
FACILITY REQUIREMENTS & GUIDELINES FOR RADIOACTIVE MATERIAL OR RADIATION MACHINE LABORATORIES

1.0 **PURPOSE**

To establish basic criteria for laboratory facilities (labs) to provide a safe work environment.

2.0 **SCOPE**

This procedure applies to all labs covered by the Georgia Tech Radiation Safety Program that use or store radioactive material (RAM) or that use radiation machines.

3.0 **RESPONSIBILITIES**

3.1 The Office of Radiological Safety (ORS) shall submit shielding designs to the appropriate state agency when required and perform initial inspections of new facilities prior to their use of radiation.

3.2 Georgia Tech Facilities Management project managers shall inform ORS when plans are being made for construction or remodeling of a lab within the scope of this Procedure.

3.3 The Authorized User (AU) is responsible for consulting with ORS prior to establishing the radiation work area and ensuring these requirements are met, including the installation of shielding, if necessary.

4.0 **REFERENCES**

4.1 National Institutes of Health, Special Requirements for Laboratories using Radioactive Materials

4.2 10 CFR 20, Appendix B

4.3 Georgia Institute of Technology Laboratory Safety Manual

4.4 Procedure 9310, Posting and Labeling for Radioactive Materials and Radiation Machines

4.5 Procedure 9502, Control and Accountability of Radiation Machines

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5.0 **DEFINITIONS**

5.1 For the remainder of this document, the words “shall” and “will” indicate when an item is required. The words “should” and “may” indicate when an item is recommended, but not required.

6.0 **GUIDELINES & REQUIREMENTS**

6.1 **Labs for Radiation Machine Use**

6.1.1 ORS shall perform a shielding design and provide shielding requirements prior to construction or remodeling in labs that will contain radiation machines. See section 6.3 below.

6.1.1.1 Labs that contain x-ray equipment equipped with shielding (such as x-ray diffractometers, cabinet x-ray machines) or equipment that produces by-product x-rays (such as electron microscopes or e-beam evaporators) are not likely to require structural shielding in the walls of the room.

6.1.2 Open beam and some cabinet x-ray systems shall have door interlocks, warning lights, control panel keys, and other safety and interlock features described in Procedure 9502.

6.1.3 There shall be suitable means of egress, so that any person may escape the interior of the room or area without delay, or an effective means within the room for preventing or terminating production of the x-rays, and which cannot be reset from the outside of the room.

6.2 **Labs for RAM Use or Storage**

6.2.1 **General Guidelines & Requirements**

The following guidelines are in addition to laboratory design requirements found in the Georgia Institute of Technology Laboratory Safety Manual.

6.2.1.1 The lab shall have access to hand washing facilities.

6.2.1.2 There shall be adequate space for storing radioactive materials and radioactive waste.

6.2.1.3 Laboratories shall have physical security measures to prevent unauthorized access to the radioactive material or to the laboratory itself.

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- 6.2.1.4 A telephone should be present in the laboratory. A landline phone is preferred, but if none is present, a cell phone must be present.
- 6.2.1.5 Lab benches and hoods should be designed with consideration for additional weight from possible lead bricks and shielding.
- 6.2.2 **Neighborhood Laboratory (Low Level) Criteria**
- Open laboratories where radiation to be used is expected not to exceed the Low Level quantities in the Appendix.
- 6.2.2.1 Normal ventilation is usually sufficient. The use of airborne radioactive materials is prohibited.
- 6.2.2.2 Localized security of radioactive material is required (including storage areas such as refrigerators, freezers, drawers, or waste containers).
- 6.2.3 **Enclosed Laboratory (Intermediate Level) Criteria**
- A laboratory designated for radioisotope use which is locked when unoccupied and where radiation to be used may be in the Intermediate Level quantities in the Appendix, or where gaseous radioactive material is to be used.
- 6.2.3.1 Shall meet General Guidelines & Requirements in section 6.2.1 above.
- 6.2.3.2 Airborne activity should be kept as low as reasonably achievable through the use of fume hoods or glove boxes. Fume hoods shall meet all criteria (e.g., face velocity) specified in the Georgia Institute of Technology Laboratory Safety Manual.
- 6.2.3.3 The room should be kept at a slightly negative pressure with the exhaust via a fume hood.
- 6.2.3.4 Laboratory should be designed and constructed for radiological control and safety (e.g. metal cabinets, smooth floors, etc.).
- 6.2.3.5 Counting rooms should be located in a separate enclosed laboratory.
- 6.2.4 **Secured Access Laboratory (High Level) Criteria**
- Enclosed laboratory specifically designated for use of radioactive materials where radiation to be used may be in the High Level quantities in the Appendix.

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- 6.2.4.1 Shall meet Enclosed Laboratory Criteria in section 6.2.3 above.
- 6.2.4.2 Secured Access Laboratories shall have an evaluation of shielding requirements performed prior to construction or remodeling.
- 6.2.4.3 Additional security measures such as security cameras and increased access controls may be required.
- 6.3 **Shielded Rooms and Areas**
 - 6.3.1 Information required to be submitted to ORS for shielding designs shall include:
 - 6.3.1.1 Building name, address, and room number
 - 6.3.1.2 For laboratories with radiation machines:
 - 6.3.1.2.1 A room diagram showing dimensions, travel/traverse limits of the machine, direction of the beam, windows and doors, operator's/control panel location and dimensions, and use of all adjacent areas (including above and below),
 - 6.3.1.2.2 Maximum machine technique factors (kV, mA or mAs)
 - 6.3.1.2.3 Anticipated workload of the machine (minutes per week)
 - 6.3.1.3 For RAM laboratories:
 - 6.3.1.3.1 A room diagram showing dimensions, location of RAM use, windows and doors, and use of all adjacent areas (including above and below),
 - 6.3.1.3.2 Isotopes and activities of use
 - 6.3.1.3.3 Anticipated experiment duration (hours per week, frequency, etc.)
 - 6.3.2 ORS shall be involved in each stage of the installation of the shielding. The final assessment of the adequacy of the design and construction of structural shielding shall be based on a radiation survey conducted by ORS after the installation is completed. If the radiation survey shows any deficiencies, additional shielding and/or modifications shall be provided by the AU and installed to the satisfaction of ORS.

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6.4 **High Radiation Areas (as defined in Procedure 9310)**

6.4.1 Positive control shall be established over each entrance or access point to a High Radiation Area. Any one of the several options listed below is acceptable for exhibiting positive control over the area:

6.4.1.1 Each access point may be equipped with a control device that will cause the radiation level to decrease below 100 mrem/hour upon entry of the area by personnel, or

6.4.1.2 Each access point may be equipped with a control device that emits a conspicuous visible or audible alarm signal so that the supervisor of the individual, as well as the individual himself, is made aware of the fact that entry into a High Radiation Area has occurred, or

6.4.1.3 Each access point shall be maintained locked except during periods when access to the area is required. Positive control shall be exercised over each individual entry.

6.4.2 **Other Requirements**

6.4.2.1 When access control is established over a High Radiation Area, the control shall not prevent an individual from leaving a High Radiation Area.

6.4.2.2 If a High Radiation Area is established for 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the requirements in 6.4.1.

7.0 **RECORDS**

7.1 Records of shielding requirements and shielding confirmation surveys shall be maintained by ORS as permanent records of Georgia Tech.

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APPENDIX

Table of Hazard Classifications for Radionuclides

The quantities below are meant to serve as general guidelines. The RSO may require additional facility requirements based on a review of the specific area and/or procedure.

ALI means the Annual Limit on Intake as specified in 10 CFR 20, Appendix B.

	Low Level	Intermediate Level	High Level
C-14	< 10 mCi	> 10 mCi and < 200 mCi	> 200 mCi
H-3	< 10 mCi	> 10 mCi and < 200 mCi	> 200 mCi
I-125	< 200 uCi	> 200 uCi and < 4 mCi	> 4 mCi
P-32	< 2 mCi	> 2 mCi and < 40 mCi	> 40 mCi
S-35	< 10 mCi	> 10 mCi and < 200 mCi	> 200 mCi
All other Unsealed	< ALI	> ALI and < 20 * ALI	> 20 * ALI
Sealed Sources	<2 mrem/hr @ 1' from source	<10 mrem/hr at 1' from source	>10 mrem/hr at 1' from source