ILLINOIS INSTITUTE OF TECHNOLOGY
SAFETY POLICY COMMITTEE

Radiation Safety Policy

Approved: April 27, 2021
Reviewed: January 22, 2024

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1) PURPOSE

The safe use of sources of radiation requires a multi- layered effort. The Illinois Emergency Management Agency (IEMA) regulates uses of sources of radiation. The Radiation Safety Office is responsible for operational safety and compliance. The Radiation Safety Committee approves authorized users of radioactive material. The Authorized Users are responsible for the safety and compliance of their activities.The overall goal is to ensure that faculty, staff, students, and the public are safe, and that IIT is in compliance with required IEMA rules and regulations, and license conditions.

2) SCOPE

This policy describes the requirements and procedures for safe and compliant use of radioactive material and machine sources of ionizing radiation collectively known as sources of radiation. All uses of radioactivematerial and other sources of radiation are subject to the rules and regulations in and referred to in this policy. If you have any questions related to the use of sources of radiation, contact the Radiation Safety Officer.

3) ALARA STATEMENT

IIT is committed to keeping the dose received by individuals as low as is reasonably achievable (ALARA),social and economic factors being taken into account, through the implementation of management control over work practices, personnel qualifications and training, control of occupational and public exposure to radiation, and planning for unusual situations. IIT management has implemented management control by stating that the Radiation Safety Officer has responsibility and authority to ensure that doses are maintainedALARA.

Meeting the ALARA concept includes an annual review of the Radiation Safety Program and verifying through surveys and personal monitoring that the dose rates are ALARA. The radiation safety training includes ALARA principles, principles and practices of radiation safety such as external radiation protection, contamination protection, and normal and emergency practices necessary to maintain dose ALARA.

4) DEFINITIONS

Student(s) – A currently enrolled, part-time or full-time IIT student who is enrolled in a course of study utilizing one of IIT's instructional laboratories or workshops.

Laboratory Users – Students and other individuals who utilize laboratory space for research, instruction, or clubs, as well as visitors to laboratory space and facility workers.

Radiation Safety Committee - Reviews and approves proposed uses of licensed radioactive material that take into consideration such matters as the adequacy of facilities and equipment, training and experience ofindividuals, and the operating or handling procedures.

Radiation Safety Officer (RSO) –. The person within an organization responsible for the safe useof radiation and radioactive materials as well as regulatory compliance.

Research Laboratories – Laboratory space maintained by the University's colleges that are intended primarily to support research purposes.

Personal Protective Equipment (PPE) – Equipment to provide a protective barrier from a

potential Hazard. Examples include, but are not limited to, safety glasses, lab coats, goggles, face shields, disposablegarments, respirators and gloves.

Hot Lab – Any area at Illinois Institute of Technology where radioactive material is handled, stored,transported, used, and/or disposed.

Authorized User – An individual who is designated by the Radiation Safety Committee and approved bythe Radiation Safety Officer to use sources of radiation.

Restricted Areas – Access to which is limited by the licensee for the purpose of protecting individualsagainst undue risks from exposure to radiation and radioactive materials.

Dosimeter – A device used to measure an absorbed dose of ionizing radiation**.**

Plan of Area – This includes all areas that will be used for any activities described. The plan includes, a map and written description of the plan area that will provide a clear picture of the location of the radiationactivity.

5) RESPONSIBILITIES

Providing a safe environment for Students, staff and faculty is a responsibility shared by both faculty and academic administration. Each level must communicate effectively with the others in order to accomplish this task; effective communication requires identification of those responsible for laboratory safety and individual ownership of those responsibilities. This section outlines what must be done and by whom, in a specific timeframe, and how documentation of these activities will be generated and maintained.

a) <u>Radiation Safety Committee (RSC)</u>: The Radiation Safety Committee (RSC) reports to the Vice Provost for Research. The Radiation Safety Committee reviews and approves proposed uses of licensed radioactive material that take into consideration such matters as the adequacy of facilities and equipment, training and experience of individuals, and the operating or handling procedures.

The Committee will consider the recommendation made by the Radiation Safety Officer based upon an interview with a new applicant and a review of the facilities. Where an applicant is alreadyan Authorized User, the Radiation Safety Officer may give temporary approval for the new use of radioactive material if the new use does not represent a change in the level of the hazard in the laboratory. This temporary approval will be subject to the final review and approval of the Radiation Safety Committee. Where an Authorized User requests an increase in the Individual Possession Limit, the Radiation Safety Officer may give final approval if, in the Radiation Safety Officer's judgment, there is no significant increase of the hazard in the laboratory.

To establish a quorum and to conduct business, at least one-half of the Radiation Safety Committee membership must be in attendance and must include, at a minimum, the management's representative, an Authorized User, and the Radiation Safety Officer. However, no more than once per year, the Radiation Safety Officer's designee may substitute for the Radiation Safety Officer, provided the designee has been given a written report that will include all information necessary for that meeting, such as the

minutes of the previous Committee meeting and reports by the Radiation Safety Officer. Reports by the Radiation Safety Officer shall include reports of investigations and information necessary for the reviews. To maintain membership on the Committee, a member must attend at least one-half of the meetings held in any year.

The Radiation Safety Committee will provide each member with a copy of the meeting minutes before the next meeting. The minutes of each Radiation Safety Committee meeting include:

- The date of the meeting
- Members in attendance
- members absent
- A summary of deliberations
- Discussions
- Recommended actions
- Results of all votes, and
- Documentation of an annual Radiation Protection Program review.

b) **<u>Radiation Safety Officer</u>:** The Radiation Safety Officer is responsible for the day-to-day operations of the radiation safety program. The Radiation Safety Officer makes recommendations regarding authorizations, and policy to the Radiation Safety Committee, and to IIT management. The Radiation Safety Officer has the ability, and authority, to alter, suspend, modify, or terminate any use of sources of radiation producing equipment that the Radiation Safety Officer determines might be a threat to individuals or the environment, or might result in non-compliance.

The Radiation Safety Officer reports to the Director of Environmental Health and Safety. In an emergency, when not on campus, the Radiation Safety Officer is available by phone 24x7. The duties and responsibilities of the Radiation Safety Officer include:

1. Ensuring that radioactive material possessed by IIT conforms to the material authorized byIIT's license;
2. Ensuring that only individuals authorized by the license use the radioactive material;
3. Instructing personnel in proper radiation protection practices;
4. Measuring radiation levels, keeping records of these measurements, and recommending andevaluating corrective actions;
5. Ensuring that personnel monitoring devices are used where indicated, exchanged at requiredintervals, and that records are kept of monitoring results;
6. Ensuring that interlock switches and warning signals are functioning and that postings areproperly located;
7. Investigating each known or suspected case of excessive or abnormal exposure to determinethe cause and take steps to prevent its recurrence;
8. Being immediately available to serve as a point of contact with IEMA and giving

assistancein case of emergency (e.g. damage, fire, theft);

9. Ensuring that the Radiation Protection Policy is implemented andreviewed;
10. Ensuring that the proper authorities (i.e. IEMA, local police, U.S. DOT) are notified promptlyin case of accident, damage, theft, or loss of radioactive material; and
11. Ensuring that the terms and conditions of the license are met and that the required records aremaintained and reviewed for compliance with IEMA regulations and license conditions.

c) **<u>Authorized users</u>** - Radioactive material may be used by, or under the supervision of, individuals who are designated by the Radiation Safety Committee. Use of machine sources of radiation is approved by the Radiation Safety Officer. Sources of radiation may be used only within restrictedareas that have been approved by the Radiation Safety Officer.

(a) Safe handling of sources of radiation is the responsibility of the authorized user under whose authorization work is being performed. It is the Authorized User's responsibility to ensure that the uses of sources of radiation are safe and compliant.

(b) The Authorized User is required to provide suitable facilities and equipment and to providetask specific safety training and supervision for all individuals in any areas for which the user is authorized. The Authorized User must maintain all records required by the RadiationSafety Officer.

6) AUTHORIZATION TO USE RADIOACTIVE SOURCES

To apply for authorization to use sources of radiation, refer to Appendix A. To apply for authorization touse sources of radiation, complete the form on the following page and send it to the Radiation Safety Officer

7) PROCUREMENT OF RADIOACTIVE MATERIAL

a. Procurement of radioactive material must be by Purchase Order issued by Procurement Services, whowill transmit the Order to the supplier.

b. Authorized Users will prepare and submit a requisition to Procurement Services to procureradioactive material, following the procedures in the most recent version of the IIT Purchasing Manual.

c. The requisition will contain the following information, plus all other information required by the IITPurchasing Manual.

1. The word, "RADIOACTIVE" in uppercase.
2. The name of the Authorized User, who has been approved by the Radiation Safety Committee.
3. The radionuclide being acquired in the form of XX-NN, where XX is the elemental symbol and NN is the mass number, e.g. H-3, C-14, Zr-89, or Ac-225. The elemental name and mass number identify a radionuclide.

4. The quantity of the radionuclide expressed in units of curies (Ci), or subunits of the curie, i.e. microcurie (µCi) ormillicurie (mCi).

5. The form, e.g. salt, oxalate, chloride, or thymidine.

d. Procurement Services will call (847) 965-1999 and request a control number. Procurement Serviceswill provide:

1. The name of the Authorized User.

2. The radionuclide, quantity, and form.

3. The expected arrival date.

4. The vendor and PO Number.

If the procurement is approved, a one-time control number will be issued. The control number indicatesthat the acquisition has been approved by the RSO and is used to track the order when shipped.

e. When placing an order for radioactive material, the supplier shall be instructed to place the followinginformation on the shipping label:

[The control number]
Eli Port, RSO, Mailbox 13
Tower Basement Mail
Room10 West 35th St.
Chicago, IL 60616

To avoid delivery errors, no other information, such as the Authorized User or laboratory number, shouldbe on the label.

f. The supplier shall be instructed to request that the carrier send tracking information to:

(Name of The Authorized

User),consult@rssi.us

Tracking information shall include:

Shipped date and
time,Deviations,
Expected delivery date and
time,Delivered date and time.

Transferring radioactive materials from one Authorized User to another must be initiated through the Radiation Safety Officer to meet license requirements and to control contamination. Transferring radioactive material to or from Illinois Institute of Technology must be through the RSO to meet licensingrequirements.

8) INFORMATION AVAILABLE TO WORKERS IN RESTRICTED AREAS

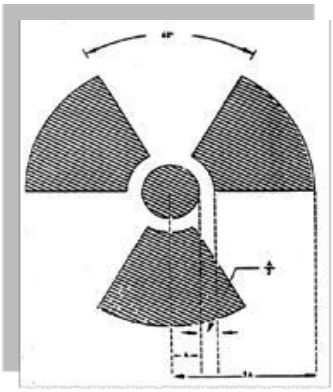
An individual working in a restricted area may examine the following documents at the Radiation Safety Office:

1. IEMA rules and regulations 32 IAC Part 340, "Standards for Protection Against Radiation", and 32 IAC Part 400, "Notices, Instructions and Reports to Workers; Inspections". These documents are also available at https://www2.illinois.gov/iema/laws/Pages/regs-title32.aspx
2. IIT's Radioactive Material License, and referenced documents.
3. The operating procedures applied to use of sources of radiation.

If you are issued a dosimeter, you may request a record of your exposure to radiation or radioactive materials. You may view dosimetry reports in the Radiation Safety Office. The reports are also posted in areas where sources of radiation are used.

9) POSTINGS IN RESTRICTED AREAS AND LABELS

The Radiation Safety Officer posts areas where sources of radiation are used or stored with signs that have the radiation warning symbol shown below and a description of the hazard in the restricted area.



Radiation Warning Symbol

Access to restricted areas must be controlled by administrative or physical controls. Faculty, staff or studentsshould notify the Radiation Safety Officer if they believe required signs are missing.

Containers of radioactive material shall be labeled with the radiation warning symbol, the words "Caution-Radioactive Materials", and the radionuclide identity and quantity.

10) DOSIMETRY

The Radiation Safety Office distributes whole body dosimeters, and extremity dosimeter rings. Each wearperiod, the dosimeters are collected and are sent to the dosimetry service provider for analysis. The Radiation Safety Officer receives and reviews the dosimetry report from each wear period and makes them available to dosimetry participants. Dosimeters are distributed to the following individuals:

1. Persons who are likely to receive a dose in excess of 10% of applicable limits.

2. Persons who work with significant quantities of hard beta and gamma emitters in sealed or unsealed form.
3. Persons who request a dosimeter due to personal concerns will be issued dosimeters for 2 wear periods. The dosimetry results will be reviewed by the Radiation Safety Officer and the individual.

11) HOT LAB CONDUCT

The objective of the radiation safety program is to ensure that radioactive materials are used safely and in compliance. The Rules of Hot Lab Conduct describe the steps that will help in achieving safe and compliantuse of radioactive material.

a) Compliance with the rules

1. The Rules of Hot Lab Conduct shall be posted in every restricted area where radioactive material is used. As part of their authorization, each authorized user is expected to follow the Rules of Hot Lab Conduct. Adherence to these rules is checked routinely in surveys and safetyaudits by the Radiation Safety Office.
2. If non-compliance with these rules is noted, a statement of non-compliance is given to the user on a survey report and another is forwarded to the Radiation Safety Committee.
3. When repeated non-compliance occurs, the Radiation Safety Officer will meet with the Authorized User in whose laboratory the non-compliance has occurred. Recommended corrective action will be supplied, and the Radiation Safety Committee will be informed of the

   planned corrective action.
4. If repeated non-compliance continues, the Radiation Safety Committee will review the status of the user's authorization and the action the Radiation Safety Officer plans to take. Planned action will be communicated in writing to the Authorized User and the Authorized User's Department Chair.

b) Basic Rules of Hot Lab Conduct

1. Plan in detail and make practice runs before starting new procedures.
2. Keep radioactive work organized and separate. Do not spread contamination into unrestricted areas.
3. Be neat. Contamination can be reduced and controlled effectively by proper organization and work layout. Keep work areas free of materials not required. Decontaminate equipment not inuse and store elsewhere.
4. Cover work areas with bench paper.
5. Do not eat, drink, smoke, store or prepare food, or apply cosmetics in the Hot Lab. No materialshall be placed on the skin or in the mouth in a hot lab where radioactive material is present.

6. Wear Personal Protective Equipment (PPE) including protective eyewear, disposable gloves,and lab coat or other disposable garment.
7. Wash hands after removing protective gloves, and monitor hands, feet, and clothing forcontamination before leaving the restricted area.
8. NO pipetting by mouth.
9. Radioactive material in a container must be transported in secondary containment with doublethe volume of absorbent material to completely contain the material if it spills when being transported.
10. Return radioactive materials to storage when they are not being used.
11. Immediately dispose of radioactive waste in radioactive waste containers.
12. Wear assigned dosimeters.
13. In emergencies, contact: The Radiation Safety Officer, (847) 965-1999. The Radiation Safety Officer is available 24 hours/7 days a week.

12) EMERGENCIES

The authorized user and any worker the user supervises must immediately notify the RSO in the event ofany incident or unusual event involving radioactive material or radiation producing devices.

Notification is required for:

1. Missing, lost, or stolen sources of radiation.
2. Spills of radioactive material.
3. Known or suspected ingestion, inhalation, or absorption through skin of any quantity ofradioactive material.
4. Any suspected over-exposure to personnel.
5. Receipt of misidentified or mislabeled material.

In case of any incident or unusual

event: Eli Port, Radiation

Safety Officer

Telephone Number: (847) 965-1999

(24x7)Email: eport@rssi.us

In case of suspected personal injury: (312) 808-6363 or 911

In case of fire and/or explosions: (312) 808-6363 or 911

13) EMERGENCY PROCEDURES

IN AN EMERGENCY, FIRST AID AND LIFE SAVING EFFORTS COME FIRST.

A. Responsible contingency planning requires that suitable emergency procedures be prepared beforehand and be made known to all individuals who might be involved. Each user should give consideration to the nature of possible incidents or accidents, be familiar with the following procedures, and have spill mitigation supplies in their labs.

B. Missing Material

When licensed material is suspected or confirmed to be missing, report the event to the Radiation Safety Officer at 847-965-1999 immediately. The Radiation Safety Officer will determine what further action must be taken.

C. Specific Procedures for Releases of Radioiodine

These releases offer significant risk to exposed individuals. Potassium iodide (KI) is available to block the thyroid of individuals who might be or who have recently been exposed.

Follow the dosing instructions attached to the container of KI tablets.

D. Minor Spills (less than 10 ALIs)

1. Immediately notify all other persons in the room.
2. Clear the room of all persons except those needed to deal with the spill area.
3. Use PPE, confine the spill immediately.
    a. Liquid spills -- Drop absorbent paper or a spill pillow on spill.
    b. Dry spills -- Dampen thoroughly, taking care not to spread contamination (use water unless a chemical reaction would release air contaminants; if water cannot be used, use oil).
4. Decontaminate.
5. Monitor all persons involved in spill cleanup.
6. Do not resume work in area until a survey shows that the contamination has beenremoved or the approval of the Radiation Safety Officer is obtained.

E. Major Licensed Material Spills (≥ 10 ALIs)

In general, a spill or accident outside of a hood involving more than 10 ALIs will require theuse of this emergency procedure, whether the material spilled is in dry or wet form. Because it is difficult to set a limit that will be significant in all cases, the person responsible for the spill should follow the recommended procedure for their own protection and for the protection of others.

1. The room must be vacated immediately, and the individual should avoid the inhalation of any radioactive licensed material which may be airborne. Survey yourself immediately anddo not leave the area if any contamination is detected. A warning sign must be posted on the closed door.

2. The primary responsibility is the safety of personnel; possible loss of property is a secondary consideration. Only such measures for the prevention of the spread of a hazard (dropping absorbent cellulose pads for liquids, righting of containers) as can be carried outduring the time in which the breath can be held before leaving the room should be attempted. Thereafter, entrance to the room will be permitted only under the supervision of the Radiation Safety Officer or the Radiation Safety Officer's designee.

3. Any clothing or other items suspected of having been contaminated shall be removed immediately and returned to the room in which the accident occurred or to a closed radioactive waste container (do not transport to other areas).

4. If any of the spilled material may have come into contact with the skin, or any part of the individual's body, skin should be thoroughly flushed with water immediately and an emergency shower used, if available. The amount of activity on the person before and after washing should be determined, if possible. The amount of material involved in the spill should be estimated so this information may be given to the Radiation Safety Officer.

5. As soon as the spill has occurred, assistance should be sought by notification of:

    a. The Radiation Safety Officer at 847-965-1999; and

    b. The area supervisor.

F. Decontamination of Facilities

Decontamination of facilities and equipment will be performed under the supervision of the Radiation Safety Officer or designee. Methods of decontamination are essentially the same as for cleaning of any facilities or equipment. Detergents and water are suitable for cleaning mostsurfaces. More caustic or corrosive solutions may be used for severely contaminated surfaces. More detailed information about specific agents and cleaning methods are available from the Radiation Safety Officer.

In any emergency, the primary concern must always be the protection of personnel from radiation hazards. The secondary concern is the confinement of contamination to the local areaof the accident.

14) RADIOACTIVE WASTE DISPOSAL

a) Radioactive waste will be collected routinely on Tuesdays.

b) To request waste collection, call the Radiation Safety Officer (847) 965-1999

1. Tell the person who responds

    a. The number of containers of each type of waste below

    b. The number of replacement containers you will need.

2. Request collections by Monday afternoon to have waste collected on Tuesday.

c) Fill out the Radioactive Waste Card completely (See Appendix B).

1. Leave the card with the waste.

2. This card must accompany every drum, jug, or five trays of vials. Waste cannot be pickedup without the card filled in completely.

d) Prepare the waste

1. Any animal wastes must be double bagged in plastic bags. Low specific activity animalwaste and LSC fluid, with < 0.05 uCi/g of H-3 or C-14 must be kept apart from otherwaste.

2. Short lived dry waste (P-32, I-125, or S-35) must be kept apart from other waste.

3. DO NOT mix low specific activity H-3 or C-14, or short-lived dry waste (P-32, I-125,or S-35) with other waste. Containers will be provided when necessary.

15) SURVEYS

Restricted areas where licensed material in unsealed form is used will be surveyed for surface contaminationand, when millicurie quantities of gamma emitters are used, exposure rates.

Laboratories where sealed sources are used will be surveyed for exposure rates at the beginning of use andwhen changes that could affect exposure rate occur. In low background areas, except those where H-3 is used, direct surface contamination surveys will be performed using portable survey instruments capable of detecting the radionuclides being used. For H-3, where surface contamination is found and in high background areas, a surface wipe will be made to determine if the activity is removable.

Survey results are entered on the IIT survey report form (See Appendix C). Survey frequencies listed below are based on the quantities of radionuclide in unsealed form used. When material with a half- life of 60 days or less is used, surveys may be discontinued after ten half-lives from the date of last use and resumedwhen new material is acquired.

The Radiation Safety Office performs the surveys at the frequency in the table. The Radiation Safety Officerwill inform the Authorized User of the frequency of surveys they must perform.

Quantity of Radionuclide Per Use	Frequency of Surveys
Q < 0.1 ALI*	Quarterly
0.1 ALI < Q <1 ALI	Monthly
1 ALI < Q	Weekly

*See Appendix E for ALIs for frequently used radionuclides.

For the following uses, except with H-3, daily instrument surveys shall be performed.

- During and at the end of labeling projects involving millicurie quantities of material;or

- During experiments involving millicurie quantities of P-32 or radioiodine.

Where H-3 is used or contamination is detected in an instrument survey, wipe test surveys shall be performed.

A sample survey form follows. The Radiation Safety Officer will provide forms for each use area.

16) SEALED SOURCES

The Radiation Safety Officer maintains inventory of sealed sources. Sources must be inventoried and tested by the Radiation Safety Officer every 6 months.

17) DECLARED PREGNANCY

A pregnant worker has a right to declare a pregnancy in writing. IIT must reduce the dose limit to the fetus of a worker who has declared a pregnancy. A guidance document and the form reproduced below used to declare a pregnancy are in Appendix F. If a pregnancy is not declared in writing, the worker's occupationaldose limits will remain unchanged.

18) BIOASSAY PROGRAM

A bioassay for I-125 measures the activity of I-125 uptake by the thyroid. A bioassay will be performed whenever intake of a significant quantity of an isotope is suspected. The RSO will provide detailed instructions for bioassays.

All persons labeling with Iodine-125 (I-125) MUST have measured their thyroid I-125 uptake between 24 and 72 hours after using in excess of 0.4 mCi. The measurement uses instrumentation calibrated for I-125 gamma radiation attenuated by neck tissue in a standard geometry. The minimum detectable activity (MDA)and the efficiency of the instrumentation are determined at the time of calibration. These values are valid only when the instrument is within the required calibration period.

The Radiation Safety Officer will advise investigators of the need to submit, collect, and analyze, bioassay samples where there is a significant probability of intake. The following bioassay schedules are based upon the radiotoxicity, the probability of incorporation of a significant level, the ease of detection, and the type of procedures where the radionuclides are used.

Bioassay Schedule

Isotope	Use Levels	Frequency	Method
H-3	10mCi ≤ A < 100mCi 100mCi ≤ A	Quarterly Within one week after each use	Urinalysis by LSC
Tritiated Thymidine	1 mCi ≤ A < 10 mCi 10 mCi ≤ A	Monthly Within one week after each use	Urinalysis by LSC
I-125	1 mCi < A	Within 24 to 72 hours of the use and weekly until thyroid burden is < 4 μCi.	Direct thyroid count

When bioassay results indicate that 25% of the annual limit on intake (ALI*) for the specific isotope is present in the critical organ use will be evaluated immediately with the objective of reducing the intake of radioactive material. When an ALI is measured in a critical organ, use of radioactive material will be suspended procedures will be evaluated and modified as necessary to reduce intake of radioisotopes to ALARA.

*See Appendix E for ALIs for frequently used radionuclides.

19) ANIMAL EXPERIMENTS

a) USE OF RADIOACTIVE MATERIAL IN ANIMAL EXPERIMENTS

These requirements are in addition to other IIT requirements for the use of animals, and are not a replacement for the institutional requirements. All animal experiments must first receive approval from IACUC.

1. Animal studies will be limited to small animals (e.g. rats, mice). Animal facilities containing licensed material will be locked or secured by administrative control to prevent unauthorized access to, or removal of, licensed material.

2. Animals, animal parts, carcasses, animal waste, and bedding materials that are or become radioactive will be kept separate from non-radioactive material.

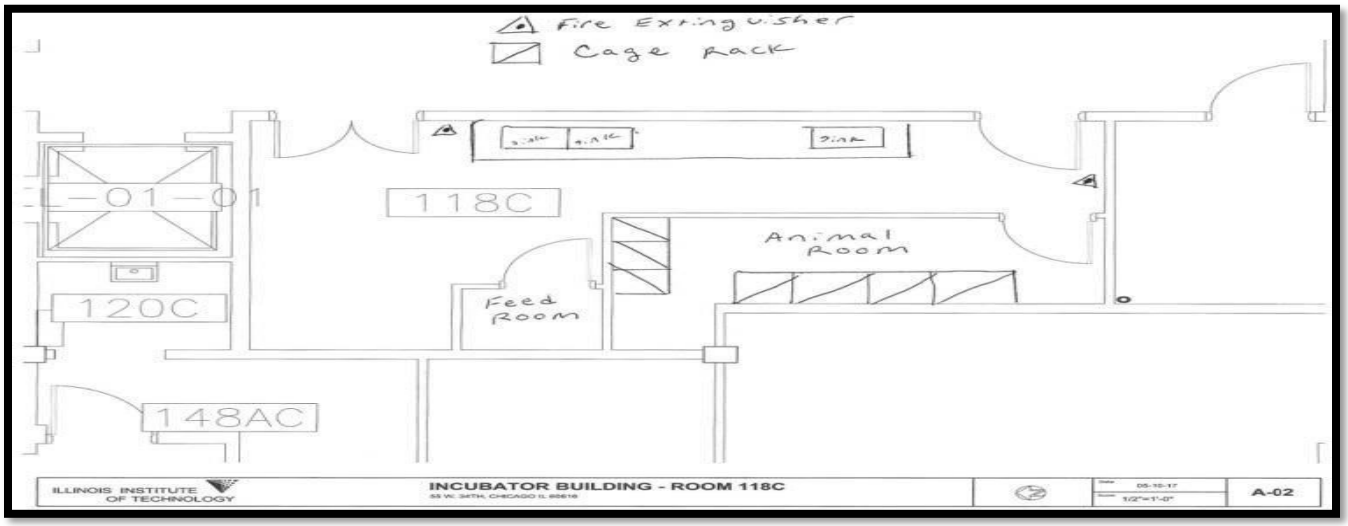
3. Sacrificed animals, animal parts, bedding, and wastes will be placed in specified containers and labeled with the date, the radionuclide, the quantity, and the words “Caution
– Radioactive Material”.

4. Animal facilities (cages, floors, etc.) will be decontaminated and surveyed prior to release for unrestricted use.

5. Experimental animals and their products shall not be used for human consumption following administration of licensed material.

6. Cages containing animals that have been administered licensed material will be labeled to indicate the radionuclide administered, the date of administration, the amount administered, and the words “Caution – Radioactive Material”. Prior to any cage change, animal handling, and transportation, the individual working with the animals will wear a nurse’s cap, an N95 mask, a gown, and double nitrile gloves.

A floor plan for the current animal room, ERB 118C, is below.



b) HANDLING RADIOACTIVE ANIMAL WASTE

- Keep all radioactive animal and biohazard waste separate from other radioactive waste.
- Bag carcasses, organs, tissues, and bedding in plastic bags.
- Place a sufficient amount of absorbent material in the bag to absorb fluids which may leach from the waste.
- Place the bag in a second plastic bag, seal it, and ensure the exterior is free of contamination.
- Make sure each bag is clearly posted with the words “Caution –Radioactive Material”.
- Complete and attach a radioactive waste card, pictured below, to the bag.
- Make sure any additional chemicals or hazards are posted on each bag.
- Keep all radioactive animal waste with a half-life of less than 90 days separated from other radioactive animal waste.
- Keep radioactive animal waste cold or frozen until it has been collected by the Radiation Safety Office or released as non- radioactive waste by the Radiation Safety Officer.
- Document all radioactive animal waste stored in an animal waste log which should include: waste ID, the date the waste was sealed, Authorized User, isotope(s) used, activity, date collected or released by the Radiation Safety Officer, and any other hazards.
- Please call the Radiation Safety Officer at 847-965-1999 if you have any questions or concerns.

c) CLEANING AND DECONTAMINATING CAGES

- Prior to any cage change, animal handling, or transportation, the individual working with the animals will wear a disposable nurse's cap, a mask, a gown, sleeves, and doublenitrile gloves.
- Researchers handling cells, tissues, chemicals (radioactive or non-radioactive), and mice(radioactive or nonradioactive) in a biosafety cabinet or a fume hood must wear disposable PPE arm sleeves, nitrile gloves, and eye glasses or goggles at all times.
- Carefully remove gloves using the inside-out technique.
- All experiments including preparation of cancer cells, implantation of tumors to immune-deficient mice, and injection of a drug molecule to the mice must be conductedunder a biosafety cabinet to ensure sterility.
- All cages and food should be autoclaved and sterilized prior to use.
- Transport cells in a sealed container (1.5 mL skew-capped tubes) tightly kept in a sealedsecondary container.
- Clean up inside the biosafety cabinet by spraying with 70% isopropanol before and afterthe work.

Injections of radioactive material into animals shall be in leak proof trays lined with absorbent material. Protective lab gloves must be worn while the injection takes place. Cages that house animals injected with radioactive material must be clearly marked as follows:

1. Name of the radioisotope
2. Amount of radioactive material injected per animal
3. Date of injection
4. Principal investigator's name and department
5. Radiation warning symbol and the words "Caution-Radioactive Material"

Animals containing radioactive materials must be kept in cages segregated from other animals.

20) APPROVAL

The IIT Safety Policy Committee reviewed and recommend the adoption of this Policy on April 19, 2021, and this Radiation Safety Policy is approved and effective this 27th day of April 2021. Modifications to thispolicy have been reviewed and approved, and are effective as of the date noted on the cover page. The Safety Policy Committee will review the contents, implementation and effectiveness of this Policy no lessthan annually (but as often as necessary) to ensure that it meets all required legal and regulatory requirements and is adequately providing a safe and healthful environment for IIT faculty, employees andstudents.

By: /s/ Peter Kilpatrick
Peter Kilpatrick, Provost and Senior Vice President

By: /s/ Bruce Watts
Bruce Watts, Vice President for Facilities & Public Safety

Appendix A

APPLICATION FOR AUTHORIZATION TO POSSESS AND USE RADIOACTIVE MATERIAL

<table>
<tr><td>1. Name of Applicant:
Office Location:
Telephone:
Email:</td><td>2. Department:

3. Application Date:</td></tr>
<tr><td>4. College:</td><td rowspan="2">5. Locations and phone numbers where materials will be used and stored. Please attach plans of areas.</td></tr>
<tr><td>6. Individual Workers:
a.
b.
c.</td></tr>
<tr><td>7. Radionuclides:
a.
b.
c.
d.
e.</td><td>8. Forms and maximum activities for each radionuclides:
a.
b.
c.
d.
e.</td></tr>
<tr><td colspan="2">9. Describe procedures and details of use. Identify features related to radiation safety. Include plans for security when radioactive materials are not in use.</td></tr>
<tr><td colspan="2">10. Describe radiation safety and security considerations and precautions.</td></tr>
<tr><td colspan="2">11. Describe instrumentation used for radiation safety purposes.</td></tr>
<tr><td>For Radiation Safety Use
Date Received:</td><td>12. Signatures. Read instructions carefully.</td></tr>
<tr><td>Date approved by Committee: _____
Date authorization sent: _____</td><td>Applicant

_____
Department Chair</td></tr>
</table>

APPLICATION FOR AUTHORIZATION TO POSSESS AND USE RADIOACTIVE MATERIAL

Instructions: Open the application using Acrobat Reader and type directly into the form. If you need additional space for a section, use a separate sheet for each section. When the form is complete, print it. Submit one original, and one copy to the Radiation Safety Office. Keep a copy for yourself.

1. Applicant Name:

2. Department:

3. Date:

4. College:

5. Locations where Material will be used. Please attach Plans of Areas. Attach a plan, with features bearing on radiation safety, for each area. Tangible barriers, e.g. walls and doors define restricted areas. A single authorized user is responsible for each area.

6. Individual Workers: List workers who, at the time of this application, who, in addition to the Authorized User, will have access to the restricted area and who will be responsible for licensed material without your direct supervision. Additional Individual Workers can be added without amending your authorization. Do not include individuals who will be supervised by these named individuals. Attach a Statement of Training and Experience for yourself, for each named worker, and for supervised individuals (Appendix E). All workers in a restricted area must have completed training.

7. Radionuclides: List the radionuclides that will be used.

8. Forms and Activities: List the form and the maximum activity of each radionuclide in Item 7.

9. Describe protocols. Attach radiation safety protocols describing the use of each form of radioactive material. Describe features related to safety for the procedures, radionuclides, and quantities you will use.

10. Describe radiation safety and security. Describe the procedures you will use to minimize exposure and control contamination. Specifically identify how the area will be physically arranged, safety procedures, equipment, and how individuals will be supervised and provided with task specific training by you. Describe how material storage and use areas will be controlled, with access limited to the named individuals and individuals who are directly supervised. You are required to secure licensed material from unauthorized removal or access when the laboratory is unoccupied.

11. Describe instrumentation. Describe the instrumentation used for radiation safety purposes, and how you will ensure that an instrument is in calibration, and operating properly each day of use.

12. Signatures. By signing this application, you are acknowledging that you have accepted responsibility for the use of radioactive material in your laboratory. You are responsible for the safety of all individuals and compliance with IIT and IEMA regulations. The Department Chair is similarly responsible for your use of radioactive material.

Appendix B
RSSI
Radioactive Waste Card

RSSI

Radioactive Waste Card

Authorized User_____ Date Placed: _____

Date Collected: _____

Department_____ Building_____ Room_____

ISOTOPE	ACTIVITY
_____	_____
_____	_____
_____	_____
_____	_____

Type of Waste: L_____ S_____ Scint._____ A _____

This card must accompany **EVERY** Drum, jug, or **FIVE** trays of vials.
Waste cannot be picked up without this card filled in completely.

ILLINOIS INSTITUTE OF TECHNOLOGY

Appendix C

Radioactive Material Survey Report

RADIOACTIVE MATERIAL SURVEY REPORT

FACILITY_____BUILDING_____AREA_____

Routine ☐ Spot Check ☐ Close Out ☐ Follow Up ☐ Other ☐_____

Instrument A: Make/Model_____ Probe_____Serial No._____Check Source ☐

Instrument B: Make/Model_____ Probe_____Serial No._____Check Source ☐

Wipes Counted On: Make_____Model_____Serial No._____Check Source ☐

Radioactive material		
Nuclide	Form	Activity

Surface Contamination Measurement Below

SURVEY FINDINGS

Area	Instr.	Dose/Exposure Rate ( )		Direct Surface Emission Rate		Removable Activity		
		Surface	@ 1 m.	cpm	dpm/ 100cm^2	Wipe #	cpm	dpm/ 100cm^2
Background								
1.								
2.								
3.								
4.								
5.								

Comments _____

_____

By_____ Date____/___/____ Page____of_____

Appendix D
Decontamination Guidelines
Action Levels

Action levels in unrestricted areas are those listed in 32 IAC 340. Appendix A. Decontamination Guidelines and are reproduced below.

Alpha Emitters

Removable	555	mBq per 100 cm^2 =	average over any
	15	pCi per 100 cm^2 =	one surface
	33	dpm per 100 cm^2	
	1.67	Bq per 100 cm^2 =	maximum
	45	pCi per 100 cm^2 =	
	100	dpm per 100 cm^2	
Total (fixed)	16.7	Bq per 100 cm^2 =	average over any
	450	pCi per 100 cm^2 =	one surface
	1,000	dpm per 100 cm^2	
	83.3	Bq per 100 cm^2 =	maximum
	2,250	pCi per 100 cm^2 =	
	5,000	dpm per 100 cm^2	

Beta-Gamma Emitters:

Removable (all beta-gamma emitters except hydrogen-3)	3.7	Bq per 100 cm^2 =	average over any
	100	pCi per 100 cm^2	one surface
	18.5	Bq per 100 cm^2 =	maximum
	500	pCi per 100 cm^2	
Removable (hydrogen-3)	37	Bq per 100 cm^2 =	average over any
	1,000	pCi per 100 cm^2	one surface
	185	Bq per 100 cm^2 =	maximum
	5,000	pCi per 100 cm^2	

Action levels in restricted areas shall be 10 times the levels in unrestricted areas.

Appendix E
Frequently used ALIs.

Radionuclide	ALI (µCi)	Most Restrictive
Ac-225	2E-1	I
Bi-205	1E3	O
C-14	2E3	I or O
Ca-45	8E2	I
Cd-109	3E2	O
Cm-144	3E1	I
Cr-51	4E4	O
Cu-64	1E4	O
Fe-55	2E3	I
Fe-59	2E2	I
Gd-153	1E2	I
Gd-159	3E3	O
H-3	8E4	I or O
I-125	4E1	O
In-111	4E3	O
Lu-177	2E3	I or O
P-32	6E2	O
P-33	6E3	O

I by Inhalation
O by Ingestion

Appendix F
U.S. Nuclear Regulatory Commission Guide
Instruction Concerning Prenatal Radiation Exposure

JUNE 1999

U.S. Nuclear Regulatory Commission

REGULATORY GUIDE

Office of Nuclear Regulatory Research

REGULATORY GUIDE 8.13

(Draft was issued as DG-8014)

INSTRUCTION CONCERNING PRENATAL RADIATION EXPOSURE

i. 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 instruction in "the health protection problems associated with exposure to radiation and/or radioactive material, 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 rem (5 mSv)." Section 20.1208 also requires licensees to "make efforts to avoid substantial variation above a 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 Individual Monitoring of External and Internal Occupational Dose," licensees are required tomonitor theoccupational dose to a declared pregnant woman, using an 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 (e) of 10 CFR 20.2106, "Records 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 declaredpregnant 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 Parts19 or 20, which were approved by the Office of Management and Budget, 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.

ii. 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 protectionpurposes, the scientific community generallyassumes that any exposure to ionizing radiation may causeundesirable biological effects and that the likelihood of these effects increases as the dose increases. Atthe occupational dose limit for the whole body of 5 rem (50 mSv) per year, the risk is believed to bevery 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 consistentwith a lifetime cancer risk resultingfromexposureduringgestationwhich is two to threetimes that for theadult" (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 marginof 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 eachpregnancy.

iii. REGULATORY POSITION

1. Who Should Receive Instruction

Female workers 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 may be given a copy of this guide with its Appendix, an explanation of the 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 or supervisor who may be affected by a declaration of pregnancy or who may have to take some action in response to sucha 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 the opportunity to ask questions about information contained in this Regulatory Guide 8.13. The licensee may take credit for instruction that the worker hasreceived 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 with10 CFR20.1208.

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 byname (e.g., John Smith), position(e.g., immediatesupervisor, theradiationsafetyofficer), 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 expire done 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, 0.5 rem (5 mSv) 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 monthlydose 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.

iv. 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 complyingwith thespecified 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 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.

APPENDIX G

ILLINOIS INSTITUE OF TECHNOLOGY

STATEMENT OF TRAINING AND EXPERIENCE OF APPLICANT FOR AUTHORIZATION TO USE RADIOACTIVE MATERIAL OR TO HAVE ACCESS TO A RESTRICTED AREA

Name of Applicant or Worker	**Department**

Training	Where Trained	Duration of Training	On the Job (Yes or No)	Formal Course (Yes or No)
Principles and practices of radiation protection				
Radioactivity measurements, techniques and instruments				
Mathematics basic to measurement of radioactivity				
Biological effects of radiation				
IIT License and IEMA Regulations				

Experience with Sources of Radiation				
Isotope or Type of Machine Source	Maximum Activity or Machine Parameters	Where Experience was Gained	Duration of Experience	Type of Use

CERTIFICATION

I certify that have received training in the subjects listed above and understand it, and that the described experience with sources of radiation is accurate. I acknowledge that I may be required to receive additional training before working independently with sources of radiation.

Name

Signature