Officer. At that time, their status will revert to that in effect before her declaration.

Should the student elect NOT to declare their pregnancy status or reverse their declaration, it shall be understood that the program is under no requirement to afford any measures with regard to radiation safety other than those which are routinely afforded to all radiography students and faculty.

Should the gravid student declare and submit the declaration form to the Program Director, the following measures will become effective for the duration of her pregnancy or declaration while she is enrolled within or employed by the program:

1. The Program Director or Clinical Preceptor will initiate the use of the form entitled "Radiation Received during Gestational Period."
2. The student will be counseled by the Program Director, Clinical Preceptor, Chief Radiologist, Radiation Safety Officer, Radiation Physicist, or all five, regarding methods to protect herself from ionizing radiation, and she will be asked to read the previously distributed Regulatory Guide 8.13, and or NCRP Report No. 54 and the Technical Bulletin Radiation Safety Considerations for the Declared Pregnant Worker.
3. The student must wear a radiation monitor at all times when working with ionizing radiation. An additional badge must be worn at waist level, under the lead apron, and must not leave the hospital property at any time except when being sent out for processing and reading.
4. Students will have the option to continue their clinical education without modification, during the entire gestational period.
5. Rotations evaluations and/or clinic time missed because of pregnancy must be made up. The student will assume the responsibility of meeting with the Program Director and Clinical Preceptor to plan this make-up time.
6. Under NO circumstance will a pregnant student or any student hold or assist in holding a patient or image receptor during a radiographic exposure.
7. The student must bring to the Program Director, as soon as possible, written permission from her physician permitting her to continue her clinical assignments.
8. The student will not be permitted to receive a cumulative radiation dose exceeding 0.5 rem (500 millirems) during the gestation period. The following will be done to ensure that the limit is not exceeded:
    a. The radiation monitor reports will be carefully monitored during the

gestation period, noting averages and trends that may cause the cumulative exposure to exceed the limit. The results will be shared with the student following receipt of each exposure report.

b. The student will be counseled by the Program Director, Clinical Preceptor, Chief Radiologist, Radiation Safety Officer, Radiation Physicist, or all five, if and when the cumulative radiation dose during the gestation period reaches 250 mrem.

NRC Report and Regulatory Guide 8.13 will be followed.
Revision 3 NRC Report June 1999 Regulatory Guide 8.13 (Draft was issued as DG-8014)

Instruction Concerning Prenatal Radiation Exposure

1. Introduction

The Code of Federal Regulations in 10 CFR Part 19, "Notices, Instructions, and Reports to Workers: Inspection and Investigations," in Section 19.12 "Instructions to Workers," requires instructions in the "health protection problems associated with exposures to radiation and/or radioactive materials, in precautions or procedures to minimize exposure and in the purposes and functions of protective devices employed." The instructions must be "commensurate with potential radiological health protection problems present in the work place."

The Nuclear regulatory Commission's (NRC's) regulations on radiation protection are specified in 10 CFR Part 20, "Standards for Protection Against Radiation"; and 10 CFR 20.1208, "Dose to an Embryo/Fetus," requires licensees to "ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman does not exceed 0.5 (5 mSv)." Section 20.1208 also requires licensees to "make efforts to avoid substantial variation above uniform monthly exposure rate to a declared pregnant woman. A declared pregnant woman is defined in 10 CFR 20.1003 as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. This regulatory guide is intended to provide information to pregnant women, and other personnel, to help them make decisions regarding radiation exposure during pregnancy. This Regulatory Guide 8.13 supplements Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure" (Ref. 1), which contains a broad discussion of the risks from exposure to ionizing radiation.

Other sections of the NRC's regulations also specify requirements for monitoring external and internal occupational dose to a declared pregnant woman. In 10 CFR 20.1502, "Conditions Requiring Monitoring of External and Internal individual monitoring device, if it is likely that the declared pregnant woman will receive, from external sources, a deep dose equivalent in excess of 0.1 rem (1 mSv). According to Paragraph I of 10 CFR 20.21106, "Record of individual Monitoring Results," the licensee must maintain records of dose to an embryo/fetus if monitoring was required, and the records of dose to the embryo/fetus must be kept with the records of dose to the declared pregnant woman. The declaration of pregnancy must be kept on file, but may be maintained separately from the dose records. The licensee must retain the required form or record until the Commission terminates each pertinent license requiring the record. The information collections in this regulatory guide are covered by the requirements of 10 CFR Parts 19 or 20, which were approved by the Office of Management and Budget (OMB), approval numbers 3150-0044 and 3150-0014, respectively. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

2. Discussion

As discussed in Regulatory Guide 8.29 (Ref. 1), exposure to any level of radiation is assumed to carry with it a certain amount of risk. In the absence of scientific certainty regarding the relationship between low dose exposure and health effects, and as a conservative assumption for radiation protection purposes, the scientific

community generally assumes that any exposure to ionizing radiation may cause undesirable biological effects and that the likelihood of these effects increases as the dose increases. At the occupational dose limit for the whole body of 5 rem (50 mSv) per year, the risk is believed to be very low.

The magnitude of risk of childhood cancer following in-utero exposure is uncertain in that both negative and positive studies have been reported. The data from these studies "are consistent with lifetime cancer risk resulting from exposure during gestation which is two or three times that for the adult" (NCRP Report No. 116, Ref. 2). The NRC has reviewed the available scientific literature and has concluded that the 0.5 rem (5 mSv) limit specified in 10 CFR 20.1208 provides an adequate margin of protection for the embryo/fetus. This dose limit reflects the desire to limit the total lifetime risk of Leukemia and other cancers associated with radiation exposure during pregnancy.

In order for a pregnant worker to take advantage of the lower exposure limit and dose monitoring provisions specified in 10 CFR Part 20, the woman must declare her pregnancy in writing to the licensee. A form letter for declaring pregnancy is provided in this guide or the licensee may use its own form letter for declaring pregnancy. A separate written declaration should be submitted for each pregnancy.

3. Regulatory Position

1. Who Should Receive Instruction?

   Female workers (or students) who require training under 10 CFR 19.12 should be provided with the information contained in this guide. In addition to the information contained in Regulatory Guide 8.29 (Ref. 1), this information may be included as part of the training required under 10 CFR 19.12.

2. Providing Instruction

   The occupational worker/student may be given a copy of this guide with its Appendix, an explanation of the 8.13- 8.13-2 contents of the guide, and an opportunity to ask questions and request additional information. The information in this guide and Appendix should also be provided to any worker/student or supervisor who may be affected by a declaration of pregnancy or who may have to take some action in response to such a declaration.

   Classroom instruction may supplement the written information. If the licensee provides classroom instruction, the instructor should have some knowledge of the biological effects of radiation to be able to answer questions that may go beyond the information provided in this guide. Videotaped presentations may be used for classroom instruction.

   Regardless of whether the licensee provides classroom training, the licensee should give workers/students the opportunity to ask questions about the information contained in this Regulatory Guide 8.13. The licensee may take credit for instruction the worker/student has received within the past year at other licensed facilities or in other courses or training.

3. Licensee's Policy on Declared Pregnant Women

The instruction provided should describe the licensee's specific policy on declared pregnant

women, including how those policies may affect a woman's work situation. In particular, the instruction should include a description of the licensee's policies, if any, that may affect the declared pregnant woman's work situation after she has filed a written declaration of pregnancy consistent with 10 CFR 20.1208. The instruction should also identify who to contact for additional information as well as identify who should receive the written declaration of pregnancy. The recipient of the woman's declaration may be identified by name (e.g., John Smith), position (e.g., immediate supervisor, the radiation safety officer), or department (e.g., the personnel department).

4. Duration of Lower Dose Limits for the Embryo/Fetus

   The lower dose limit for the embryo/fetus should remain in effect until the woman withdraws the declaration in writing or the woman is no longer pregnant. If a declaration of pregnancy is withdrawn, the dose limit for the embryo/fetus would apply only to the time from the estimated date of conception until the time the declaration is withdrawn. If the declaration is not withdrawn, the written declaration may be considered expired one year after submission.

5. Substantial Variations above a Uniform Monthly Dose Rate

   According to 10 CFR 20.1208 (b), "The licensee shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in paragraph (a) of this section," that is, 0.5rem (5mSv) to the embryo/fetus. The National Council on Radiation Protection and Measurements (NCRP) recommends a monthly equivalent dose limit of 0.05 rem (0.5 mSv) to the embryo/fetus once the pregnancy is known (Ref. 2). In view of the NCRP recommendation, any monthly dose of less than 0.1 rem (1 mSv) may be considered as not a substantial variation above a uniform monthly dose rate and as such will not require licensee justification. However, a monthly dose greater than 0.1 rem (1 mSv) should be justified by the licensee. 8.13-8.13-3

Implementation

The purpose of this section is to provide information to licensees and applicants regarding the NRC staff's plans for using this regulatory guide. Unless a licensee or an applicant proposes an acceptable alternative method for complying with the specified portions of the NRC's regulations, the methods described in this guide will be used by the NRC staff in the evaluation of instructions to workers/students on the radiation exposure of pregnant women.

REFERENCES

1. USNRC, "Instruction Concerning Risks from Occupational Radiation Exposure," Regulatory Guide 8.29 Revision 1, February 1996.

2. National Council on Radiation Protection and Measurements, Limitation of Exposure to Ionizing Radiation, NCRP Report No. 116, Bethesda, MD, 1993. 8.13-8.13-4 APPENDIX

Questions and Answers Concerning Prenatal Radiation Exposure

1. Why am I receiving this information?

   The NRC's REGULATIONS (IN CFR 19.12, "Instructions to Workers') require that licensees instruct individuals working with licensed radioactive materials in radiation protection as appropriate for the situation. The instruction below describes information that occupational workers/students and their supervisors should know about the radiation exposure of the embryo/fetus of pregnant women. The regulations allow a pregnant woman to decide whether she wants to formally declare her pregnancy to take advantage of lower dose limits for the embryo/fetus. This instruction provides information to help women make an informed decision whether to declare a pregnancy.

2. If I become pregnant, am I required to declare my pregnancy?

   No. The choice of whether to declare your pregnancy is completely voluntary. If you choose to declare your pregnancy, you must do so in writing and a lower radiation dose limit will apply to your embryo/fetus. If you choose not to declare your pregnancy, you and your embryo/fetus will continue to be subject to the same radiation dose limits that apply to other occupational workers.

3. If I declare my pregnancy in writing, what happens?

   If you choose to declare your pregnancy in writing, the licensee must take measures to limit the dose to your embryo/fetus to 0.5 rem (5 mSv) during the entire pregnancy. This is one-tenth of the dose that an occupational worker/student may receive in a year. If you have already received a dose exceeding 0.5 rem (5 mSv) in the period between conception and the declaration of your pregnancy, an additional dose of 0.05 rem (0.5 mSv) is allowed during the remainder of the pregnancy requires licensees to make efforts to avoid substantial variation above a uniform monthly dose rate so that all the 0.5 rem (5 mSv) allowed dose does not occur in a short period during the pregnancy. This may mean that, if you declare your pregnancy, the licensee may not permit you to do some of your normal job functions if those functions would have allowed you to receive more than 0.5 rem, and you may not be able to have some emergency response responsibilities.

4. Why do the regulations have a lower dose limit for the embryo/fetus of a declared pregnant woman than for a pregnant worker who has not declared?

   A lower dose limit for the embryo/fetus of a declared pregnant woman is based on a consideration of greater sensitivity to radiation of the embryo/fetus and the involuntary nature of the exposure. Several scientific advisory groups have recommended (References 1 and 2) that the dose to the embryo/fetus be limited to a fraction of the occupational dose limit. 8.13-8.13-5

5. What are the potentially harmful effects of radiation exposure to my embryo/fetus?

   The occurrence and severity of health effects caused by ionizing radiation are dependent upon the type and total dose of radiation received, as well as the time period over which the exposure was received. See Regulatory GUIDE 8.29, "Instruction Concerning Risks from Occupational Exposure" (Ref.3), for more information. The main concern is embryo/fetus susceptibility to the harmful effects of radiation such as cancer.

6. Are there any risks of genetic defects?

Although radiation injury has been induced experimentally in rodents and insects, and in the experiments, it was transmitted and became manifest as hereditary disorder in their offspring, radiation has not been identified as a cause of such effect in humans. Therefore, the risk of genetic effects attributable to radiation exposure is speculative. For example, no genetic effects have been documented in any of the Japanese atomic bomb survivors, their children, or their grandchildren.

7. What if I decide that I do not want any radiation exposure at all during my pregnancy?

You may ask your employer/clinical preceptor for a rotation that does not involve any exposure at all to occupational radiation dose, but your employer/clinical preceptor is not obligated to provide you with a rotation involving no radiation exposure. Even if you receive no occupational exposure at all, your embryo/fetus will receive some radiation dose (on average 75 mrem (0.75 mSv) during your pregnancy from natural background radiation. The NRC has reviewed the available scientific literature and concluded that the 0.5 rem (5 mSv) limit provides an adequate margin of protection for the embryo/fetus. This dose limit reflects the desire to limit the total lifetime risk of leukemia and other cancers. If this dose limit is exceeded, the total lifetime risk of cancer to the embryo/fetus may increase incrementally. However, the decision on what level of risk to accept is yours. More detailed information on potential risk to the embryo/fetus from radiation exposure can be found in References 2-10.

8. What effect will formally declaring my pregnancy have on my job/RT student status?

Only the licensee can tell you what effect a written declaration of pregnancy will have on your job /student status. As part of your radiation safety training, the licensee should tell you the company's policies with respect to the job/student status of declared pregnant women. In addition, before you declare your pregnancy, you may want to talk to your supervisor/Program Director or your radiation safety officer and ask what a declaration of pregnancy would mean specifically for you and your job/student status. In many cases you can continue in your present job/clinical rotation with no change and still meet the dose limit for the embryo/fetus. For example, most commercial power reactor workers (approximately 93%) receive, in 12 months, occupational radiation doses that are less than 0.5 rem (5 mSv) (Ref. 11). The licensee may also consider the likelihood of increased radiation exposures from accidents and abnormal events before making a decision to allow you to continue in your present job/rotation. 8.13-8.13-6

If your current work/rotation might cause the dose to your embryo/fetus to exceed 0.5 rem (5 mSv), the licensee has various options. It is possible that the licensee can and will make a reasonable accommodation that will allow you to continue performing your current job/rotation, for example, by having another qualified employee do a small part of the job that accounts for some of your radiation exposure.

9. What information must I provide in my written declaration of pregnancy?

You should provide, in writing, your name, a declaration that you are pregnant, the estimated date of conception (only the month and year need be given), and the date that you give the letter to the licensee. A form letter that you can use is included at the end of these questions and answers. You may

use that letter, use a form letter the licensee has provided to you, or write your own letter.

10. To declare my pregnancy, do I have to have documented medical proof that I am pregnant?

    NRC regulations do not require that you provide medical proof of your pregnancy. However, NRC regulations do not preclude the licensee from requesting medical documentation of your pregnancy, especially if a change in your duties is necessary in order to comply with the 0.5 rem (5 mSv) dose limit.

11. Can I tell the licensee orally rather than in writing that I am pregnant?

    No. The regulations require that the declarations must be in writing.

12. If I have not declared my pregnancy in writing, but the licensee suspects that I am pregnant, do the lower dose limits apply?

    No. The lower dose limits for pregnant women apply only if you have declared your pregnancy in writing. The United States Supreme Court has ruled (in United Automobile Workers International Union v. Johnson Controls, Inc., 1991) that "Decisions about the welfare of future children must be left to the parents who conceive, bear, support, and raise them rather than to the employers who hire those parents" (Reference 7). The Supreme Court also ruled that your employer may not restrict you from a specific job "because of concerns about the next generation." Thus, the lower limits apply only if you choose to declare your pregnancy in writing.

13. If I am planning to become pregnant but am not yet pregnant and I inform the licensee of that in writing, do the lower dose limits apply?

    No. The requirement for lower limits applies only if you declare in writing that you are already pregnant.

14. What if I have a miscarriage or find out that I am not pregnant?

    If you have declared your pregnancy in writing, you should promptly inform the licensee in writing that you are no longer pregnant. However, if you have not formally declared your pregnancy in writing, you need not inform the licensee of your non-pregnant status.

15. How long is the lower dose limit in effect?

    The dose to the embryo/fetus must be limited until you withdraw your declaration in writing or you inform the licensee in writing that you are no longer pregnant. If the declaration is not withdrawn, the written declaration may be considered expired one year after submission.

16. If I have declared my pregnancy in writing, can I revoke my declaration of pregnancy even if I am still pregnant?

    Yes, you may. The choice is entirely yours. If you revoke your declaration of pregnancy, the lower dose limit for the embryo/fetus no longer applies.

17. What if I work under contract at a licensed facility?

The regulations state that you should formally declare your pregnancy to the licensee in writing. The licensee has the responsibility to limit the dose to the embryo/fetus.

18. Where can I get additional information?

The references to this Appendix contain helpful information, especially Reference 3, NRC's Regulatory Guide 8.29, and "Instruction Concerning Risks from Occupational Radiation Exposure," for general information on radiation risks. The licensee should be able to give this document to you.

For information on legal aspects, see Ref 7, "The Rock and the Hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children--- What can the employer do?" which is an article in the journal Radiation Protection Management.

You may telephone the NRC Headquarters at (301) 415-7000. Legal questions should be directed to the Office of the General Counsel, and technical questions should be directed to the Division of Industrial and Medical Nuclear Safety. You may also telephone the NRC Regional

Offices at the following numbers: Region I, (610) 337-5000; Region II, (404) 562-4400; Region III, (630) 829- 9500; and Region IV, (817) 860-8100. Legal questions should be directed to the Regional Counsel, and technical questions should be directed to the Division of Nuclear Materials Safety. 8.13-8

References

1. National Council on Radiation Protection and Measurements, Limitation of Exposure to Ionizing Radiation, NCRP Report No. 116, Bethesda, MD, 1993.
2. International Commission on Radiological Protection, 1990 Recommendations of the International Commission on Radiological Protection, ICRP Publication 60, Ann. ICRP 21: No. 1-3, Pergamon Press, Oxford, UK, 1991.
3. USNRC, 'Instruction Concerning the Risks from Occupational Exposure," Regulatory Guide 8.29, Revision 1, February 1996.11 (Electronically available at www.nrc.gov/NRC/RG/index.html)
4. Committee on the Biological Effects of Ionizing Radiations, National Research Council, Health Effects of Exposure to Low Levels of Ionizing Radiation (BEIR V), National Academy Press, Washington, DC,1990.
5. United Nations Scientific Committee on the Effects of Atomic Radiation, Sources and Effects of Ionizing Radiation, United Nations, New York, 1993.
6. R.Doll and R. Wakeford, Risk of Childhood Cancer from fetal Irradiation," The British Journal of Radiology, 70, 130-139, 1997.
7. David Wiedis, Donald E. Jose, and Timm O. Phoebe, "The Rock in the hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children--- What can an Employer Do? Radiation Protection Management, 11, 41-49, January/February 1994.
8. National Council on Radiation Protection and Measurements, Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus, or Nursing Child, NCRP Commentary No.

9, Bethesda, MD, 1994.

9. National Council on Radiation Protection and Measurements, Risk Estimates for Radiation Protection, NCRP Report No. 115, Bethesda, MD, 1993. 1Single copies of regulatory guides, both active and draft, and draft NUREG documents may be obtained free of charge by writing the Reproduction and Distribution Services Section, OCIO, USNRC, Washington, DC 20555- 0001, or by fax to (301)415-2289, or by email to Distribution@NRC.Gov. Active guides may also be purchased from the National Technical Information Service on a standing order basis. Details on this service may be obtained by writing NTIS, 5285 Port Royal Road, Springfield, VA 22161.

   Copies of active and draft guides are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW, Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343. 8.13-8.13

10. National Radiological Protection Board, Advice on Exposure to Ionizing Radiation during Pregnancy, National Radiological Protection Board, Chilton, Didcot, UK, 1998.

11. M.L. Thomas and D. Hagemeyer, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and other Facilities, 1996, "Twenty Ninth Annual Report, NUREG 0713, Vol. 18 USNRC, 1998.22 2Copies are available at current rates from the U.S. Government Printing Office, P.O. Box 37082, Washington, 20402- 9328 (telephone (202)512-1800); or from the National Technical Information Service by writing NTIS at 5285 Port Royal Road, Springfield, VA 22161.

    Copies are available for inspection or copying for a fee from the NRC Public Document Room at 2120 L Street NW., Washington, DC; the PDR's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202) 634-3273; fax (202) 634-3343 (8.13-8.13-10)

Regulatory Analysis-USDA Program

A separate regulatory analysis was not prepared for this regulatory guide. A regulatory analysis prepared for 10 CFR Part 20, “Standards for Protection Against Radiation” (56 FR 23360), provides the regulatory basis for this guide and examines the costs and benefits of the rule as implemented by the guide. A copy of the “Regulatory Analysis for the Revision of 10 cfr Part 20” (PNL-6712, November 1988) is available for inspection and coping for a fee at the NRC Public Document Room, 2120 L Street NW, Washington, DC, as an enclosure to Part 20 (56 FR 23360). 8.13- 8.13-12.

United States Department of Agriculture-Office of Human Resources Management Safety and Health Management Division

Radiation Safety Considerations for the Declared Pregnant Woman

Background

As part of its radioactive materials license, the U. S. Department of Agriculture (USDA) has committed to a safe Environment for all individuals working with radioactive materials or x-ray producing equipment.

The Nuclear Regulatory Commission’s (NRC) Standards for Protection against Radiation (10 CFR Part 20) require that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). This dose is ten times lower than the occupational dose allowed for a radiation worker.

This document describes how to implement a program that satisfies this safety requirement. This document covers the following topics:

- What is a Declared Pregnant Woman?
- USDA Program
- Frequently Asked Questions
- How to Officially Declare a Pregnancy
- Steps to Lower Radiation Dose
- Sources of Additional Information
- Specific References
- Questions Regarding this Bulletin
- Suggested Form Letter for Declaring Pregnancy

Approved by: John T. Jensen – Director, Radiation Safety Staff
Date: 9/6/96

What Is a Declared Pregnant Woman?

Definition: A declared pregnant woman is defined in the NRC regulations as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

The Purpose of Declaration

The purpose of making the declaration is to have the employer (Program Director/Clinical Preceptor) take steps to ensure that the embryo/fetus is monitored for radiation exposure during the pregnancy and that the radiation dose is within regulatory limits.

What Is a Declared Pregnant Woman?

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The Purpose of Declaration

The purpose of making the declaration is to have the LACC Program Director and Clinical Preceptor take steps to ensure that the embryo/fetus is monitored for radiation exposure during the pregnancy and the radiation dose is within regulatory limits.

USDA Program

Overview
Regulations require that licensees instruct individuals working with radioactive materials in radiation protection as appropriate for the situation. In particular, radiation protection regulations allow a pregnant woman to decide whether she wants to formally declare her pregnancy to her employer (Program Director and Clinical Preceptor), thereby taking advantage of the special dose limits provided to protect the developing embryo/fetus. Federal safety regulations are gender neutral, and it is inappropriate for facility management to arbitrarily place additional restrictions on a woman who appears to be pregnant.

By training, women who become pregnant should be aware of the additional safety precautions available to them to ensure a low radiation exposure during the gestation period. However, they may be satisfied with their current work (clinical training) situation and believe that existing precautions and procedures provide an adequate measure of safety during their pregnancy. It is for this reason that the USDA program is voluntary.

Training
Instruction concerning prenatal radiation exposure and its risks to the embryo/fetus will be provided to the radiation workers (radiologic technology students) before she is allowed to work (rotate) in a restricted area. Each supervisor (Program Director and/or Clinical Preceptor) of a female worker (student) who will receive an occupational dose in a restricted area or a Permit Holder supervising a female Associate User, should also receive this instruction. Attendance records indicating the date of training and the individuals trained (including their signatures) must be maintained by the facility.

Type of Training
The training should be presented both orally and in written form. Copies of the Frequently Asked Questions and Steps to Lower Radiation Dose (or this entire Technical Bulleting) should be included. Workers (students) should be given the opportunity to ask questions.

Duration of Lower Dose Limits
The lower dose limit of 0.5 rem (5 mSv) is in effect until the declared pregnant woman:

- Is known to have given birth;
- Informs the facility that she is no longer pregnant; or
- Informs the facility that she no longer wants to be considered a declared pregnant woman.
- Twelve months after the declaration is submitted, the declaration will expire.

Additional Consultation
After declaring her pregnancy, the woman should discuss her work (clinical training) situation with her supervisor (Program Director, Clinical Coordinator, Clinical Preceptor), permit holder, Radiation Safety Officer (RSO), or other management representatives.

The purpose of this consultation is to review past radiation exposures in the facility and determine the changes in clinical training practices, if any, that are to be made, etc.

Any agreed changes or an acknowledgment that no changes are necessary should be written and signed by all parties.

Facility Management Responsibilities
Each USDA facility should review this guidance and determine how the information will be incorporated into its personnel management system. Statement from the declared pregnant woman that she has received additional training (such as a review of the Frequently Asked Questions) and consultation regarding her work (didactic education/clinical training) situation. The RSO, permit holder, supervisor, personnel officer, or other appropriate individual should also sign any additional consulting or training documentation.

Note: The Frequently Asked Questions, How to Officially Declare a Pregnancy, Steps to Lower Radiation Concerning Prenatal Radiation Exposure.

Frequently Asked Questions (FAQs)

1. **If I become pregnant, am I required to inform my employer (Program Director) of my pregnancy?**
   No. It is your choice whether to declare your pregnancy to your employer (Program Director). If you choose to declare your pregnancy, a lower radiation dose limit will apply to you. If you choose not to declare your pregnancy, you will continue to be subject to the same radiation dose limits that apply to non-pregnant students, even if you are visibly pregnant.

2. **If I inform my employer (Program Director) in writing of my pregnancy, what happens?**
   The amount of radiation that you will be allowed to receive will decrease because there is a lower dose limit for the embryo/fetus of female workers() who have formally declared their pregnancy in writing. Ordinarily, the radiation dose limit for a a worker() is 5 rems (50 millisieverts) in a year. But if you declare in writing that you are pregnant, the dose to the embryo/fetus is generally limited to 0.5 rem (5 millisieverts) during the 9-month pregnancy, which is one-tenth of the dose limit that an adult worker() may receive in a year. In addition, licensees must try to avoid substantial variation above a uniform monthly dose rate so that all the dose received does not occur during a particular time of the pregnancy. This may mean that, if you declare your pregnancy, you may not be permitted to perform some of your regular job functions and you may not be able to have emergency response responsibilities.

7. Why do the regulations have a lower dose limit for a woman who has declared her pregnancy than for a normal worker?

3. The purpose of the lower limit is to protect her unborn child. Scientific advisory groups recommend that the dose before birth be limited to about 0.5 rem rather than the 5 rem (50 millisieverts) occupational annual dose limit because of the sensitivity of the embryo/fetus to radiation.[1,2] Possible effects include deficiencies in the child's development, especially the child's neurological development, and an increase in the likelihood of cancer.

8. What effects on development can be caused by radiation exposure?

4. The effects of large doses of radiation on human development are quite evident and easily measurable, whereas at low doses the effects are not evident or measurable and therefore, must be inferred. For example, studies of the effects of radiation on animals and humans demonstrate clearly and conclusively that large doses of radiation such as 100 rems (1 sievert) organs when the radiation is delivered during the period of rapid organ development[2,3,4,5]. The developing human brain has been shown to be especially sensitive to radiation. Intellectual disability has been observed in the survivors of the atomic bombings in Japan exposed in utero during sensitive periods. Additionally, some other groups exposed to radiation in utero have shown lower than average intelligence scores and poor performance in school[4].

The sensitivity of the brain undoubtedly reflects its structural complexity and its long developmental period (and hence long sensitive period); the most sensitive period is during about the 8th to 15th weeks of gestation followed by a substantially less sensitive period for the two months after the 15th week[4]. There is no known effect on the child's developing brain during the first two months of pregnancy or the last three months of pregnancy[4].

No developmental effects caused by radiation have been observed in human groups at doses at or below the 5-rem (50 millisievert) occupational dose limit. Scientists are uncertain whether there are developmental effects at doses below 5- rems (50 millisievert). It may be that the effects are present but are too mild to measure because of the normal variability from one person to the next and because the tools to measure the effects are not sensitive enough. Or it may be that there is some threshold dose below which there are no developmental effects.

In view of the possibility of developmental effects, even if very mild, at doses below 5-rem (50 millisieverts), scientific advisory groups consider it prudent to limit the dose to the embryo/fetus to 0.5 rem (5 millisieverts)[1,2]. At doses greater than 5 rems (50 millisierverts), such as might be received during an accident or during emergency response activities, the possibility of developmental effects increases.

5. How much will the likelihood of cancer be increased?

?

Radiation exposure has been found to increase the likelihood of cancer in many studies of adult human and animal groups. At doses below the occupational dose limit, an increase in cancer incidence has not been proven but is presumed to exist even if it is too small to be measured. The question is whether the embryo/fetus is more sensitive to radiation than an adult.

While the evidence for increased sensitivity of the embryo/fetus to cancer induction from radiation exposure is inconclusive, it is prudent to assume that there is some increased sensitivity. Scientific advisory groups assume that amount of radiation received as an adult[1]. If this is true, there would be 1

radiation-induced cancer death in 200 people expose in utero at the occupational dose limit of 5 rems (50 millisievert)[1]. Scientific advisory groups have considered this risk to be too high and have thus recommended that the radiation dose to the embryo/fetus be limited to a maximum of 0.5 rem (5 millisieverts). At that dose, there would be 1 radiation induced cancer death per 2000 people. This would be in addition to the 400 cancer deaths from all causes that one would normally expect in a group of 2000 people.

9. How does the risk to the embryo/fetus from occupational radiation exposure **compared** to other avoidable risks?

The risk to the embryo/fetus from 0.5 rem or even 5 rems of radiation exposure is relatively small compared to some other avoidable risks.

Of particular concern is the excessive consumption of alcohol during pregnancy. The U.S. Public Health Service has concluded that heavy alcohol consumption during pregnancy (three drinks per day and above) is the leading known cause of intellectual disability[6]. Children whose mothers drank heavily during pregnancy may exhibit developmental problems such as hyperactivity, distractibility, short attention spans, language difficulties, and delayed maturation, even when their intelligence is average.

In studies tracking the development of children born to light or moderate drinkers, researchers have also correlated their mothers' drinking patterns during pregnancy with low birth weight, decreased attention spans, delayed reaction times, and lower IQ scores at age four years. Youngsters whose mothers averaged three drinks per day during pregnancy were likely to have five points lower Iqs than normal.

Cigarette smoking may also harm the unborn[6]. There is a direct correlation between the amount of smoking during pregnancy and the frequency of spontaneous abortion and fetal death. Children of mothers who smoke while pregnant are more likely to have impaired intellectual and physical growth. Maternal smoking has also been associated with such behavioral problems in offspring as lack of self-control, irritability, hyperactivity, and disinterest. Long-term studies indicate that these children perform less well than matched youngsters of nonsmokers on tests of cognitive, psychomotor, language, and general academic functioning.

Alcohol and smoking are only examples of other risks in pregnancy. Many other toxic agents and drugs also present risk. In addition, many factors that cannot be controlled present risk. There is an increased risk in pregnancy with increasing maternal age. Maternal disease may be an important risk factor. Malnutrition, toxemia, and congenital rubella may be associated with birth defects. Maternal diabetes and high blood pressure have been associated with problems in the newborn.

Furthermore, many birth defects and developmental problems occur without an obvious cause and without any obvious risk factors. For example, viruses that we may not even be aware of can cause defects, which can arise from spontaneous random errors in cell reproduction. But these are things that we cannot do anything about.

In summary, you are advised to keep radiation exposure of your unborn child below 0 – 0.5 rem.

Still, you should also remember that alcohol consumption, cigarette smoking, and the use of other drugs can do a great deal of harm.

10. What if I decide that I do not want any radiation exposure at all during my pregnancy?

You may ask your employer (Program Director and Clinical Preceptor) for a job (clinical rotation) that does not involve occupational radiation exposure. However, your employer (Program Director/Clinical Preceptor) may not have such a position or may not be willing to provide you with a job (clinical rotation) involving no radiation exposure. Even if you receive no occupational exposure, you will receive a dose typically about 0.3 rem (3 millisieverts) from unavoidable natural background radiation[7].

11. How will formally declaring my pregnancy affect my job (RT Student) status?

Only your employer (Program Director) can tell you what effect a declaration of pregnancy will have on your job (RT Student) status. As part of your radiation safety training, your employer (Program Director/Radiation Safety Officer) should tell you the policies concerning the job (RT Student) status of declared pregnant women. In addition, the program recommends that, before you declare your pregnancy, you should talk to your employer (Program Director/Radiation Safety Officer) and ask what a declaration of pregnancy would mean specifically for you and your job (RT Student) status.

However, if you do not declare your pregnancy, the lower exposure limit of 0.5 rem (5 millisieverts) does not apply. It is most likely that your employer (Program Director/Radiation Safety Officer) will tell you that you can continue to perform your job (clinical rotation) with no changes and the occupational radiation doses above the 0.5 rem (5 millisievert) is limited for declared pregnant women.

Note: No USDA employees (RT student) have received, in nine months, occupational radiation doses that are above the 0.5 rem.

If the dose you currently receive is above the 0.5 rem (5 millisievert) dose allowed for a declared pregnant woman, it is quite likely that your employer (Program Director/Radiation Safety Officer/Clinical Preceptor) can and will make a reasonable accommodation that will allow you to continue performing your current job (RT student training).

On the other hand, it is possible, although not common, that your employer (Program Director/Radiation Safety Officer) will conclude that there is no reasonable accommodation that can be made without undue hardship that would allow you to do your job (RT student training) and remain within the dose limits for a declared pregnant woman. In these few instances, your employer (Program Director/Radiation Safety Officer) may conclude that you can no longer be permitted to do your current job (RT student training), that you must be removed from your job (RT student training), for example, your physician requires you to bed rest for the duration of your pregnancy.

If your employer (Program Director/Radiation Safety Officer) concludes that you must be removed from your current job (clinical training) in order to comply with the lower dose limits for declared pregnant women, you may be concerned about what will happen to you and your job (RT student status). The answer to that depends on your particular situation. That is why you should talk to your

employer (Program Director/Radiation Safety Officer) about your particular situation. In addition, telephone numbers that may be useful for obtaining information are listed in the Sources of Additional Information.

How to Officially Declare A Pregnancy

1. What information must I provide in my declaration of pregnancy?

You must provide your name, a declaration that you are pregnant, the estimated date of conception (only the month and year need to be given), and the date of the letter given to your employer (Program Director/Radiation Safety Officer). The declaration is included in this bulletin (document). You may use that letter or write your own letter.

2. To declare my pregnancy, do I have to have documented medical proof that I am pregnant?

No proof is necessary.

3. Can I tell my employer (Program Director/Radiation Safety Officer) orally rather than in writing that I am pregnant?

No, the declaration must be in writing. As far as the regulations are concerned, an oral declaration or statement is the same as not telling your employer that you are pregnant.

4. If I have not declared my pregnancy in writing, but my employer (Program Director/Radiation Safety Officer) notices that I am pregnant, do the lower dose limits apply?

No. The lower dose limits for pregnant women apply only if you have declared your pregnancy in writing. The choice of whether to declare your pregnancy and thereby work under the lower dose limits is your choice, not your employer's (Program Director/Radiation Safety Officer (RSO)). Your employer (Program Director/Radiation Safety Officer) may not remove you from a specific job because you appear pregnant.

5. If I am planning to become pregnant but am not yet pregnant, and I inform my employer of that in writing, do the lower dose limits apply?

No. the lower limits apply only if you declare that you are already pregnant.

6. What if I have a miscarriage or find out I am not pregnant?

If you have declared your pregnancy in writing, you should promptly inform your employer that you are no longer pregnant. The regulations do not require that the revocation of a declaration be in writing, but we recommend that you revoke the declaration in writing to avoid confusion. Also, your employer may insist upon a written revocation for its own protection. If you have not declared your pregnancy, there is no need to inform your employer of your new, non-pregnant status. If you have a miscarriage and become pregnant again before you have revoked your original declaration of pregnancy, you should submit a new declaration of pregnancy because the date of conception has

changed.

7. How long is the lower dose limit in effect?

The dose to the embryo/fetus must be limited until:

1. Your employer (Program Director and RSO) knows you have given birth;
2. You inform your employer (Program Director and RSO) that you are no longer pregnant;
3. You inform your employer (Program Director and RSO) that you no longer wish to be considered pregnant.

8. If I have declared my pregnancy in writing, can I revoke my declaration of pregnancy even if I am still pregnant?

Yes, you may. The choice is entirely yours. If you revoke your declaration of pregnancy, the lower dose limits no longer apply.

9. Can I tell my employer (Program Director/RSO) I am pregnant when I know I am not just to work (train) under the lower dose limits?

The purpose of the NRC regulations is to allow a pregnant woman to choose a heightened level of protection from radiation exposure for the embryo/fetus during her pregnancy. That purpose would not be served by intentionally declaring yourself to be a pregnant woman when you know you are not pregnant. There are no NRC regulatory requirements specifically addressing the actions your employer (Program Director/RSO) might take if you provide a false declaration. However, nothing in NRC regulations would prevent your employer (Program Director/RSO) from taking action against you for deliberately lying.

Steps to Lower Radiation Dose

Your employer (Program Director/RSO) should already have explained how to keep radiation doses low as part of the instructions that are given to all workers (RT students). However, it would be best if you asked your supervisor (Program Director) or the RSO whether any additional steps can be taken.

External Radiation Exposure

External radiation is the radiation you receive from sources or radioactive materials outside your body. Time, distance, and shielding are fundamental principles for reducing external radiation exposure. Decrease your time near radiation sources, increase your distance from radiation sources, and increase the shielding between yourself and the source. You should work quickly and efficiently in radiation areas so that you are not exposed to the source any longer than necessary. As the distance is increased from the radiation source, the dose decreases. When possible, you should work behind shielding. The shielding will absorb some of the radiation, thus reducing the amount that reaches you.

Internal Radiation Exposure

Internal radiation is the radiation you receive from radioactive materials that have entered your body,

generally through the air you breathe, the food you eat, or the water you drink. Your employer (RSO) will have specific procedures to minimize internal radiation exposure. Those procedures probably incorporate the following general precautions that should be taken when you are working with radioactive materials that are not encapsulated:

1. Wear lab coats or other protective clothing if there is a possibility of spills.
2. Use gloves while handling encapsulated radioactive materials.
3. Wash hands after working with encapsulated radioactive materials.
4. Do not eat, drink, smoke, or apply cosmetics in areas with encapsulated radioactive material.
5. Do not pipette radioactive solutions by mouth.

These basic principles should be incorporated into the specific methods and procedures for doing your work (clinical training). Your employer (Program Director/RSO) should have trained you in those specific rules and procedures. If you become pregnant, it is an excellent time to review the training materials on the methods and procedures that you were provided in your clinical education and training. You can also talk to your supervisor about getting refresher training on how to keep radiation doses As Low As Reasonably Achievable (ALARA).

Sources of Additional Information

The USDA's Radiation Safety Handbook contains specific information regarding the types and amounts of radioactive materials and radiation sources used within the Department. The overall Radiation Safety Program is also described.

You can find additional information on the U.S. Nuclear Regulatory Commission (NRC) website, or you can also telephone the NRC Regional Offices at the following numbers:

1-800-368-5642
301-415-7000

Region I (800) 432-1156
Region II (800) 577-8510
Region III (800) 522-3025
Region IV (800) 952-9677

These regions are described on NRC Form-3 "Notice to Employees", which should be posted at your workplace.

Legal questions should be directed to the Regional Counsel, and technical questions should be directed to the Division of Radiation Safety and Safeguards.

If you believe you have been discriminated against, you should contact the
U. S. Equal Employment Opportunity Commission (EEOC)
1801 L Street NW,

Washington, DC 20507
or
EEOC Field Office by calling (800) 669-4000 or (800) 669-EEOC.

For individuals with hearing impairments, the EEOC's TDD number is (800) 800-3302

Specific References

1. Limitation of Exposure to Ionizing Radiation, Report No. 116, National Council on Radiological Protection and Measurements, Bethesda, MD, 1993 [The National Council on Radiological Protection and Measurements (NCRP) is a nonprofit corporation chartered by Congress in 1964 to collect information and make recommendations on protection against radiation. This publication, on pages 37-39, summarizes the conclusions of the NCRP with respect to protection of the human embryo/fetus against radiation. This publication should be available through best public library systems and most good university libraries. Your employer may also have a copy.]
2. 1990 Recommendations of the International Commission on Radiological Protection, Ann. ICRP 21: No. 1-3, Pergamon Press, 1991. [This publication, on pages 146-149, summarizes the conclusions of the ICRP on the effects of radiation on the human embryo/fetus.]
3. Health Effects of Exposure to Low Levels of Ionizing Radiation (BEIR V), Committee on the Biological Effects of Ionizing Radiation, National Research Council, National Academy Press, Washington, DC, 1990.
4. United Nations Scientific Committee on the Effects of Atomic Radiation, Sources and Effects of Ionizing Radiation, United Nations, New York, 1993.
5. Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus, or Nursing Child, NCRP Commentary No. 9, National Council on Radiation Protection and Measurements, Bethesda, MD, 1994.
6. Alcohol, Tobacco, and Other Drugs May Harm the Unborn, U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, DHHS Publication No. (ADM) 92- 1711, Rockville, Maryland, 1990.
7. Exposure of the Population in the United States and Canada from Natural Background Radiation, Report No. 94, National Council on Radiological Protection and Measurements, Bethesda, MD, 1987.
8. Instruction Concerning Prenatal Radiation Exposure, U. S. Nuclear Regulatory Commission Regulatory Guide 8.13, December 1987.

Questions Regarding this Bulletin

If there are any questions regarding the USDA radioactive waste management program, contact:
USDA Radiation Safety Staff
5601 Sunnyside Avenue
Mail Stop 5510
Beltsville, MD 20705-5000

Dose for Occupational Workers

Dose for Occupational Workers	
Whole Body (Annual) Dose for Occupational Workers	50 mSv/year (5,000 mRem/year) Stochastic Effects
Lens of the Eye	150 mSv/year (15,000 mRem/year)* Non-Stochastic Effects
Extremities and Skin	500 mSv/year (50,000 mRem/year) Non-Stochastic Effects
Fetal Entire Gestation	5 mSv/gestation (500 mRem/gestation)
Fetal Monthly Dose Limit	.05 mSv/month (50 mRem /month)
General Population	1 mSv/year (100 mRem/year)

ALARA "Trigger" Levels

The ALARA concept imposes lower operational dose limits that are even more restrictive than the maximum Legal dose limits shown in Table I above. This ensures an enhanced safety factor for what is already considered to be safe annual doses for radiation workers.

Dosimeter (Monthly)	**ALARA Level I 30% Limit Faction**	**ALARA Level II 60% Limit Faction**	**ALARA Level III 90 % Limit Faction**
Whole Body (Monthly)	1.25 mSv (125 mRem)	2.5 mSv (250 mRem)	3.75 mSv (375 mRem)
Extremity (Monthly)	3.75 mSv (375 mRem)	7.5 mSv (750 mRem)	11.25 mSv (1,125 mRem)
Declared Pregnant Worker (Monthly)**	0.0125 mSv (1.25 mRem)	0.025 mSv (2.5 mRem)	0.0375 mSv (3.75 mRem)
Dosimeter (Quarterly)	**ALARA Level I 10% Limit Faction**	**ALARA Level II 30% Limit Faction**	**ALARA Level III 60% Limit Faction**
Whole Body (Quarterly)	1.25 mSv (125 mRem)	3.75 mSv (375 mRem)	7.5 mSv (750 mRem)
Extremity (Quarterly)	3.75 mSv (375 mRem)	11.25 mSv (1,125 mRem)	22.5 mSv (2,250 mRem)

*Note: The International Commission on Radiological Protection (ICPR), National Institutes of Health (NIH), and Nuclear Energy Agency (NEA) reduced their occupational annual equivalent dose to the lens of the eye from 150 mSv to 20 mSv in 2021.
**The calculations used for the declared pregnant female's monthly gestation was 12 months instead of 9 months as a prudent measure.

ALARA I	Radiation Safety Officer Notified. Report kept on file.
ALARA II	Badged Radiation Employee/Student receives a Report of Unusual Radiation Exposure (RURE)
ALARA III	Badged Radiation Employee/Student receives a Report of Unusual Radiation Exposure (RURE)
	RSO performs a Review of a Worker Exposure Conditions and Procedures

What are the ALARA Investigation Levels?

There are two types of ALARA investigation levels for external occupational radiation exposure as indicate by a dosimeter.

If a worker's dose for any calendar month (30 days), calendar quarter (3 months) or calendar year (12months) exceeded these values, an investigation is conducted by the RSO to determine if there are reasonable ways to reduce the dose levels.

How the LACC RT Department Determined and Calculated the ALARA Levels:
The ALARA Levels were based on a percentage faction per monthly and quarterly dose readings for the various maximum permissible doses.

For **monthly** dose readings:
ALARA Level I was based on a 30% faction.
ALARA Level II was based on a 60% faction.
ALARA Level III was based on a 90% faction.

For **quarterly** dose readings:
ALARA Level I was based on a 10% faction.
ALARA Level II was based on a 30% faction.
ALARA Level III was based on a 60% faction.
*Lower percentages were used based on the quarterly readings.

Calculation:
Level = (percent x dose limit) / monthly or quarterly

For example:

ALARA I for Whole Body (monthly) = (.30 x 5000 mrem) / 12 months
= 1500 mrem/12 months
= 125 mrem or (1.25 mSv)

*Note: The International Commission on Radiological Protection (ICPR), National Institutes of Health (NIH), and Nuclear Energy Agency (NEA) reduced their occupational annual equivalent dose to the lens of the eye from 150 mSv to 20 mSv in 2021.
**The calculations used for the declared pregnant female's monthly gestation was 12 months instead of 9 months as a prudent measure.

Los Angeles City College
Department of Radiologic Technology
855 N. Vermont Ave
Los Angeles, Ca 90029
Phone: 323-953-4000 ext 2942

Voluntary Declaration of Pregnancy

Student Name: _____ LACC ID :_____

Date of Birth : _____

Phone Number: _____

I am submitting this Declaration of Pregnancy to inform Radiation Safety Officer (RSO) that I am pregnant. The estimated date of delivery is _____. I have made the decision to permit application of the embryo/fetal dose limits specified by the Nuclear Regulatory Commission (NRC) in Title 10 Code of Federal Regulations Part 20.1208 (10 CFR20.1208) or the State of California Ionizing Radiation Rules as applicable.

Declarant must choose one of the following options:
I prefer that dosimeters issued to me for fetal monitoring and corresponding reports of results be:

____ held at RSO offices where I will arrange to personally collect and exchange them at the start of each wear period.

____ sent to me via the contact person of the Dosimeter series assigned to the authorized user or facility where carry out my Clinical Training, at the start of each wear period.

I have read and understand the written material regarding the potential health effects from exposure to ionizing radiation published in Regulatory Guide 8.13 by the Nuclear Regulatory Commission and distributed by RSO. I also have read and understand the written explanatory information on the reverse side of this form. The decision to declare my pregnancy to Radiation Safety Service is a personal choice which I have made freely.

I understand that by making this declaration:

1) The fetal dose limits specified in 10 CFR 20.1208 (NRC) will become applicable for the entire period of gestation and can result in RSO placing restrictions on work I perform using radioactive materials or other sources of ionizing radiation for the sole purpose of ensuring compliance with the embryo/fetal dose limits specified in 10 CFR 20.1208 (NRC) and that such restrictions might otherwise not be imposed absent this declaration.

2) I may revoke this declaration at any time without explanation by submitting a signed and dated Revocation of Declaration of Pregnancy to RSO.

3) Stipulation Regarding Didactic Training

A. While enrolled in the program, I agree to attend and complete all classes in which I have registered and complete all class assignments in a manner consistent with my peers within the guidelines set forth by the individual instructor and LA City College. I understand that at the instructor's option, I am not to be given any allowances regarding absenteeism or quality or quantity of didactic work as required for the individual courses.

B. Regarding my participation during experiments utilizing the live lab on campus or any experiment requiring an ionizing radiation source, I understand, agree with, and shall adhere to the provision set forth in the following section of this policy.

C. **Accommodation:** In the event that I am unable to successfully complete the course objectives and requirements, I understand that I may be dropped from the program at the completion of the semester. I also understand that once my pregnancy is over, reinstatement to the program will be set for the first available opening at my level of training. After this period of time has elapsed, I may be required to remediate before being formally accepted back into the program at the appropriate level of training.

4) Stipulation Regarding Clinical Training

A. I have read the following publications that have been provided:

1. U.S. Nuclear Regulatory Commission - Regulatory Guide - Office of Nuclear Regulatory Research: Regulatory Guide 8.13 - Instruction Concerning Prenatal Radiation Exposure, revision 3, June 1999

2. U.S. Nuclear Regulatory Commission - Regulatory Guide - Office of Nuclear Regulatory Research: Appendix: Questions & Answers Concerning Prenatal Radiation Exposure

Student Signature	**Date**
Program Director Signature	**Date**
RSO Signature	**Date**

Los Angeles City College
Department of Radiologic Technology
855 N. Vermont Ave
Los Angeles, Ca 90029
Phone: 323-953-4000 ext 2943

Voluntary Pregnancy Declaration Revocation Form

Student Name: _____
LACC ID :_____
Date of Birth : _____
Phone Number: _____
Date of Declaration of Pregnancy to RSO: _____

I wish to formally notify Radiation Safety Officer (RSO) that, as of this date, **I am revoking the Declaration of Pregnancy** I filed with RSO on the date shown above. Included with this notice are any unreturned pregnancy monitor dosimeters that were still in my possession. Please arrange to end the issuance of any additional pregnancy monitor dosimeters. Thank you.

I have read and understand the written material regarding the potential health effects from exposure to ionizing radiation published in Regulatory Guide 8.13 by the Nuclear Regulatory Commission and distributed by RSO. The decision to revoke my prior declaration of pregnancy to Radiation Safety Service is a personal choice which I have made freely.

I understand that by making this declaration, the fetal dose limits specified in 10 CFR 20.1208 will no longer be applicable for any remaining period of gestation. This revocation terminates any previous restrictions on work I perform using radioactive materials or other sources of ionizing radiation, that had been imposed by RSO, for the sole purpose of ensuring compliance with the embryo/fetal dose limits specified in 10 CFR 20.1208.

_____ _____
(Student Signature) Date

_____ _____
Program Director Date

_____ _____
(RSO Representative) Date

Addendum to Pregnancy Policy

Appendix: Questions and Answers Concerning Prenatal Radiation Exposure

1. Why am I receiving this information?

   The NRC's regulations (in 10 CFR 19.12, "Instructions to Workers") require that licensees instruct individuals working (training) with licensed radioactive materials in radiation protection as appropriate for the situation. The instruction below describes the information that occupational workers (RT students) and their supervisors (Program Director, Clinical Coordinator, Radiation Safety Officer, Clinical Preceptor) should know about the radiation exposure of the embryo/fetus of pregnant women. The regulations allow a pregnant woman to decide whether she wants to formally declare her pregnancy to take advantage of lower dose limits for the embryo/fetus. This instruction provides information to help women make an informed decision about whether to declare a pregnancy.

2. If I become pregnant, am I required to declare my pregnancy?

   No. The choice of whether to declare your pregnancy is entirely voluntary. If you choose to declare your pregnancy, you must do so in writing, and a lower radiation dose limit will apply to your embryo/fetus. If you choose not to declare your pregnancy, you and your embryo/fetus will continue to be subject to the same radiation dose limits that apply to other occupational workers.

3. If I declare my pregnancy in writing, what happens?

   If you choose to declare your pregnancy in writing, the licensee must take measures to limit the dose to your embryo/fetus to 0.5 rem (5 millisieverts) during the entire pregnancy. This is one-tenth of the dose that an occupational worker may receive in a year.

   If you have already received a dose exceeding 0.5 rem (5 mSv) in the period between conception and the declaration of your pregnancy, an additional dose of 0.05 rem (0.5 mSv) is allowed during the remainder of the pregnancy.

   In addition, 10 CFR 20.1208, "Dose to an Embryo/Fetus." Requires licensees to make efforts to avoid substantial variation above a uniform monthly dose rate so that all the 0.5 rem (5 mSv) allowed dose does not occur in a short period during the pregnancy. This may mean that if you declare your pregnancy, the licensee may not permit you to do some of your regular job functions if those functions would have allowed you to receive more than 0.5 rem. You may not be able to have some emergency response responsibilities.

4. Why do the regulations have a lower dose limit for the embryo/fetus of a declared pregnant woman than for a pregnant worker (RT student) who has not declared?

   A lower dose limit for the embryo/fetus of a declared pregnant woman is based on a consideration of greater sensitivity to radiation of the embryo/fetus and the involuntary nature of the exposure. Several scientific advisory groups have recommended[1,2] that the dose to the embryo/fetus be limited to a fraction of the occupational dose limit.

5. What are the potentially harmful effects of radiation exposure to my embryo/fetus?

   The occurrence and severity of health effects caused by ionizing radiation are dependent upon the type and total dose of radiation received, as well as the period over which the exposure was received. See Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Exposure" for more information[3]. The main concern is embryo/fetal susceptibility to the harmful effects of radiation, such as cancer.

6. Are there any risks of genetic defects?

   Although radiation injury has been induced experimentally in rodents and insects, and in the experiments was transmitted and became manifest as hereditary disorders in their offspring, radiation has not been identified as a cause of such effect in humans. Therefore, the risk of genetic effects attributable to radiation exposure is speculative. For example, no genetic effects have been documented in any of the Japanese atomic bomb survivors, their children, or their grandchildren.

7. What if I decide that I do not want any radiation exposure at all during my pregnancy?

   You may ask your employer (Program Director/RSO/Clinical Preceptor) for a job (clinical rotation) that does not involve any exposure at all to occupational radiation dose, but your employer (Program Director/RSO/Clinical Preceptor) is not obligated to provide you with a job involving no radiation exposure. Even if you receive no occupational exposure at all, your embryo/fetus will receive some radiation dose (on average 75 mrem (0.75 mSv) during your pregnancy from natural background radiation.

   The NRC has reviewed the available scientific literature and concluded that the 0.5 rem (5 mSv) limit provides an adequate margin of protection for the embryo/fetus. This dose limit reflects the desire to limit the total lifetime risk of leukemia and other cancers. If this dose limit is exceeded, the total lifetime risk of cancer to the embryo/fetus may increase incrementally. However, the decision on what level of risk to accept is yours. More detailed information on potential risk to the embryo/fetus from radiation exposure can be found in References 2-10.

8. What effect will formally declaring my pregnancy have on my job status?

   Only the licensee can tell you what effect a written declaration of pregnancy will have on your job status. As part of your radiation safety training, the licensee should tell you the company's policies with respect to the job (RT student) status of declared pregnant women.

   In addition, before you declare your pregnancy, you may want to talk to your supervisor (Program Director) or your radiation safety officer and ask what a declaration of pregnancy would mean specifically for you and your job (RT student) status. In many cases you can continue in your present job (clinical training) with no change and still meet the dose limit for the embryo/fetus. For example, most commercial power reactor workers (approximately 93%) receive, in 12 months, occupational radiation doses that are less that 0.5 rem (5 mSv)[11]. The licensee may also consider the likelihood of increased radiation exposures from accidents and abnormal events before making a decision to allow you to continue in your present job (clinical training). If your current work (clinical rotation) might cause the dose to your embryo/fetus to exceed 0.5 rem (5 mSv), the licensee has various options. It is possible that the licensee can and will make a reasonable accommodation that will allow you to

continue performing your current job (clinical training), for example, by having another qualified employee do a small part of the job that accounts for some of your radiation exposure.

9. What information must I provide in my written declaration of pregnancy?

   You must provide your name, a declaration that you are pregnant, the estimated date of conception (only the month and year need to be given), and the date of the letter given to your employer (Program Director/Radiation Safety Officer). The declaration is included in this bulletin (document). You may use that letter or write your own letter.

10. To declare my pregnancy, do I have to have documented medical proof that I am pregnant?

    NRC regulations do not require that you provide medical proof of your pregnancy. However, NRC regulations do not preclude the licensee from requesting medical documentation of your pregnancy, especially if a change in your duties is necessary in order to comply with the 0.5 rem (5 mSv) dose limit.

11. Can I tell the licensee orally rather than in writing that I am pregnant?

    No. The regulations require that the declaration must be in writing.

12. If I have not declared my pregnancy in writing, but the licensee suspects that I am pregnant, do the lower dose limits apply?

    No. The lower dose limits for pregnant women apply only if you have declared your pregnancy in writing. The United States Supreme Court has ruled (in United Automobile Workers International Union v. Johnson Controls, Inc., 1991) that "Decisions about the welfare of future children must be left to the parents who conceive, bear, support, and raise them rather than to the employers who hire those parents" (Reference 7). The Supreme Court also ruled that your employer may not restrict you from a specific job (clinical rotation) "because of concerns about the next generation." Thus, the lower limits apply only if you choose to declare your pregnancy in writing.

13. If I am planning to become pregnant but am not yet pregnant and I inform the licensee of that in writing, do the lower dose limits apply?

    No. The requirement for lower limits applies only if you declare in writing that you are already pregnant.

14. What if I have a miscarriage of find out that I am not pregnant?

    If you have declared your pregnancy in writing, you should promptly inform the licensee in writing that you are no longer pregnant. However, if you have not formally declared your pregnancy in writing, you need not inform the licensee of your nonpregnant status.

15. How long is the lower dose limit in effect?

    The dose to the embryo/fetus must be limited until you withdraw your declaration in writing or you inform the licensee in writing that you are no longer pregnant. If the declaration is not withdrawn, the written declaration may be considered expired one year after submission.

16. If I have declared my pregnancy in writing, can I revoke my declaration of pregnancy even if I am still pregnant?

    Yes, you may. The choice is entirely yours. If you revoke your declaration of pregnancy, the lower dose limit for the embryo/fetus no longer applies.

17. What if I work under contract at a licensed facility?

    The regulations state that you should formally declare your pregnancy to the licensee in writing. The licensee has the responsibility to limit the dose to the embryo/fetus.

18. Where can I get additional information?

    The references to this Appendix contain helpful information, especially Reference 3, NRC's Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," for general information on radiation risks. The licensee should be able to give this document to you.

    For information on legal aspects, see Reference 7, "The Rock and the Hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children—What Can the Employer Do?", an article in the journal Radiation Protection Management.

    You may telephone the NRC Headquarters at (301) 415-7000. Legal questions should be directed to the Office of the General Counsel, and technical questions should be directed to the Division of Industrial and Medical Nuclear Safety.

    You may also telephone the NRC Regional Offices at the following numbers:
    Region 1, (610) 337-5000; Region II, (404) 562-4400; Region III, (630) 829-9500; and Region IV, (817) 860-8100.

    Legal questions should be directed to the Regional Counsel, and technical questions should be directed to the Division of Nuclear Materials Safety.

References for Appendix

1. National Council on Radiation Protection and Measurements, *Limitations of Exposure to Ionizing Radiation*, NCRP Report No. 116, Bethesda, MD, 1993.
2. International Commission on Radiological Protection, *1990 Recommendations of the International Commission on Radiological Protection*, ICRP Publication 60, Ann. ICRP 21: No. 1-3, Pergamon Press, Oxford, UK, 1991.
3. USNRC, *"Instruction Concerning Risks from Occupational Radiation Exposure",* Regulatory Guide 8.29, Revision 1, February 1996. (Electronically available at www.nrc.gov/NRC/RG/indes.html)
4. Committee on the Biological Effects of Ionizing Radiations, National Research Council, *Health Effects of Exposure to Low Levels of Ionizing Radiation* (BEIR V), National Academy Press, Washington, DC, 1990.
5. United Nations Scientific Committee on the Effects of Atomic Radiation, *Sources and Effects of Ionizing Radiation*, United Nations, New York, 1993.
6. R. Doll and R. Wakeford, *"Risk of Childhood Cancer for Fetal Irradiation,"* The British Journal of Radiology, 70, 130-139, 1997.
7. David Wiedis, Donald E. Jose, and Timm O. Phoebe, *"The Rock and the Hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children—What Can the Employer Do?"* Radiation Protection Management, 11, 41-49, January/February 1994.
8. National Council on Radiation Protection and Measurements, *Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus, or Nursing Child*, NCRP Commentary No. 9, Bethesda, MD, 1994.
9. National Council on Radiation Protection and Measurements, *Risk Estimates for Radiation Protection*, NCRP Report No. 115, Bethesda, MD, 1993.
10. National Radiological Protection Board, *Advice on Exposure to Ionising Radiation During Pregnancy*, National Radiological Protection Board, Chilton, Didcot, UK, 1998.

Dosimeter Gestation Log Record

Name:_____ Date: _____

Dosimeter No. and Type: _____

- Written Pregnancy Declaration Date: _____
- Gestation Period_____
- Expected Delivery Date _____
- Previous exposure history from the beginning of RT program/clinical training _____
- Previous exposure history last 9 months_____
- Report prepared by _____

Month	Collar	Waist	Deep Dose (DDE)	Eye Dose (LDE)	Shallow Dose (SDE)	Signature

* All documentation reviewed monthly with student/employee and R.S.O.

Overview

Holding Patient Restrictions:

No person shall be regularly employed to hold patients or image receptors during exposures, nor shall such duty be performed by any individual occupationally exposed to radiation during the course of his/her other duties. When it is necessary to immobilize the patient, mechanical supporting or immobilization devices shall be used.

If patient or image receptors must be held by an individual, that individual shall be protected with appropriate shielding devices such as protective gloves and a protective apron of at least 0.5 mm lead equivalent. No part of the attendant's body shall be in the useful beam. The exposure of any individual used for holding patients shall be monitored.

Procedure

Pregnant women and persons under 18 years of age shall not hold patients under any conditions. Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99).

- ☐ Mechanical devices (instead of persons) must be used whenever possible to restrain patients. Examples include adjustable restraints, sponges, sheets, tape, pigg-o-stat chest unit, Velcro straps, etc.
- ☐ Always have proper Dosimeter badge
- ☐ Protective Barrier Shielding - utilization of Primary and Secondary Barriers, lead glass window, lead equivalent lined walls, doors, floor and ceiling. Always, close doors, stay behind lead barriers and observe restrictions.
- ☐ Protective Tube Housing - protects both radiographer and patient from off-focus radiation (x-rays emitted through the x-ray tube window).
- ☐ Shielding - lead-wrap-around apron no less than .5 mm lead in thickness (.5 mm is commonly used). NCRP report #102 recommends a lead apron of no less that .5 mm Pb. eq. for fluoroscopic and c-arm operative procedures. Lead protective gloves no less than .25mm lead in thickness.
- ☐ Never leave protective barrier while making x-ray exposures.

Part 2: Radiation Protection Precautions for Personnel
Fluoroscopic and Portable/Operating Room Areas

Overview

Since Fluoroscopic, Angiographic and Portable/C-Arm Operating Room procedures may cause the greatest potential for personal exposure from secondary and scattered radiation, precautions in these areas are essential. When on clinical rotation, be cognizant of 3 Cardinal Principles:

1. Maximize DISTANCE - Inverse Square Law - stand as far back as possible while securing patient safety.
2. Utilize SHIELDING - Apron, gloves, protective fluoro drape, thyroid and eye shields, sliding panel and portable barriers.
3. Minimize TIME - Know routine procedure, have room equipped, be efficient, have technique and Imaging system programmed.

Procedure Fluoroscopic and Portable/Operating Room Areas

A. **Distance** - Maximize distance as the distance between sources of radiation increases, the radiation intensity decreases by the square of the distance.

$$I_1 = (D_2)^2 = I_2 (D_1)^2$$

Example: 2 x distance = 1/4 intensity
3 x distance = 1/9 intensity
4 x distance = 1/16 intensity

Keep as far back as possible for both Fluoroscopic and Portable exams.

B. **Shielding** - Placing shielding material between the radiation source and technologist reduces the level of exposure. Such as:

- Protective apron, gloves, thyroid shield, wrap-around goggles (min. of .35 mm lead eq.)
- Sliding drape (minimal of .5mm lead)
- Sliding panel (on the x-ray table)
- Mobile Radiation Barriers (on wheels)
- Standing behind the Radiologist (They become a barrier)

NOTE: NCRP - National Council on Radiation Protection and Measurements *recommends* that protective aprons of at least .5 mm Pb eq. **shall** be worn in fluoroscopy. A wrap-around protective apron should be used by individuals who are moving around during the procedure - NCRP Report #102, Page 18, 6/89.

C. **Time** - Duration of exposure should always be minimized whenever possible. The dose to the individual is directly related to the length of exposure.

Example: Exposure = exposure rate x time
10 mR/min x 5 min = 50 mR

It is noted that image intensification, the 5 minute reset timer, and the on-off fluoroscopic foot switch all aid in reducing the length of exposure for the patient and operator.

D. **Other Considerations** - Many of the methods and devices which reduce the patients and operators exposure when operating **fixed radiographic equipment** will also reduce the dose received by the radiographer during a fluoroscopic procedure. These include:

- Patient Immobilization - Radiographers should never stand in the primary beam to immobilize a patient during a radiographic exposure. Mechanical devices should be used to immobilize the patient.
- Also utilize: a cumulative timing device (maximum 5 min limit)
- Source to Table Distance (no less than 15" for fluoroscopy)
- The safest place to stand during fluoroscopy may be directly behind the radiologist, or 90 degrees from the source.
- On portable (bedside radiography) a long 6-foot exposure cord is beneficial in reducing dosage to the operator.

Radiation Protection Guidelines for The Patient
Possibility of Pregnancy

- Always inquire about possibility of pregnancy before any x-ray exposures are taken.
- Follow appropriate hospital procedures and guidelines on patient pregnancy.

Procedure

- Collimation - Collimating devices capable of restricting the useful beam to the area of clinical interest shall be used. The x-ray films used as the recording medium during the x-ray examination shall show substantial evidence of cut- off (beam delineation).
  - Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20.

- Radiographic filtration - The aluminum equivalent of the total filtration in the useful beam shall not be less than:

  - 0.5 mm below 50 kVp
  - 1.5 mm between 50-70 kVp
  - 2.5 mm above 70 kVp.

  * Minimum filtration equals inherent plus added.

- Gonadal Shielding - Gonadal shielding of not less than 0.5 mm lead equivalent shall be used for patients who have not passed the reproductive age during radiographic procedures in which the gonads are in the useful beam, except for cases in which this would interfere with the diagnostic procedure.

- Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99)

- Entrance Skin Exposure (ESE) Measurements

  It is essential that ESE measurements be available for common x-ray examinations preformed with each x-ray unit.
  - Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99)

- Exposure Index Guidelines For CR/DR Systems; have accurate exposure charts and "exposure index" guidelines established and maintained for each unit.

Pediatric Patient

Take careful and appropriate actions and follow *ALARA* and "*Image Gently*" guidelines.

Procedural Steps (not necessarily in the following order)

- Read and evaluate the clinical requisition carefully-follow HIPAA requirements.
- Promote effective communication, thus reducing the possibility of error. Give clear, concise instructions.
- Collimate the primary beam only to the area desired (show visible evidence of beam restriction on each radiograph).
- Use proper CR /DR protocols for reducing exposure in compliance with local, state and federal regulations.
- Use proper source to image distance (SID) and interpret room technique chart accurately.
- Use proper lead gonadal shielding when appropriate. Examples include shaped contact shield, flat contact shield, and shadow shield (0.5mm lead).
- Use proper immobilization devices when necessary.
- Use proper primary beam filtration (2.5mm at over 75 kVp)
- Use proper exposure factors (within ESE recommendations)

Radiation Protection Guidelines for The Patient

- Use proper radiographic processing controls.
- Avoid repeats (they double patient exposure dose)
- Use proper positioning and respiratory phase for each projection.
- Evaluate the Image, check "exposure index" and the image quality.

Radiation Protection Guidelines for The Patient
Entrance Skin Exposure (ESE) Measurements

- It is essential that ESE measurements be available for common x-ray examinations preformed with each x-ray unit.

- Per CCR Title 17, Division 1, Chapter 5, subchapters 4 and 4.5 17 CCR 30253 and Title 10, Code Federal Regulation (CFR), Part 20 and the US NRC Regulatory Guide 8.13 – Instruction Concerning Pregnant Radiation Exposure (June 99).

- Exposure Index Guidelines for CR/DR Systems; have accurate exposure charts and "exposure index" guidelines established and maintained for each unit.

Area Monitoring and Control

Radiation Area Monitoring

The need for area monitoring shall be evaluated and documented. The Los Angeles City College Radiology Program instituted area monitoring in April 2017 with OSL radiation badges in classrooms 5 and 10 to monitor radiation levels in the classroom labs. Students have not performed energized laboratories in the x-ray rooms since the college is waiting for approval from the CDPH-RHB on the registration of the live x-ray rooms.

- Instrument Calibration and Maintenance

Instruments used to verify compliance with regulatory requirements must be appropriate for use and calibrated at required frequencies. Specify instruments to be used and procedures to verify conformity.

Maintenance of the machine should be addressed. This may be addressed in part by the operator's manual from the manufacturer. The manual is located in the RT File Room 3.

All maintenance and calibration are completed by Carestream.

Radiological Controls

Entry and Exit Controls

Entry and exit from controlled areas must be adequate to ensure radiation safety. Design of emergency escape routes shall comply with applicable building codes. Procedures addressing this requirement are documented.

All applicable building codes were followed in the design of emergency escape routes for our facility. There are two exits from classroom RT 10 and one from classroom RT 5. Interlocks on all doors entering the x-ray room prevent radiation exposures from being done if the door is open.

Posting

Areas that are required to be posted should be identified in the Radiation Protection Program. In addition to procedures for ensuring that such areas are properly posted.

Include procedures for ensuring that areas or rooms containing as the only source of radiation are posted with a sign or signs that read "CAUTION X-RAY". Identify who is responsible for maintaining those signs and/or labels. In addition, certain documents must be posted. This requirement is found in 17 CCR 30255(b).

Entrances to X-ray suites are posted with signs that read "CAUTION X-RAY". Conspicuously post:

A current copy of the 17 CCR, incorporated sections of 10 CFR 20, and a copy of operating and emergency procedures applicable to work with sources of radiation (If posting of documents specified above is not practicable, the registrant may post a notice which describes the document and states where it may be examined).

The link to the 17 CCR and incorporated sections of 10 CFR 20 are found on the LACC website on the Additional Links>Radiation Safety Related Links: https://www.vmb.ca.gov/laws_regs/rad_laws.pdf

A copy of the Radiation Protection Program — Policies and Procedures is located in the, RT Room 3. In addition, an electronic copy of the RPP is available in the school's OneDrive.

1. A current copy of Department Form RH-2364 (Notice to Employees) in a sufficient number of places to permit individuals working in or frequenting any portion of a restricted area to observe a copy on the way to or from such area.

   A current copy of RH-2364 (Notice to Employees) is found in classrooms 1, 5, 10, hallway bulletin board on the north wall of room 9.

   Any notice of violation involving radiological working conditions or any order issued pursuant to the Radiation Control Law and any required response from the registrant.

   N/A to the LACC Program.

Disposal of Equipment

Registrants shall report in writing to the Department the sale, transfer, or discontinuance of use of any portable source of radiation. See the Guidance for Disposal of X-ray

- Two radiographic units were purchased and installed in the Radiologic Technology Building in 2016. The radiation machines registration paperwork was submitted to Daisy Zapata who is the Radiation Protection Specialist for the Los Angeles County Public Health- Radiation Management.
- The email dated December 17, 2015 from Daisy Zapata indicated it was best for us to submit the documentation to her so she can forward the changes to Sacramento through her expedited processing.

Other Controls

The registrant should evaluate the need for other controls in addition to those mentioned above. The following items should be considered:

1. Types of controls used to reduce or control exposure to radiation, such as positioning aids, gonadal shielding, protective aprons, protective gloves, mobile shields, etc.

   Positioning aids, gonadal shielding, protective aprons, and protective gloves are available in labs, RT 5 A, RT 5B, and RT 10.

2. Procedures for routine inspection/maintenance of such controls.

   Gonadal shielding, protective aprons and protective gloves are inspected yearly. During the radiation protection class (RT 240), students are required to x-ray the protective equipment for cracks, etc. Positioning aids are inspected routinely for damage by the Program Director/RSO and are repaired or replaced.

Emergency Exposure Situations and Radiation Accident Dosimetry

Identify any possible emergency exposure situations or radiation accidents and document procedures to address such, to include dose assessment.

It is unlikely there would be an emergency radiation situation at Los Angeles City College due to the low volume of radiographs performed on phantoms and direct supervision of students is required at all times.

However, if it is determined that a student or faculty member may have received a radiation dose in excessive amounts the radiation dosimeter will be read immediately and arrangements would be made for the exposed person to have blood drawn at a local hospital so a baseline Complete Blood Count (CBC) could be established. The person would be kept understand observation for an additional week at which time a second blood sample would be drawn for comparison with the baseline measurements. In addition, the individual would be examined for other signs of excessive radiation exposure such as skin reddening, radiation sickness and loss of hair.

Record Keeping and Reporting

All record keeping and reporting requirements are specified in regulations. Document the applicable requirements and commitments to compliance. The facility must also maintain all records of the Radiation Protection Program, including annual program audits and program content review. The following items should also be identified:

The RSO/Program Director is responsible for maintaining all required records. For the most part, all records will be located in RT Room 2 and 3 in various files, folders, and/orotebooks located in the file cabinet.

1. The person responsible for maintaining all required records is the Radiation Safety Officer and Program Director.
2. Where the records will be maintained. (File cabinets in RT Room 2 or in RT room 3 Radiology Building)
3. The format for maintenance of records and documentation. (Written documentation)
4. Procedures for record keeping regarding additional authorized sites (mobile providers N/A).

Record Keeping and Reporting

1. The person responsible for maintaining all required records is the Radiation Safety Officer and Program Director.

2. The records are maintained in RT Room 2 or 3 in various files, folders, and/ notebooks located in the file cabinet.

3. The affiliated clinical training sites provide the Radiation Safety Officer with radiation records of students training at their facilities which are kept on file.

The following record keeping and reporting requirement for Radiology Program Audits include:

(a) Radiation Machines: current registration with CDPH-RHB and performance evaluations

(b) Personnel: orientation to new equipment and continuing education requirements

(c) Procedure Manual: Review of Los Angeles City College Radiologic Technology Student Manual and Clinical Competency requirements, and affiliated hospital procedure manuals.

(d) Radiation monitoring exposures of students and faculty

(e) Repair records for x-ray producing equipment

Reports to Individuals

The Registrant shall provide reports of individual exposure when requested in accordance with 17 CCR 0255. Document procedures addressing this requirement.

Students and faculty are provided, free of charge, dosimetry badges throughout the duration of their training. OSL dosimetry badges must be submitted on a quarterly basis to Landauer.

Students and faculty are required to review their dose report on a quarterly basis via the RSO or Landauer website. Termination summary reports are kept indefinitely per CPDH-RHB requirements and are available in the Landauer OSL website.

Radiation Safety Training

Operating and Safety Procedures

All registrants are required to have a written operating and safety procedure manual. This may be the operating manual that comes with a radiation unit which may include safety procedures. However, if safety procedures are not included in the manual they must be developed. These safety procedures must be posted on the machine or where the operator can observe them while using the machine.

Document all training your employees, both occupationally exposed and non-occupationally exposed workers, are required to have before using radiation machines including continuing education. Also, document other training you provide to your employees or visitors, such as radiation safety and protection program review, safety meetings, formal classroom training, etc.

Some of these requirements are found in the 17 CCR 30255(b) (1). Specifically, each registrant shall:

1. Inform all individuals working in or frequenting any portion of a controlled area of the use of radiation in such portions of the controlled area;

2. Instruct such individuals in the health protection problems associated with exposure to radiation, in precautions or procedures to minimize exposure, instruct such individuals in, and instruct them to observe, to the extent within their control, the applicable provisions of Department regulations for the protection of personnel from exposures to radiation occurring in such areas;

3. Instruct such individuals of their responsibility to report promptly to the registrant any condition which may lead to or cause a violation of department regulations or unnecessary exposure to radiation, and of the inspection provisions of 17 CCR 30254;

4. Instruct such individuals in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and advise such individuals as to the radiation exposure reports, which they may request pursuant to 17 CCR 30255.

During the first semester of the program, students are orientated to the various components (policies & procedures) of our Radiation Protection Plan (RPP). They subsequently enroll in courses that include radiation protection related training and information that covers all the items listed below.

For detailed information, please see Addendums of the RT 202, RT 240, and RT 243 Course Syllabi

Quality Assurance Programs

During selected courses (RT 210 Quality Assurance focuses heavily on this), students must complete various quality assurance type of experiments to check our radiation machines. If a problem is noted, the instructor of record will notify the Program Director. If possible, the Program Director will correct the problem or make arrangements for servicing.

Document and explain quality assurance programs for your radiation machine(s). The explanation should include the types of checks that are done, the interval at which they are done, what actions are taken if problems are noted, and who is responsible for those checks.

* Machines are typically evaluated by the Radiation Safety Officer on an annual basis during classes the cover quality assurance measurements. If problems are noted then the school's service agents, Merry X-ray or Carestream, are contacted to evaluate and test the equipment and make repairs if needed. The records of the repair are kept in the Program Directors Office, Room 3.

Such checks should be performed on the machine to ensure that it is functioning properly and that all safety controls are in effect.

The Radiography Equipment Safety Laboratory is conducted each semester for new cohorts taking radiography classes, specifically RT 206, 207, 210, 240, 260, and 280

Periodically, the Los Angeles County Department of Radiation Health performs inspections and quality control checks on the equipment. The last inspection was in 2021.

Regulations

Maintenance of all applicable regulations is required. Faculty enforce the regulations when performing laboratory experiments at the college and hospital Radiation safety officers, licensed technologists and clinical coordinators when the students are at their clinical training sites.

Internal Audit Procedures

The Registrant must audit the Radiation Protection Plan on an **annual basis**. Documentation of the annual audits may be requested during inspection. The following items should be addressed depending on the scope of the radiologic health protection problems:

1. Identification of inspection types and program audits conducted, to include radiation machines, personnel and procedures.

   Summit Industries or Carestream technical personnel are called when troubleshooting is needed for the x-ray machines. Due to the COVID-19 pandemic, the energized machines have not been inspected since our last CA State inspection. The department is waiting for approval for funding for Preventative Maintenance (PM).

2. Identification of the individual(s) who are responsible for performing inspections and/or audits

   Summit Industries or Carestream technical personnel are called periodically to inspect/repair the x-ray machines. They are the individuals who provide inspections or audits of the equipment.

3. Identification of where and at what intervals the inspections and/or audits are conducted.

   Locations: Room 5A & 5B Intervals: As needed

4. Procedures for conducting the inspections and/or audits.

   When Summit Industries or Carestream technical personnel are called in to repair, we ask that they look over the equipment specifications.

5. Instructions on the identification of proper use of instrumentation if staff performs machine maintenance or fluoroscopic monitoring.

   The Radiologic Technology faculty were trained in proper use of equipment use, monitoring, and maintenance when the Summit Industries and Carestream DR Ascending during the initial installation. Manufacturers are called when repairs are needed.

Addendums

Please see the next several pages for the following addendums:

- RSO Designation Letter & CV's
- Student Clinical Performance Evaluation Form
- Clinical Competency Form
- RT 260 Digital Competency Evaluation of Radiology Equipment
- 30423 Radiologic Technologist Fluoroscopy Equipment Orientation Check-Off Form
- Notification of High Dosimeter Reading, Clinical Affiliate
- Notification of High Dosimeter Reading, Student Notification
- Radiation Exposure Report/Questionnaire
- Student Manual, Clinical Radiation Protection Rules (Appendix II)
- Student Manual, Policies on Direct/Indirect Supervision of Radiography Students (Appendix II)
- RT 202 Course Outline
- RT 240 Course Outline
- RT 243 Course Outline

RSO Designation Letters and Curriculum Vitis

To: Michael Loomis, LACC RT Program Director

From: Julie Washenik, LACC RT Dept. Chair/Clinical Coordinator/Didactic Instructor

CC: Radiation Protection Plan

Date: August 19, 2021

Re: Radiation Safety Officer Designation

This letter confirms that I, Julie Washenik, have accepted the designation to serve as the Radiation Safety Officer for the Los Angeles City College Radiologic Technology Program, August 19, 2021. It is understood that as the Radiation Safety Officer my responsibilities include:

(A) Reviewing the RPP content and implementation annually;

(B) Ensuring the requirements of this section are met;

(C) Reviewing all personnel monitoring dosimetry reports within 10 days of receipt to ensure the occupational dose limits specified in Subpart C of Title 10, Code of Federal Regulations, Part 20 (10 CFR Part 20), incorporated by reference in section 30253, are not exceeded;

(D) Overseeing reporting of student accidents, incidents, or errors related to radiation safety;

(E) If the school possesses reportable sources of radiation, as defined in section 30100, ensuring compliance with the applicable requirements of subchapter 4.0 (commencing at section 30100) of this chapter for reportable sources of radiation;

i. Monitor occupational radiation exposure to, and supply and require the use of personnel monitoring equipment, as defined in section 30100, by all students;

ii. Ensure personnel monitoring equipment that require processing to determine the radiation dose are processed and evaluated by a dosimetry processor that meets 10 CFR Part 20.1501(c) as incorporated by reference in section 30253;

iii. Investigate, perform an analysis, and take corrective action to prevent future occurrences of radiation exposure to a student exceeding any of the following:

(1) Occupational dose limits specified in 10 CFR Part 20, Subpart C, as incorporated by reference in section 30253; or

(2) Investigational levels established pursuant to subsection (b)(5)

(F) Establish investigational levels to monitor student radiation exposures that, when exceeded, will initiate a review or investigation by the RSO. The methodology or reasons for the established levels and actions that will be taken by the RSO when the levels are exceeded shall be documented and maintained for inspection. The investigational levels and actions that will be taken by the RSO to maintain student exposure as low as reasonably achievable (ALARA) shall be documented and provided to students.

(G) Verify that each clinical site used by the school has an RPP as required by 10 CFR Part 20.1101, as incorporated by reference in section 30253;

(H) Establish and implement written policies and procedures pertaining to pregnancy status of students in accordance with 10 CFR Part 20.1208, as incorporated by reference in section 30253. Policies and procedures developed to comply with this provision shall:

i. Be followed by the school;

ii. Be published and made known to accepted and enrolled students;

iii. Include a notice of voluntary disclosure; and

iv. Provide options for student continuance in the program; and

(I) Be subject to sections 30254, 30255(b)(4) through (b)(6), and 30295 and the applicable record keeping and reporting requirements of Subparts L and M of 10 CFR Part 20, as incorporated by reference in section 30253. The word "user" found in the aforementioned provisions, and defined in section 30100, shall be construed broadly to include an approved school. The report required pursuant to section 30255(b)(6) shall be provided to the student upon graduation, dismissal, suspension, or voluntary withdrawal from the program, or, if the final report has not been received by the date of that event, within 30 days after the student's report is received from the dosimetry processor.

(J) Documentation demonstrating compliance with this section shall be maintained for Department inspection.

Notification of High Dosimeter Reading, Clinical Affiliate

Date:

Dear Clinical Instructor/ Department Manager:

RE: Report of Unusual Radiation Exposure

This memo is to express concern about the RADIATION DOSIMETERY REPORT dated _____ to_____, in which the identified student received _____ millirems.

Monthly_____

Quarterly _____

Please compare this reading with those of your personnel to note any similar excesses in your staff's reading. If this is the case, please let me know when the Radiation Safety officer is scheduled to check your x-ray machine(s) for radiation leakage.

If the reading is high due to excessive fluoroscopic procedures, please rotate the student through areas of the clinical training that would normally give the student the least amount of radiation.

The Students are closely monitored to conform to the standards recommended by our accreditation board. With your assistance, I am confident we can address this matter appropriately.

Sincerely,

_____ (student)

_____ (Clinical Coordinator)

Cc: Vanessa Havakian, ARSO

Julie Washenik, MHA, R.T.(R)(M)(F), CRT(R)
Program Director/RSO
(323) 953-4000 ext. 2941

Notification of High Dosimeter Reading, Student Notification

Los Angeles City College
Diagnostic Radiologic Technology Program

To:_____, Student

From: Julie Washenik, MHA, R.T.(R)(M)(F), CRT(R)(F)

Date:

RE: Radiation Dosimetry Report

Students are closely monitored to conform to the standards recommended by our accreditation board. With that in mind, this memo is being written to express concern about your RADIATION DOSIMETRY REPORT dated_____to_____, in which you received _____ millirems.

Our investigation limit for a quarterly deep dose equivalent for students is _____ mrems. Students are notified when their exposure exceeds this investigative limit. Your dose is above our limit and indicates a need to review work procedures in order to, if feasible, further reduce your exposure.

Please refer to you **RT Student Handbook** and **Program Policies** concerning Clinical Radiation Protection Rules. These safety rules have been established for your protection. As a general rule of good practice, apply the basic rules of time, distance, and shielding to keep your exposure as low as possible. With your assistance, I am confident we can address this matter appropriately.

In order to evaluate any affecting your exposure, students are required to compete the attached questionnaire as quickly as possible after an exposure limit has been exceeded. Please return this questionnaire to me when completed.

Los Angeles City College

Diagnostic Radiologic Technology Program Radiation Exposure

Report/Questionnaire

Student Name:_____Monitoring Period: _____

Affiliate:_____Exposure Reading:_____mrems

1. Was the badge placed or stored near ionizing radiation?

   - o No
   - o Yes if yes, please describe:_____

2. Were you accidently exposed to a beam of ionizing radiation?

   - o No
   - o Yes if yes, please describe:_____

3. Did you hold a patient during an x-ray exposure?

   - o No
   - o Yes if yes, please describe:_____

4. Did you work significantly more hours or procedures during this period in fluoro (including C-arm)?

   - o No
   - o Yes if yes, please describe:_____

5. Did you work significantly more hours or procedures during doing portables?

   - o No
   - o Yes if yes, please describe:_____

6. Were you involved in procedures requiring unusually high exposure to ionizing radiation beside those addresses in questions 4 and 5?

   - o No
   - o Yes if yes, please describe:_____

7. Have there been any unusual incidents or additional information that will help explain your dose?

   - o No
   - o Yes if yes, please describe:_____

_____ _____

Student Date

Radiation Safety Rules for Campus Laboratory Classes and Clinical Education Centers

The following rules have been established for your protection against ionizing radiation during Campus Laboratory Classes and at the Clinical Education Centers. These rules are mandatory and must be followed without exception.

1. A Radiation Dosimeter (OSL) properly oriented and placed, must be worn at all times. If protective aprons are used, the OSL and OSL USB badge must be worn outside the apron so that any radiation reaching any part of the body will be recorded.

2. Except for three specific situations, you may not remain in a radiographic room any time during activation of the tube (when x-rays are being generated). The three exceptions are surgery, portables, and fluoroscopic work, discussed below.

3. You must not hold or support a patient during exposure, nor will you hold or support a cassette (Image Receptor (IR)) during exposure, except in an emergency. If such an emergency arises, you must wear a protective apron and gloves.

4. During activation of the tube, you must not be in a direct line with either tube or patient. You must not observe the patient during exposure from an adjacent room or hall unless through a protective window. You must not "peek" around a door nor through a crack between door and wall.

5. During an exposure, do not place yourself in direct line with the central ray, even though you are wearing a lead apron…and even though a lead shield is interposed between the tube and yourself. The tube must in all cases be pointing away from your body.

6. Under no circumstances will you permit yourself or your fellow students (or any other human being) to serve as "patients" for test exposures or experimentation.

7. If during fluoroscopic procedures you remain in the radiographic room the following will prevail:

    a. A lead apron must be worn at all times or you must remain behind a lead protective screen.

    b. The OSL badge will be worn as noted above.

    c. You must stand as far from the patient and tube as possible, consistent with the conduct of the examination.

8. Do not, during the observation period (R.T. 260), actually make exposures on patients. You may assist in helping patients onto tables, etc., but only under direct supervision of a staff technologist.

9. With permission of the technologist, you may make test exposures on inanimate objects. In so doing, all radiation safety rules must be followed.

10. When assisting and/or performing radiographic procedures in surgery and/or at the bedside the following will prevail:

    a. A lead apron will be worn.

    b. A OSL badge will be worn (see #1 above).

    c. Stand as far from the patient and tube as possible.

    d. Stand so that the central ray is pointing away from your body.

    e. Observe all regulations, which apply to work in surgery, such as preserving sterile fields, wearing surgical garments, etc. (The technologist will provide details).

Student Policies & Procedure Handbook: Policies on Supervision of Radiography Students

1. **All students must perform all medical imaging procedures under the direct supervision of a qualified practitioner until a radiography student achieves competency**. The JRCERT defines direct supervision as student supervision by a qualified practitioner who: reviews the procedure in relation to the student's achievement; evaluates the condition of the patient in relation to the student's knowledge; is present during the conduct of the procedure; and reviews and approves the procedure and/or image.

2. **All students must perform all medical imaging procedures under the indirect supervision of a qualified practitioner after a radiography student achieves competency.** The JRCERT defines indirect supervision as that supervision provided by a qualified practitioner immediately available to assist students regardless of the level of student achievement. Immediately available is interpreted as the physical presence of a qualified practitioner adjacent to the room or location where a radiographic procedure is being performed. This availability applies to all areas where ionizing radiation equipment is in use.

3. Repeat radiographic examinations: All radiologic technology students, regardless of the student's level of competency and in support of professional responsibility forprovision of quality patient care and radiation protection, **NON-DIAGNOSTIC RADIOGRAPHS SHALL BE REPEATED ONLY IN THE PRESENCE OF A QUALIFIED RADIOGRAPHER.**

4. Failure to comply with this policy will be grounds for disciplinary action. Continued abuse will result in termination from the program.

Los Angeles City College
RT 260
Digital Competency Evaluation
Radiology Equipment

Competency: The student is able to:

Scale: 0=Unacceptable; 1=Needs Improvement; 2=Competent/Acceptable; 3=Above Average; 4=Exceeds Expectations (at RT level)

					PROCEDURE SETUP
0	1	2	3	4	1. Turn on and off Digital Imaging system (including computers and PACS)
0	1	2	3	4	2. Correctly select the appropriate Image Receptor for the exam
0	1	2	3	4	3. Correctly erase all cassettes prior to imaging patients
0	1	2	3	4	4. After exposing the image receptor, correctly use the scanner to identify the cassette number to the image processor
0	1	2	3	4	5. Correctly enter patient data into the computer
0	1	2	3	4	6. Correctly place annotations such as "time" "erect, supine" etc. on the film
0	1	2	3	4	7. Select the proper histogram Look Up Table
0	1	2	3	4	8. Use the Window Level and Window Width selectors to adjust the contrast and density of the image
0	1	2	3	4	9. Send the image to the PACS system for Radiologist review
0	1	2	3	4	10. Send the image to the Laser Printer to produce a "hard copy" of the image
					QUALITY CONTROL
0	1	2	3	4	1. Check that all equipment is connected properly
0	1	2	3	4	2. Make sure that plate loading / unloading is working properly
0	1	2	3	4	3. Erase plates before use
0	1	2	3	4	4. Store plates in an area free of radiation exposure and excess light
0	1	2	3	4	5. Clean imaging plates with appropriate solutions and technique
0	1	2	3	4	6. Print daily test pattern for Laser Copier and evaluate
0	1	2	3	4	7. Verify the computer monitor is working properly by viewing an SMPTE phantom
0	1	2	3	4	8. Use a densitometer to measure density on SMPTE laser printed test sheets
					IMAGE EVALUATION
0	1	2	3	4	1. Recognize "under and over" exposure problems
0	1	2	3	4	2. Evaluate the "S" number of the exposure to determine if it is within acceptable ranges
0	1	2	3	4	3. Correctly manipulate the image using window levels and window width

****** If the student receives a "0" in any of the above categories, then he/she will not receive credit for the comp. ******

Student Name: _____ Date:_____

RT's Name (Please Print):_____ RT's Signature:_____ Date:_____

******In order for this form to be valid, the technologist must be registered by the ARRT for at least 2 years. ******

Los Angeles City College
30423 Radiologic Technologist Fluoroscopy Equipment Orientation Check-Off

Scale: 0=Unacceptable; 1=Needs Improvement; 2=Competent/Acceptable; 3=Above Average; 4=Exceeds Expectations (at RT level)					
0	1	2	3	4	1. Raise and lower x-ray tube/Image Intensifier by using the vertical lock
0	1	2	3	4	2. Move the x-ray tube/Image Intensifier the length of the table using the longitudinal lock
0	1	2	3	4	3. Move the x-ray tube/ Image Intensifier the width of the table using the transverse lock
0	1	2	3	4	4. Place a 14 x 17, 10 x 12, and 8 x 10 cassette in the Bucky Drawer lengthwise and crosswise
0	1	2	3	4	5. Center the x-ray tube when it is perpendicular to the Bucky Drawer
0	1	2	3	4	6. Use the DETENT button and lock the x-ray tube to center it transversely
0	1	2	3	4	7. Angle the Image Intensifier cephalic and caudal to any given degree
0	1	2	3	4	8. Demonstrate how to rotate the tube head and maintain proper centering to the film
0	1	2	3	4	9. Center the x-ray tube when angled to the Bucky Drawer
0	1	2	3	4	10. Demonstrate how to move the Bucky Drawer the length of the table and lock it into position
0	1	2	3	4	11. Employ requested distances to the table or upright with various CR cassette sizes lengthwise and or crosswise
0	1	2	3	4	12. Demonstrate how to collimate to the appropriate field size
0	1	2	3	4	13. Employ requested distances to the table or the upright Bucky by using distance markers on the ceiling or behind the x-ray tube (40-44"/ 72")
0	1	2	3	4	14. Demonstrate how to angle the x-ray table (Trendelenberg) by using the table controls as well as the "tower" controls
0	1	2	3	4	15. Place the table in an upright position
0	1	2	3	4	16. Manipulate the x-ray tube/Image Intensifier to place it in the horizontal position for a decubitus position
0	1	2	3	4	17. Demonstrate how to lock the fluoroscopic tower over the table so it doesn't float back
0	1	2	3	4	18. Demonstrate how to remove the fluoroscopic tower (if so equipped)
0	1	2	3	4	19. Load and unload spot films in the tower
0	1	2	3	4	20. Program the spot film for : full, split horizontal –vertical, and four on one spot films
0	1	2	3	4	21. Demonstrate how to activate the compression device
0	1	2	3	4	22. Demonstrate how to lock the fluoroscopic tower in place and how to hookup and turn on/off the C-arm
0	1	2	3	4	23. Move the fluoroscopic tower the length of the table using the motor driven handle
0	1	2	3	4	24. Connect the videotape recording system
0	1	2	3	4	25. Identify the generator controls (On/Off, mA, KVp, Seconds/time, and phototimer cells and density settings)
0	1	2	3	4	26. Manipulate the rotor and exposure switch button
0	1	2	3	4	27. Set and operate the following controls: K V p, mA, Seconds, phototimer, fluoro timer and density settings.
0	1	2	3	4	28. CR or DR : The patient on the "work list" or type patient information in system
0	1	2	3	4	29. CR or DR: Select various body regions, body parts, and views/projections * Preset Parameters: Adult, Pediatric, small, medium large, Bucky receptor, Focal spot size
0	1	2	3	4	30. Enter patient identification.
0	1	2	3	4	31. Demonstrate the full range of fluoroscopy table movement, Adjust position of the fluoroscopy grid device and apply footboard and shoulder restraints.
0	1	2	3	4	32. Store, recall, rotate, flip images and produce hard copies.
0	1	2	3	4	33. Switch programs and dose settings

**** If the student receives a "0" & or a "1" in any of the above categories, then he/she will not receive credit for the orientation.****

Student Name: _____ Date:_____

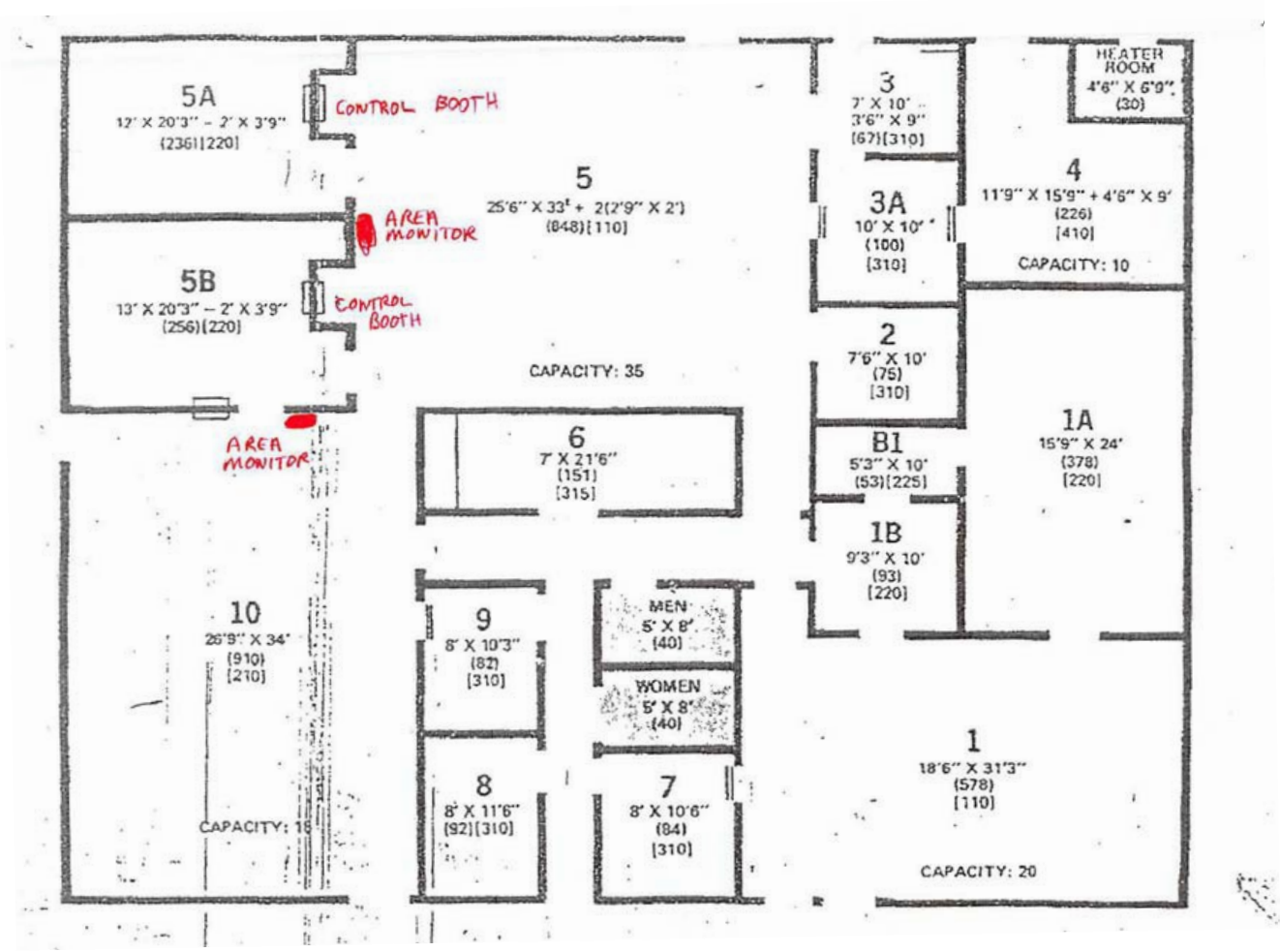
Location &Type of Equipment: _____

RT's Name (Please Print):_____ RT's Signature:_____ Date:_____

This check-off document complies to Title 17 30423 section (g) which requires an orientation check-off of each fluoroscopic room or portable fluoroscopy device prior to initial use.

****In order for this form to be valid, the Radiologic Technologist must be registered by the ARRT for at least 2 years****

Radiologic Technology Building Floor Plan



RT 202: Introduction to Electromagnetic Radiation - Course Outline

Course Goals

1. Explain selected theories and basic concepts of physics.
2. Explain the necessity for protecting humans from ionizing radiation.
3. Demonstrate the use of radiation protection devices.
4. Explain the nature and production of electromagnetic radiation.
5. Function competently in image processing.
6. Analyze the components of a quality assurance program.
7. Assess the differences between various radiographic images, IR holders, Intensifying

Screens, Flat Panel Detectors

8. Assess the differences between Computed Radiography (Indirect) and Digital (Direct) Radiography
9. Explain the different effects Ionizing radiation has on Radiographic film and digital radiography

RT 202 Textbook Requirements

Title: Radiologic Science for the Technologist: Physics, Biology and Protection - 12th edition
Author: Stewart Carlyle Bushong
ISBN: 9780323661348
Copyright: 2021
Publisher: Mosby

Resource Materials

- Radiologic Technology
    - Selman, Joseph, M.D. The Fundamentals of X-ray and Radium Physics, Charles Thomas, Eighth Edition, 1994.
    - Carlton, Adler, Balac. Principles of Radiographic Imaging: An Art and A Science, 6th Edition, 2019.
    - State of California Department of Health Services, Radiologic Health Section: California Radiation Control Regulations, California Administrative Code.
    - State of California Department of Health Services, Radiologic Health Section: Quality Assurance Program for Radiology Departments, 1994.
    - **FILMS**
        - "Exploring Electromagnetic Radiation" – film
        - “Chernobyl Heart”-Film
        - "The Inside Story" – film
    - **SLIDE**
        - Bontrager: Radiation Protection
        - Bontrager: Matter, Energy, and the Nuclear Atom
        - Bontrager: X-ray Production

Mode of Instruction

All Instructors follow this detailed course outline.

Methods and Schedule of Evaluation*

SCHEDULE		METHODS
Week 1	History, Fundamental Units and Basic Concepts of Physics	Written Quiz
Week 2	Basic Concepts of Physics, Atomic Theory and Chemical Behavior	Written Quiz
Week 3-4	Concepts of Electromagnetic Radiation	Written Quiz
Week 5-6	X-ray production	Written Quiz
Week 7-8	Radiation Protection: Sources, Units, and Biological Effects Regulations for Radiation Protection	Written Quiz
Week 9	Radiation Protection: Dose Response Curves, ALARA, Methods of Reducing Radiation Dose	Written Quiz
Week 10	**Midterm Examination**	**Cumulative**
Week 11	Introduction to Radiographic Circuitry (Transformer/Rectification)	Written Quiz
Week 12	History of Image Receptors Radiographic Film , Film Holders, Intensifying Screens: HD Exposure Curve	Written Quiz
Week 13	Intro To CR/DR:	Written Quiz
Week 14	Processing Room, Automatic Processing, Components of the Automatic Processor	Written Quiz
Week 15	Quality Assurance for Automatic Processor Film	Written Quiz
Week 16	Introduction to Processing Chemicals	Written Quiz
Week 18	**Final Examination**	**Cumulative**

RT 202 COURSE OUTLINE

The required minimum level of competency to be demonstrated by each student for the Objectives of this course is 75%

Week #	Topic	Objectives
Week 1	History, Fundamental Units and Basic Concepts of Physics	1. Introduction. History of Radiation Phenomena
	A. Definitions	a. Define the terms Matter, Mass, Inertia, Motion, Force, Work and Momentum
	B. Laws	2. Explain the Conservation of Energy Law
		3. Explain Newton's Laws: One, Two and Three
		4. Assess the difference between weight and mass
		5. Compare the relationship between work, force and distance
	C. Forms of Energy	1. List and describe the various classifications of energy
		2. Differentiate between Kinetic and Potential energy
		3. Differentiate between power, work and energy
		4. List and explain Einstein's equation relating to the transformation of energy and matter
Week 2	A. Atomic Theory and Structure of Matter: Bohr's Concept of the Structure of an Atom	1. Diagram and label the structure of Structure of an Atom, Define Atomic particle and neutron masses, atomic mass units
		Define terms: Atom, Element, Mass Number, Ion, Ionization, Molecule, Substance, Chemical bonding (ionic, Compound, Atomic number, Mass covalent), Number, Valence, Mixture
	B. Subdivisions of Matter	2. List the electrical charges of

		the proton, neutron, electron, and the nucleus of atom.
		3. Assess the difference between the atomic number and mass number of an element
		4. Differentiate between the mass number and the atomic weight of an element
		5. Determine the number of protons
		6. Name, in order, the energy levels of an atom and list the maximum
		7. Define the term Binding energy.
		8. Discriminate between isotopes, isobars, isotones, and isomers.
		9. Explain the significance of valence
	C. Chemical Behavior of Elements and Modes of Ionization	1. List the differences between in an atom when the mass
		2. Identify a compound from a group of substances.
		3. Identify mixtures from a list containing mixtures, compounds and elements.
		4. List all the methods in which an atom may become ionized.
		5. Assess the differences between atoms and ions.
		6. Discuss the Periodic Table in terms of its vertical and horizontal groups
		7. List the Symbol and Atomic number for the following elements: Hydrogen, Oxygen, Tungsten, Aluminum, Barium, Molybdenum, Iodine, Lead, Rhenium, and Beryllium
		8. List the Rare Earth Elements Atomic numbers (58 - 71)
		9. Know the symbol and atomic number of each rare earth

		element
Week 3	The Concepts of Electromagnetic Radiation	
	A. History	1. Name the individual credited with the discovery of x-rays
		2. Give the date x-rays were discovered
	B. Electromagnetic	1. Diagram the electromagnetic spectrum
		2. Distinguish between x-rays and other radiations the electromagnetic spectrum
	C. Concepts of Radiation	1. Describe the dualistic nature of x-rays
		2. EM Radiation vs. Particle Radiation a. origin b. define
	D. Properties	1. Define photon and quantum
		2. Define wavelength and frequency
		3. Wave Model and Quantum Model
		4. Define Electron volt
		5. List the twelve physical properties of x-rays
	E. Process of X-ray Production	1. Explain the process of x-ray production a. Bremsstrahlung b. Characteristic
Week 4 & 5	A. Conditions Necessary for X-ray Production	1. List four conditions necessary for the production of x-rays in an x-ray tube.
	B. The X-ray Tube	1. Describe a Crooke's Tube
		2. Differentiate between cold and hot cathode x- ray tubes
		3. Describe the Coolidge hot filament tube
		4. Define thermionic emission
		5. Explain the process of space charge effect
		6. Identify the basic components of the x-ray tube

		7. Diagram a stationary anode x-ray tube Diagram a rotating anode x-ray tube
		8. Compare the similarities and differences between stationary and rotating anode tubes
		9. List three advantages of a rotating anode x-ray tube
		10. Compare the advantages and disadvantages of large and small focal spots on the anode
		11. Define the term " Heat Unit"
		12. Describe the steps necessary to extend the useful life of an x-ray tube
		13. Describe how the focal spot is affected by "Line Focus Principle"
		14. Explain how the "Anode Heel Effect" influences radiographs
	C. Factors Affecting Quality of X-rays and Quantity	1. Define the terms: a. Milliamperes (mA) b. kVp c. Time d. Distance
		2. Assess how mA, kVp, Time and Distance affect the radiograph
		3. List and explain four factors that alter the exposure rate of an x-ray film
		4. Describe four reasons an x-ray beam is polyenergetic
		5. Explain how beam restricting devices effect the quality of x-rays
		6. List the three types of beam restricting devices used in radiography
		7. Explain how filtration reduces patient radiation exposure
		8. Differentiate between added,

		inherent, and total filtration in an x-ray tube
		9. Describe various compensating filters used for body parts that differ in thickness or density
	D. Practical Experience	1. Identify the following controls on the x-ray control console: a. kVp selector b. mA and time stations
		2. Set a pre-selected exposure on the panel
		3. Using a cassette, select the appropriate SID, center a phantom, collimate to the area of interest, expose and process the resultant radiograph.
Week 6	The Need for Radiation Protection	
	A. Sources of Radiation	1. Describe sources of background radiation
		2. Recognize the extent of background radiation
	B. Quantities and Units	3. Define the unit - Radiation exposure
		4. Define the unit - Radiation absorbed dose
		5. Define the unit - Dose Equivalent
		6. Define the terms: LET and quality factor
	C. Biological Effects of Ionizing Radiation	7. Describe the somatic effects of radiation
		8. List five somatic effects from radiation
		9. Identify the most radiosensitive organs of the body
		10. List five genetic effects from radiation
		11. Name x-ray examinations which deliver high radiation exposures

		to patients
		12. Explain how the inverse square law relates to radiation exposure
Week 7	Regulations of Radiation Protection	
	A. Title 17 - Calif. Dept. of Health and radiation effects Radiologic Health	1. Explain the difference between stochastic and non-stochastic radiation effects
		2. Discuss occupational dose limits for Section radiation workers (including pregnancy)
		3. List radiation dose limits for the general public (non-occupational limits)
		4. Explain the ALARA concept
		5. List at least three methods of monitoring personnel exposure
		6. Discuss methods of monitoring radiation areas using radiation survey instruments
Week 8 & 9	Means of Radiation Protection	
	A. Beam Restricting Devices	1. Identify three types of beam restricting devices 2. Define the purpose of beam restricting devices
		3. Explain how beam restricting devices reduce patient radiation dose
	B. Gonadal Shielding	1. Explain the purpose of gonadal shielding
		2. Identify which patients should be shielded
		3. List which radiographic procedures require shielding
		4. Describe the types of gonad shields that are available (contact and shadow)
		5. State California and National requirements for gonadal shielding
		6. Explain alternative radiographic positions (PA

		instead of AP) to reduce radiation exposure to radiation sensitive organs.
		7. AAMP Position Statement on the Use of Patient Gonadal and Fetal Shielding (2019)
	C. Tube Filtration	1. Differentiate between added and inherent filtration.
		2. Explain the purpose and need for tube filtration
		3. State the required thickness for total x-ray beam tube filtration
		4. Explain the kVp and mAs combination that
	D. Exposure Factors	1. List which type of film - screen combinations reduce radiation exposure to the patient
		2. State difference between Film/Screen and PSP Image receptors
	E. Type of Film holder	3. Describe difference between CR and DR
	F. Mammography Patient Protection	1. Explain why mammography machines use the following devices to reduce patient dose: a. Molybdenum targets with small focal spots b. Low dose mammography screens c. Low ratio grids (3:1 or 4:1) d. Breast compression
	G. Fluoroscopy Protection	1. Describe how patient radiation exposure is reduced in fluoroscopy by: a. Intermittent Fluoroscopy b. Restriction of beam size c. Correct operating factors d. Filtration e. Exposure limits (dose rate, cumulative timer) f. Primary protective barrier
	H. Electric Shock Protection	1. Explain the purpose of grounding electrical equipment.

		2. Describe the "one hand rule"
		3. List the effect of high voltage low amperage and low voltage high amperage electrocution
		4. Diagram and label Circuitry of Console • Discuss Magnetism • Discuss Electromagnetism • Sinusoidal Wave • Transformer Law • Line Voltage Compensator • Step down and Step up Transformer • Rectification: Diodes • Half-wave and Full-Wave • Rectification • mA and kV meters • Rheostat
Week 10	Midterm Examination	All topics covered from weeks 1 through 9
Week 11	A. Formation of the Image	1. Define the phrase "Latent Image Formation"
		2. Describe the function of the sensitivity speck
	B. Practical Experience	1. Apply the principles of correct film handling in the processing room
		2. Process a strip of roll film
		3. Identify the following artifacts on a processed radiograph: a. Radiation and light fog b. Static c. Crescent shaped marks d. Fingerprints e. Emulsion damage
Week 12	Screens	
	A. Intensifying Screens	1. Define the following terms a. Phosphor b. Luminescence c. Fluorescence d. Phosphorescence

		2. Explain the difference between fluorescence and phosphorescence
		3. Explain the function of an intensifying
		4. Diagram the cross sectional view of an intensifying screen
		5. Compare the "speed number" system to its corresponding generic name speed system
Week 13	B. Practical Experience	1. Demonstrate the care and handling of intensifying screens
		2. Clean selected screens using the proper procedure
		3. Perform a screen contact test
		4. Analyze the results of the screen contact test
		5. Introduction to Digital Radiography (CR/DR)
		6. Analyze data from an existing quality control chart and processor maintenance log
Week 14	DR Formation	CR/DR equipment
Week 15	DR Indirect/Direct DR	Image capturing, formation
Week 16	DR Image Artifacts	CR, DR, Fluoroscopy
Week 17	DR QC	Final Review
Week 18	Final Examination	All topics covered - Cumulative

RT 240 Radiation Protection - Course Outline

Course Goals

1. Identify the various types of interactions with photon energy and matter.

2. Know the quantities and special units of radiation used in radiation protection applications.

3. Know the interrelationships between the various quantities and units of radiation.

4. Understand the effects of ionizing radiation as it affects population exposure.

5. Realize the duties and responsibilities of the Certified Radiologic Technologists in the field of

radiation protection.
6. Understand the effects of ionizing radiation in biological systems.

7. Understand the factors that affect image formation, safety, and technologist responsibilities in fluoroscopic examinations to meet the requirements of the California State Permit.

Required Textbook(s)

Radiation Protection in Medical Radiography, 9th ed.
Author: Mary Alice Statkiewicz-Sherer, AS, RT(R), FASRT, et al. I
ISBN: 9780323825030
Copyright: 2022

Radiation Protection in Medical Radiography – Workbook, 9th ed.
Author: Mary Alice Statkiewicz-Sherer, AS, RT(R), FASRT, et al.
ISBN: 9780323825085
Copyright: 2022

Resource Material

- California Department of Health Services, Radiologic Health Branch, California Radiation Control Regulations, California Administrative Code, Title 17. Barclay's California Code of Regulations, Sacramento California, 1995.
- California Department of Health Services, Radiologic Health Branch, Syllabus on Radiography Radiation Protection 4th Draft, Department of Health Services, Radiologic Health Branch, Sacramento California 1995.
- Frankel, Robert; Radiation Protection for Radiologic Technologists, McGraw-Hill, 1976.
- Meredith and Massey; Fundamental Physics of Radiology, 2nd Edition, Williams and Wilkens Company, 1972.
- NCRP, Medical X-ray and Gamma Ray Protection for Energies Up to 10 MeV, Equipment Design and Use, Report #33, NCRP Publications.
- NCRP, Basic Radiation Protection Criteria, Report # 39, NCRP Publications NCRP, Radiation Protection for Medical and Allied Health Personnel, Report # 48, NCRP Publications.
- Noz, Marilyn E., and Maguire, Gerald Q., Jr., Radiation Protection in the Radiologic and Health Sciences, Lea Febiger, 1985
- Shapiro, Jacob, Radiation Protection, Harvard University Press, 1972.
- Selman, Joseph, The Fundamentals of Imaging Physics and Radiobiology, Charles C. Thomas Publisher Ltd., 2000

Methods of Instruction

Lectures/face to face discussion; presentations; written assignments (journals and summaries, student presentations of selected chapters), hands on labs; quizzes, tests, final exam.

Methods and Schedule of Evaluation

SCHEDULE		METHODS
Week 1	History, Fundamental of Radiation Protection	Written Quiz
Week 2	Definitions of terms relating to radiation biology and physics of radiation protection	Written Quiz

Week 3-4	Biological effects and significance of x-ray exposure	Written Quiz
Week 5-6	Personnel radiation protection	Written Quiz
Week 10	**Midterm Examination**	**Cumulative (weeks 7-9)**
Week 11	Radiation protection criteria	Written Quiz
Week 12-14	Responsibilities of the Certified Radiologic Technologist	Written Quiz
Week 16	**Final Examination**	**Cumulative**

RT 240 Course Outline

Week #	Topic	Objectives
Week 1	Syllabus/Policies Introduction to Radiation Protection	
Week 2	Radiation Types, Sources, and Doses Received	Quiz
Week 3	Radiation Quantities and Units	Quiz
Week 4	Radiation Monitoring	Quiz
Week 5	Molecular and Cellular Radiation Biology	Quiz
Week 6 - 7	Early Tissue Reactions and Their Effects on Organ Systems	Quiz
Week 8	Midterm exam	Cumulative
Week 9 - 10	Stochastic Effects and Late Tissue Reactions of Radiation in Organ Systems	Quiz
Week 11	Dose Limits for Exposure to Ionizing Radiation	Quiz
Week 12	Equipment Design for Radiation Protection	Quiz
Week 13 -14	Management of Patient Radiation Dose During Diagnostic X-Ray Procedures	Quiz
Week 15 -17	Radioisotopes & Radiation Protection	Quiz
Week 18	Final exam	Cumulative

RT 243: Principles and Practices of Fluoroscopy - Course Outline

Course Competencies

Upon successful completion of the course the student will be able to:

1. Explain dose-response relationships, relative tissue radio sensitivities, and cell survival and recovery.
2. Distinguish between Short/Long term effects, acute/chronic effects, carcinogenesis, organ and tissue response.
3. Discuss the effects and risks on the embryo and fetus.
4. Distinguish the difference in Compton effects, photoelectric absorption, Coherent scatter, Attenuation
5. Discuss the source of free electrons, acceleration, focusing of electrons, deceleration, x-ray spectrum
6. Distinguish characteristics through frequency and wavelength, beam characteristics, scatter, inverse square law, fundamental properties
7. Compare a variety of technical factors, shielding, beam restriction, filtration, equipment features, and patient positioning
8. Explain the sources of radiation exposure, basic methods of protection, protective devices, minimum lead equivalent, fluoroscopy exposure rates, recommendations for personnel monitoring, and units of measurement, dosimeters
9. Describe the types of receptors including the Image intensifier and flat panel
10. Explain the viewing conditions, spatial resolution, contrast resolution/dynamic range, DICOM, Window level and width function
11. Discuss the types of recording devices including: DSA, cine, image capture, and spot imaging
12. Explain how kVp, mA, OID affect the quality of the image.
13. Discuss the Spatial Resolution, Image Signal (exposure related)
14. Explain the characteristics for a good quality image including proper demonstration of anatomy, markers, and pathologic conditions
15. Identify factors that signify malfunction including artifacts, QC, and overexposure.
16. Discuss a variety of patient care and education components:
    - Patient identification/verification
    - Informed Consent
    - Risk versus Benefit
    - Procedure Radiation Exposure (NCRP #160)
    - Cumulative Dose Education
    - Pregnancy Status (e.g. tests and limitations)
    - Contrast Reactions
    - Patient Record Information
    - Standards of Care
    - HIPAA

RT 243 Textbook Requirements

Title: Radiologic Science for the Technologist: Physics, Biology and Protection - 12th edition

Author: Stewart Carlyle Bushong

ISBN: 9780323661348

Copyright: 2021

Publisher: Mosby

Week #	Topic	Objective
Week 1	Intro/ History	
Week 2	Components of the Fluoroscope	Quiz
Week 3-4	Equipment Operation	Quiz
Week 5-6	Radiation biology & physics	Quiz
Week 7-8	Digital Fluoroscopy	Quiz
Week 9	Midterm exam	Cumulative
Week 10	Exposure Reduction	Quiz
Week 11	Image Evaluation	Quiz
Week 12-13	Quality Control	Quiz
Week 14-15	Patient Care Consideration	Quiz; presentation due
Week 16 -17	Contrast Media	Quiz; presentation due
Week 18	Final exam	Cumulative

References

1. Ballinger P.W., Merrills Atlas of Radiographic Positions, Vol. 1, 12th Edition, 2012, Mosby Publishing Co., St. Louise MO.

2. Bushong, Stewart C., Radiologic Science for Technologists Physics, Biology, and Protection, Mosby, 10th Ed., 2013.

3. Radiologic Technology Journal, September/October 2012, Volume 84, Number 1, Best Practices in Digital Radiography. , 2012

4. National Council on Radiation Protection and Measurements (NCRP) Report #91, Adopted 6/92. Recommendations on Limits for Exposure to Ionizing Radiation. 1987. Bethesda, MD 20814

5. National Council on Radiation Protection and Measurements (NCRP) Report #102, Medical X- ray, Electron Beam and Gamma Ray Protection for Energies up to 50 MEV. 1989, (Supersedes report #33)., Bethesda MD 20814.

6. National Council on Radiation Protection and Measurements (NCRP) Report #105, Radiation Protection for Medical and Allied Health Personnel, 1989. (supersedes report #48). Bethesda, MD 20814

7. National Council on Radiation Protection and Measurements (NCRP) Report #115, Limitation of Exposure to Ionizing Radiation, 1993 (supersedes report #91) 1993, Bethesda, MD 20814.

8. N.Y.S. Sanitary Code Chapter 1, Part 16, Ionizing Radiation, N.Y.S. Department of Health Bureau of Environmental Radiation Protection, Albany, NY 12203-3399 – April 18, 2001.

9. Statkiewicz-Sherer, Visconti, Ritenour., C.V. Mosby Co., Radiation Protection in Medical Radiography, 6th Edition, 2011.

10. United States Nuclear Regulatory Commission (NRC) - Standards for Protection Against Radiation 10 CFR Part 20 - 1/1/94.

Appendix H

Los Angeles City College
Radiologic Technology Program
Verification of Radiation Protection Program Compliance at Clinical Affiliate Site

To ensure that each clinical affiliate is in compliance with the California Department of Public Health - Radiologic Health Branch's (CDPH-RHB) requirements that a Radiation Protection Plan (RPP) is in place at each facility with a registered source of radiation, the following information is being requested.

Please forward the document to your designated Radiation Safety Officer (RSO), have him/her complete, sign and email the form back to the Program Director and cc the Radiation Safety Officer of the Los Angeles City College's Radiologic Technology program:

Radiologic Technology Program Director & RSO:
Julie Washenik, R.T. (R)(F)(M), CRT, ARRT, MHA
Los Angeles City College
Radiologic Technology
855 N. Vermont Avenue
Los Angeles, CA 90029
323-953-4000 Ext. 2941
washenja@laccd.edu

Alternate Radiation Safety Officer:
Vanessa Havakian, R.T. (R)(F)(M), CRT, ARRT
Los Angeles City College
Radiologic Technology
855 N. Vermont Avenue
Los Angeles, CA 90029
323-953-4000 Ext. 2940
havakiv@laccd.edu

Los Angeles City College
Radiologic Technology Program
Verification of Radiation Protection Program Compliance at Clinical Affiliate Site

Clinical affiliate name:
RHB Facility License No.:
Radiation Safety Officer (RSO):
Lead Supervising Licentiate:

Does your facility have an established Radiation Protection Plan (RPP) that meets the requirements pursuant to the CCR, title 17, Division 1, chapter 5, subchapter 4, 4.5, 17. CCR 30253 incorporates by reference the federal regulations specified in title 10, code of federal regulations (CFR), part 20 as outlined below?

[ ] Yes [ ] No

Components of a radiation protection program:

1. Organization and administration (i.e., reporting hierarchy)
2. ALARA program
3. Dosimetry program
    a. Occupational workers
    b. Dose to fetus
    c. Program pregnancy reporting
4. Area monitoring and control
    a. Radiation monitoring
    b. Instrument calibration and maintenance
5. Radiologic controls
    a. Entry and exit controls
    b. Posting
    c. Disposal of equipment
6. Emergency exposure situations, radiation accident dosimetry, and/or unusual occurrence
7. Record keeping and reporting
8. Reports to individuals (notified of dosimetry report reading)
9. Radiation safety training
    a. Occupational workers
    b. Non-occupational workers
10. Internal audit procedures

The lead supervising licentiate shall:

1) Be responsible for supervision of students and for the acts and omissions of both students and any other individual providing direct or indirect oversight to students;
2) Ensure a supervising licentiate is available for consultation by both students and any other individuals providing direct or indirect oversight to students; and
3) Be responsible for compliance with the clinical site's affiliation agreement, or, if an affiliation agreement is not required, section 30415(a)(2).

RSO's signature:
Lead Supervising Licentiate:
Date:

Los Angeles City College
Radiologic Technology Program's
Radiologic Protection Plan (RPP)
Acknowledgement Form

This document is to attest that I have thoroughly reviewed the Los Angeles City College's Radiologic Technology Program's Radiation Protection Plan (RPP). I hereby confirm I will follow the guidelines and regulations of this document.

Student's name:

Student's signature:

Date:

Los Angeles City College
Radiologic Technology Program's
Radiologic Protection Plan (RPP)
Faculty Acknowledgement Form

This document is to attest that I have thoroughly reviewed the Los Angeles City College's Radiologic Technology Program's Radiation Protection Plan (RPP). I hereby confirm I will follow the guidelines and regulations of this document.

Program Director's name: **Julie Washenik**
Program Director's signature:
Date:

LACC RSO's name: **Julie Washenik**
LACC RSO's signature:
Date:

LACC Alternate RSO's name: **Vanessa Havakian**
LACC ARSO's signature:
Date:

Faculty's name: **Eric Banes**
Faculty's signature:
Date:

Faculty's name: **Aaron Burton**
Faculty's signature:
Date:

Faculty's name: **Rachelle Casinto**
Faculty's signature:
Date:

Faculty's name: **Fredrick Lee**
Faculty's signature:
Date:

Faculty's name: **Ernesto Reyes**
Faculty's signature:
Date:

Faculty's name: **Dianne Velilla**
Faculty's signature:
Date: