NEW MEXICO TECH

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

RADIATION SAFETY MANUAL

Radiation Safety Program

Radioactive Materials and Radiation-Producing Machines



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Prepared/Revised by	Stacy Kuykendall, Radiation Safety Officer	
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1. New Mexico Tech Radiation Protective Program

1.1 Introduction

The Radiation Safety Manual (RSM) serves to outline the policies and procedures governing the use of ionizing radiation across New Mexico Tech (NMT). Formulated and approved by the University's Radiation Safety Committee (RSC), these guidelines ensure that all ionizing radiation practices at NMT adhere to local, state, and federal regulatory standards, alongside the specific requirements detailed in the institution's Radioactive Material License and various X-Ray Radiation Machines Certificates of Registration. This manual does not cover non-ionizing radiation sources, such as lasers, microwaves, or ultraviolet light.

This document contains fundamental safety instructions for all users of ionizing radiation and for any personnel at New Mexico Tech who may experience radiation exposure. Designed to function as both an educational tool and a supporting reference, it complements formal instruction delivered by Radiation Safety Officers and Authorized Users. Various academic and operational departments at New Mexico Tech use ionizing radiation sources, including both radioactive materials and radiation-emitting equipment. New Mexico Tech maintains a radioactive material license that permits the university to acquire, receive, possess, transfer, and utilize specified radioactive substances at designated locations and for approved applications. This authorization remains subject to all existing and future rules, regulations, and directives enforced by the New Mexico Environment Department, as well as any conditions stated in the license itself. Furthermore, New Mexico Tech possesses multiple X-Ray Radiation Machines Certificates of Registration (CORs) granted by the New Mexico Environment Department Radiation Control Bureau (NMED RCB). Together, these credentials enable Radiation Safety Officer (RSO) and the RSC to grant permission to NMT faculty and staff to use radioactive materials and Radiation Machines in their research, teaching, and operational activities.

Operating out of the Office of Research, the RSO acts as the University's compliance manager, ensuring all operations involving ionizing radiation comply with state and federal laws, as well as RSC policies and mandates. An effective and

successful radiation safety strategy relies on active collaboration and cooperation across every tier of the institution. This includes the University Administration, represented through the Office of the Vice President for Research, the RSC, the RSO, Authorized Users, and their associated staff and students. New Mexico Tech remains dedicated to maintaining a high-standard radiation safety program aimed at safeguarding the health and well-being of radiation workers, the broader campus community, and the surrounding public. To achieve this goal, the program incorporates comprehensive staff training, expert consultation, facility and equipment inspections, rigorous evaluations of procedures and user credentials, and rapid emergency response capabilities for hazardous occurrences.

1.2 ALARA

New Mexico Tech endorses and adopts the principle of keeping exposures to ionizing radiation As Low As Reasonably Achievable (ALARA). The principles of ALARA are integral to the New Mexico Tech Radiation Safety Program, and every reasonable effort is made to maintain occupational exposures to ionizing radiation as far below occupational dose limits as practical.

- The University Radiation Safety Committee uses ALARA as a governing principle when developing policies and reviewing/approving requests for use of radioactive materials and Radiation Machines.
- Formal ALARA reviews are conducted annually by the RSC to assess the effectiveness of the Radiation Safety Program and implementation of the ALARA policy.
- Occupational dose and radioactive contamination administrative control limits are set well below most regulatory limits, and investigations are conducted when these limits are exceeded.
- Procedures, processes, and facilities are designed and evaluated so that exposures to workers and the general public are minimized to the greatest extent practical.

- Regular radiation safety surveillance and inspections are conducted by the Radiation Safety Officer (RSO) and EHS&RM staff to ensure proper procedures are followed.
- Records of inspections, surveys, and personnel dosimetry are maintained and regularly reviewed by the RSO to ensure radioactive contamination is controlled and employee exposures are ALARA.

The New Mexico Tech administration is committed to maintaining its radiation safety program consistent with the ALARA philosophy. The administration provides technically qualified personnel and devotes resources to ensure the university's Radiation Safety Program has the tools needed to implement the ALARA policy. However, a truly successful program requires a commitment to the principles of ALARA by all persons involved in the use of radiation at New Mexico Tech, whether they are administrators, faculty, researchers, staff, or ancillary personnel.

1.3 Objectives

New Mexico Institute of Mining and Technology (New Mexico Tech,_NMT) maintains a Radiation Protection Program (RPP) that ensures that all activities and operations involving ionizing radiation are conducted safely, responsibly, and in full compliance with the New Mexico Environment Department (NMED) Radiation Control Bureau regulations under Title 20, Chapter 3 of the New Mexico Administrative Code (NMAC), as well as applicable federal requirements (10 CFR Parts 19, 20, and 71). The program's primary goals are (1) to maintain occupational and public exposure As Low As Reasonably Achievable (ALARA) per 20.3.4.404 NMAC to protect the employees, students, contractors, and visitors of NMT and members of the general public and, (2) to establish and enforce a culture of safety, accountability, and compliance across all NMT units using licensed Radioactive Materials or Radiation Machines by ensuring that all activities involving licensed Radioactive Materials or registered Radiation Machines are conducted under the oversight of the Radiation Safety Officer (RSO) and in accordance with the University's Radioactive Material License, applicable regulations, and approved institutional authorizations.

Federal radiation-protection standards relevant to this Radiation Protection Program are contained in 10 CFR Part 20, including Subpart B (Radiation Protection Programs), Subpart C (Occupational Dose Limits), Subpart D (Radiation Dose Limits for Individual Members of the Public), Subpart F (Surveys and Monitoring), Subpart G (Control of Exposure from External Sources in Restricted Areas), Subpart H (Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas), Subpart I (Storage and Control of Licensed Material), Subpart J (Precautionary Procedures), Subpart K (Waste Disposal), Subpart L (Records), Subpart M (Reports), and the following appendices: Appendix A (Assigned Protection Factors for Respirators), Appendix B (Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage), Appendix C (Quantities of Licensed Material Requiring Labeling), Appendix D (U.S. NRC Regional Offices), and Appendix E (Nationally Tracked Source Thresholds).

The Radiation Safety Committee shall conduct and document an annual oversight review of the Radiation Protection Program to ensure continued compliance with applicable regulations and institutional requirements.

This Radiation Safety Program is implemented in accordance with applicable NMAC requirements and is informed by relevant NRC guidance documents, including NUREG-1556 guidance applicable to academic and research Radioactive Material programs.

1.4 Definitions

For the purposes of this Radiation Safety Plan, the following definitions apply (following 20.3.1 and 20.3.4 NMAC):

Agency: The **New Mexico Environment Department (NMED)**, which serves as the regulatory authority for all radiation control activities in the state through its **Radiation Control Bureau (RCB)**.

ALARA: *As Low As Reasonably Achievable*. Guiding principle of radiation protection under 20.3.4.404 NMAC**,** meaning that exposures shall be maintained as far

below the applicable limits as practical, consistent with the purpose of the activity.

Authorized User (AU): A Principal Investigator or other qualified individual who has received formal authorization from the Radiation Safety Committee (RSC) and the Radiation Safety Officer (RSO) to use specific licensed Radioactive Materials or a radiation machine.

Contamination: The presence of Radioactive Material in an undesired location, including on surfaces, equipment, clothing, personnel, or in the environment.

DOT: United States Department of Transportation

Declared Pregnant Radiation Worker: a woman who has voluntarily informed the licensee, in writing, of pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant radiation worker withdraws the declaration in writing or is no longer pregnant.

Department: means the environment department, its successors, or its predecessors, the environmental improvement agency, or the environmental protection division of the environment department.

Direct Supervision: Supervision provided by an Authorized User (AU) or a qualified radiation worker designated by the AU who is physically present in the laboratory or work area, is knowledgeable about the activity being performed, and is immediately available to observe, direct, and intervene, if necessary, to ensure safe operation and compliance with applicable regulatory requirements.

Exempt Source (or Exempt Quantity): Radioactive Material or a device containing Radioactive Material that is exempt from specified licensing requirements under applicable provisions of 20.3 NMAC because applicable exemption criteria are satisfied. An exemption from licensing requirements does not, by itself, establish that the material or activity presents no radiological hazard or is exempt from other applicable requirements.

Ionizing Radiation: A form of high-energy radiation capable of removing electrons from atoms or molecules, resulting in ionization. This type of radiation can induce chemical changes in cells and may cause damage to DNA

License: The Radioactive Material License issued to New Mexico Tech by the NMED Radiation Control Bureau, authorizing the possession and use of specified licensed Radioactive Materials in accordance with 20.3.3 NMAC (Licensing of Radioactive Material).

Natural Radioactivity: radioactivity of naturally occurring nuclides.

Naturally Occurring Radioactive Material (NORM): Materials containing radionuclides that occur naturally in the environment, including uranium, thorium, radium, potassium-40, and their decay products, in concentrations not produced by human activation or deliberate concentration processes.

NMAC: New Mexico Administrative Code

Occupational Dose: The dose received by an individual in the course of employment or assigned duties involving exposure to ionizing radiation, as defined in applicable NMAC regulations. Occupational dose does not include doses received from background radiation.

Personal Protective Equipment (PPE): Equipment and clothing worn by an individual to minimize exposure to radiation, licensed Radioactive Materials, or other workplace hazards. PPE may include, but is not limited to, lab coats, gloves, safety glasses, face shields, respirators (when required), and protective footwear. PPE does not eliminate hazards and must be used in conjunction with appropriate engineering controls, administrative controls, and safe work practices.

Radiation Machine: any device capable of producing ionizing radiation except those devices with Radioactive Material as the only source of radiation.

Radioactive Material: any material in any physical or chemical form which emits radiation spontaneously.

Radiation Worker: An individual whose assigned duties involve the use of licensed Radioactive Materials, Radiation Machines, or work in areas where occupational exposure to ionizing radiation may occur, and who is required by the Radiation Safety Officer (RSO) or applicable regulations to receive radiation safety training, follow radiation protection procedures, or participate in personnel monitoring programs.

RCB: The Radiation Control Bureau of NMED.

Restricted Area: An area where access is controlled for purposes of radiation protection and where occupational dose limits may apply, per 20.3.4 NMAC.

RSC: The Radiation Safety Committee, responsible for program oversight, authorization of uses, and review of safety procedures.

RSO / ARSO: The Radiation Safety Officer and Associate Radiation Safety Officer, who are responsible for the implementation and daily management of the Radiation Protection Program.

Sealed Source: Radioactive Material that is permanently bonded or encapsulated to prevent dispersion or leakage.

Technologically Enhanced Naturally Occurring Radioactive Material (TENORM): Naturally occurring Radioactive Material whose radionuclide concentrations or potential for human exposure have been increased through human activities or technological processes.

Unrefined and Unprocessed Ore: ore in its natural form prior to any processing such as grinding, roasting, beneficiating or refining.

Unrestricted Area: Any area to which access is neither limited nor controlled by the licensee for purposes of radiation protection, as defined in 20.3.4 NMAC.

The terms "shall" and "must" indicate mandatory requirements established by applicable regulations, license conditions, or institutional policy. The term "should" indicates recommended practices intended to support ALARA and good radiation

safety, but does not, by itself, establish a mandatory requirement unless otherwise specified.

1.5 Regulatory References

This plan is governed primarily by applicable provisions of 20.3.1 NMAC (General Provisions), 20.3.2 NMAC (Registration of Radiation Machines and Services), 20.3.3 NMAC (Licensing of Radioactive Material), 20.3.4 NMAC (Standards for Protection Against Radiation), 20.3.8 NMAC (Radiation Safety Requirements for Analytical X-Ray Equipment), 20.3.10 NMAC (Notices, Instructions and Reports to Workers: Inspections), 20.3.12 NMAC (Licenses and Radiation Safety Requirements for Well Logging), and 20.3.16 NMAC (Fees for Licensure of Radioactive Materials), as applicable to NMT activities. Each section of this document is written to align with these regulations. New Mexico, as an NRC Agreement State, regulates Radioactive Materials within its jurisdiction through the New Mexico Environment Department (NMED). Applicable federal NRC regulations are incorporated or otherwise applicable as provided by New Mexico regulations and federal law.

2. General Information

2.1 Scope of Operations

New Mexico Tech uses licensed Radioactive Materials and Radiation Machines exclusively for academic instruction, analytical research, and related scientific investigations. All such activities are conducted under the supervision of authorized personnel who have completed the required radiation safety training and have been formally approved by the Radiation Safety Committee.

The RSO and ARSO maintain the university's Radioactive Material license and ensure that all activities involving radiation comply with NMED regulations, license conditions, and institutional policies.

2.2 Facilities

All authorized activities involving licensed Radioactive Materials or Radiation Machines are conducted in designated laboratories or research facilities located on the main campus at 801 Leroy Place, Socorro, New Mexico – 87801, except for portable radiation machines authorized for field use, which may be operated at on-campus or off-campus locations in accordance with applicable regulatory requirements and approved radiation safety procedures. Facility-specific records and documentation are maintained at each use location, while master program records are retained at the NMT campus, under the custody of the Radiation Safety Officer.

For each authorized use site on New Mexico Tech's campus, site-specific information will be maintained at each individual location. Records associated with portable radiation machines used in the field shall be maintained in accordance with the Radiation Safety Program's recordkeeping requirements.

All facilities are subject to periodic inspection by the RSO. Authorized Users shall provide reasonable access to laboratories, licensed Radioactive Materials, registered Radiation Machines, and associated records to permit inspections, inventories, surveys, audits, and other activities necessary to verify compliance with applicable

regulations, license conditions, and institutional policies. All facilities may also be audited by the NMED Radiation Control Bureau to verify compliance with 20.3.4 NMAC (Standards for Protection Against Radiation) and the university's license conditions.

3. Responsibilities and Qualifications:

The Radiation Protection Program is overseen by a Radiation Safety Committee (RSC), which provides institutional review and oversight of activities involving licensed Radioactive Materials and Radiation Machines. The Committee reviews and approves license applications, radiation-use authorizations, safety procedures, and training programs to ensure compliance with applicable regulations and that radiation exposures remain ALARA.

The Radiation Safety Program supports the university's educational, research, and service missions by facilitating the safe and compliant use of licensed Radioactive Materials and Radiation Machines. The Radiation Safety Officer (RSO) and Radiation Safety Committee (RSC) provide both oversight and technical support to help ensure that radiation-related activities are conducted safely, responsibly, and in accordance with applicable regulatory requirements.

3.1 Radiation Safety Officer

The **Radiation Safety Officer (RSO)** and **Associate RSO (ARSO)** are formally appointed by the Vice President of Research and approved by the New Mexico Environment Department (NMED) Radiation Control Bureau (RCB) as part of the University's Radioactive Material License. The RSO and ARSO shall possess the education, training, and experience required to ensure the safe use of ionizing radiation and serve as the University's primary technical advisors on radiation safety matters to the Radiation Safety Committee (RSC), faculty, staff, and administration. Unless otherwise specified, references to the "RSO" throughout this manual include the Associate Radiation Safety Officer (ARSO) when acting within the scope of delegated responsibilities and authority. Administrative functions may be performed by either the RSO or ARSO, as appropriate.

Acting under the authority of NMT's Radioactive Material licenses, the RSO is responsible for maintaining the University's Radioactive Material licenses, supporting compliance with the University's registered Radiation Machines, and ensuring compliance with applicable regulatory requirements and license conditions. The RSO

implements personnel monitoring programs, conducts radiation safety training, oversees facility surveys, establishes emergency and spill response procedures, and manages all compliance reporting to NMED and other agencies. The RSO performs the initial technical review and approval of requests to use Radioactive Material and Radiation Machines prior to submission to the RSC for final authorization.

The RSO maintains comprehensive records, including Radioactive Material inventories, waste disposal and transfer documentation, personnel exposure histories, instrument calibration data, and results of internal audits. All shipping and receiving of Radioactive Material are coordinated through the Radiation Safety Office to ensure compliance with applicable state and federal requirements. The RSO conducts an annual evaluation of the entire Radiation Safety Program to assess its effectiveness and identify areas for improvement.

The RSO is authorized to suspend activities that present an immediate radiological hazard or are not being conducted in accordance with applicable regulations, license conditions, or approved institutional authorizations. The suspension shall remain in effect until corrective actions have been completed or the Radiation Safety Committee has reviewed the matter, as appropriate.

The RSO and ARSO collaborate with Facilities Management, Laboratory Safety Personnel, and Campus Police to coordinate emergency response, security, and transport activities involving licensed Radioactive Materials. In the absence of the RSO, the ARSO assumes all duties and responsibilities to ensure the continuity of the Radiation Protection Program.

3.2 Appeals and Review of Radiation Safety Decisions

Authorized Users (AUs) may request review of an RSO decision by submitting a written request to the Radiation Safety Committee (RSC) within ten (10) working days following the action. The RSC shall review the matter and provide a recommendation to the Vice President of Research (VPR) based on applicable regulatory requirements, institutional policy, and radiological safety considerations.

Actions taken by the RSO to address an immediate radiological hazard or regulatory non-compliance shall remain in effect until corrective actions have been

completed or the Vice President for Research has issued a final determination, as appropriate.

The Vice President for Research shall be notified immediately of any suspension of radiation activities or other significant enforcement action taken by the RSO. The Radiation Safety Committee shall be notified within twenty-four (24) hours, or as soon as practicable if circumstances prevent notification within that period.

The Vice President for Research serves as the University's final institutional decision-maker regarding appeals of Radiation Safety Committee recommendations, while all decisions remain subject to applicable state and federal regulations and the conditions of the University's Radioactive Material License.

3.3 Radiation Safety Committee

The **Radiation Safety Committee (RSC)** provides oversight, policy direction, and advisory review for all activities involving licensed Radioactive Materials and Radiation Machines at New Mexico Tech. The Committee ensures that the use of ionizing radiation is conducted safely, responsibly, and in compliance with all applicable federal and state regulations, and the conditions of the University's Radioactive Material License.

The RSC is composed of staff and faculty members who are active users of licensed Radioactive Materials or Radiation Machines and who represent the range of disciplines in which radiation work is conducted. Committee members provide technical, operational, and institutional perspectives relevant to the safe use of licensed Radioactive Materials and Radiation Machines across the university. The Radiation Safety Committee serves the broader interests of the university community by supporting safe research, instruction, and regulatory compliance consistent with the educational and research mission of New Mexico Tech. Current committee membership and contact information shall be maintained by the Radiation Safety Office and made available to the campus community. The Radiation Safety Officer serves as an official voting member of the Committee. A minimum of three technical members is appointed by the Vice President for Research for two-year renewable terms. When membership changes are required, the RSC Chair may recommend

candidates to the Vice President for Research based on nominations from current committee members.

The RSC meets at least quarterly to review program performance, audit findings, incident reports, and ongoing safety initiatives. It is responsible for setting institutional policies and procedures to ensure that all radiation use at NMT is performed in accordance with the ALARA principle and that all Authorized Users maintain compliance with the terms of their individual approvals and with regulatory standards. The Committee must formally review and document the overall effectiveness of the Radiation Protection Program, including the ALARA program, at least annually. In evaluating new authorization requests, the RSC reviews the qualifications, training, and experience of each applicant seeking to use or supervise licensed Radioactive Materials or Radiation Machines. It assesses the types and quantities of material or devices requested, the proposed experimental or operational procedures, and the administrative and engineering controls designed to limit exposures. The RSC also reviews proposed waste-management practices to ensure that radioactive and mixed-waste generation is minimized. The Committee encourages applicants to apply ALARA principles in every phase of their work.

The RSC may conduct reviews and votes during formal meetings or through electronic correspondence when necessary. All official communications and voting records are maintained by the RSO as part of the permanent program documentation.

All regular committee members, including the Chair and the RSO, are voting members. A quorum, required for the transaction of official business, consists of at least the Committee Chair, the RSO, and a subject-matter expert (SME) whose expertise is directly relevant to the item under consideration. Ex officio non-voting members may be invited to participate when their specialized expertise is needed to support the Committee's deliberations. Decisions are made by a simple majority vote of the members present or participating electronically, excluding abstentions.

3.4 Authorized User

After submission of Form RS-1 and review by the Radiation Safety Committee (RSC), an individual may be approved as an Authorized User (AU) to use licensed Radioactive Materials and/or Radiation Machines in accordance with the conditions of the university's Radioactive Material license and applicable institutional requirements. Authorized Users shall possess the necessary education, training, and experience to ensure the safe use and supervision of ionizing radiation. Individuals who have not yet obtained sufficient experience may complete supervised practical training, radiation safety instruction approved by the RSC, or other documented experience acceptable to the Radiation Safety Officer (RSO) and RSC. The extent of required training and supervised experience shall be commensurate with the radiological hazard, physical form of the material, complexity of the operation, and applicable regulatory requirements associated with the proposed activity. Training shall include, as applicable, radiation fundamentals, biological effects of radiation, contamination control, waste management, emergency procedures, and applicable regulatory requirements.

Authorized Users are approved to possess and use licensed Radioactive Materials under the University's Radioactive Material License and in accordance with the conditions of their Radiation Use Permit. The Radiation Use Permit authorizes specific activities and does not confer ownership of licensed Radioactive Materials or independent licensing authority. All licensed Radioactive Materials are possessed under the University's license and remain subject to institutional oversight and applicable regulatory requirements.

Each Authorized User is directly responsible for the safe conduct of all operations involving licensed Radioactive Materials or registered Radiation Machines authorized under their Radiation Use Permit. AUs shall ensure that all personnel working under their directive receive appropriate training, follow approved protocols, and comply with ALARA principles, Radiation Use Permit conditions, and applicable institutional and regulatory requirements. Authorized Users are also responsible for maintaining accurate and up-to-date inventories of all licensed Radioactive Materials, conducting and documenting required contamination, radiation, and area surveys, promptly reporting any unsafe condition, equipment malfunction, or loss of licensed

Radioactive Material to the Radiation Safety Officer (RSO), and cooperating with inspections, inventories, audits, leak testing, and other compliance activities conducted under the University's Radiation Safety Program. Authorized Users shall provide timely and reasonable access to authorized use and storage areas, licensed Radioactive Materials, registered Radiation Machines, and records required by this manual or applicable regulations.

Authorized Users are responsible for ensuring that personnel working under their authorization receive appropriate training in the safe use of Radioactive Materials and radiation machines. Training may be provided by the Authorized User or by qualified personnel designated by the Authorized User.

Responsibilities and qualifications of Authorized Users:

Authorized Users: The faculty member, researcher, or technical staff member who has received approval from the RSC to use radioactive material or devices must:

Have the necessary training and experience to safely use and supervise the use of ionizing radiation. First-time users may overcome a deficiency in training by working under the supervision of an experienced radioactive material user for at least 40 hours and satisfactorily completing a training course approved by the RSC.

Ensure that all personnel who work under their Use Permit area are fully trained and qualified to perform the work and complete periodic radiation safety training as defined under the radiation safety program policies.

Evaluate and document worker competence related to specific operational procedures.

Ensure that physical inventories of radioactive material, routine radiation surveys are completed in a timely manner, as required by the radiation safety program.

Follow applicable rules, regulations, guides, and recommendations for procurement, use, possession, storage, transfer, shipping, and disposition of radioactive materials.

Make regular area surveys of their facility to ensure that radioactive materials are being properly handled and confined to designated areas. Records of such surveys must be maintained for inspection by the RSO.

Ensure that appropriate radiation survey instruments, personnel monitoring devices, PPE, engineering controls, and other equipment necessary to ensure worker safety while performing approved activities are available and working and used when required.

Notify the RSO prior to making substantive changes that are outside the scope of approved use of radioactive material or devices such as a change of location, isotopes, or new Radiation Machines.

Notify the RSO when an AU wishes to terminate a Use Permit so the authorized area(s) and equipment can be properly decommissioned.

Notify the RSO immediately in the event of a radiation accident (major spill, fire, contamination of atmosphere, person, or area, unauthorized release of radioactive materials, theft or loss of radioactive materials) and known or suspected overexposure of personnel to ionizing radiation in accordance with applicable regulations.

3.5 Radiation Workers

The primary objective of the RSC is to ensure that no individual receives unnecessary exposure to ionizing radiation and that all activities involving licensed Radioactive Materials or Radiation Machines are conducted in accordance with the ALARA principle, as required by 20.3.4.404 NMAC.

Radiation work shall be performed only by individuals authorized under the applicable Radiation Use Permit or Radiation Machine Use Permit, or by individuals working under the supervision required by that authorization and institutional procedures. No individual may independently operate Radiation Machines or handle licensed Radioactive Material unless appropriately authorized by an Authorized User.

While New Mexico Tech, as an employer, is responsible for providing a safe and compliant work environment, the primary responsibility for maintaining radiation

exposures ALARA rests with each individual worker. To fulfill this obligation, Radiation Workers shall understand and adhere to all procedures and safety controls established by their AU, follow the operating and emergency procedures approved by the RSC, and immediately report any unsafe condition, suspected overexposure, or loss of material to the RSO.

4. Regulation and Licenses

This Radiation Safety Manual is governed primarily by the following parts of the New Mexico Administrative Code (NMAC) sections:

4.1 New Mexico Administrative Code (NMAC):

Title 20 (Environmental Protection), Chapter 3 (Radiation Protection):

- Part 1: General Provisions
- Part 2: Registration of Radiation Machines and Services
- Part 3: Licensing of Radioactive Material
- Part 4: Standards for Protection Against Radiation
- Part 6: X-Rays in the Healing Arts
- Part 8: Radiation Safety Requirements for Analytical X-Ray Equipment
- Part 10: Notices, Instructions and Reports to Workers, Inspections
- Part 12: Licenses and Radiation Safety Requirements for Well Logging
- Part 15: Licenses and Radiation Safety Requirements for Irradiators
- Part 16: Fees for Licensure of Radioactive Materials

NMAC regulations are available online at http://www.env.nm.gov/rcb/regulations

4.2 Nuclear Regulatory Commission (NRC) Regulations:

Title 10 CFR (Energy) regulations are available at www.nrc.gov. Applicable Parts:

- Part 19: Notices, Instructions, and Reports to Workers Inspections and Investigations
- Part 20: Standards for Protection Against Radiation
- Part 30: Rules of General Applicability to Domestic Licensing of Byproduct Material

- Part 33: Specific Domestic Licenses of Broad Scope for Byproduct Material
- Part 34: Licenses for Industrial Radiography Safety Requirements for Industrial Radiographic Operations
- Part 35: Medical Use of Byproduct Material
- Part 36: Licenses and Radiation Safety Requirements for Irradiators
- Part 37: Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material
- Part 71: Packaging and Transportation of Radioactive Material

4.3 US Department of Transportation (DOT) Hazardous Materials Regulations (HMR):

- 49 CFR 171–173: definitions, classification, packaging, shipping papers
- 49 CFR 177–178: highway transport and packaging specs

4.4 Radioactive Material Licenses and Registrations at NMT

- New Mexico Radioactive Material License number AA373-21
- New Mexico Radioactive Material License number DU103-24
- Certificate of Registration to Operate Radiation Machines in the State of New Mexico IN53-0014 (Bureau of Geology X-Ray Analysis Laboratory)
- Certificate of Registration to Operate Radiation Machines in the State of New Mexico IN53-0001 (EMRTC)

5. User Authorization and Permitting

The process for obtaining authorization to work with licensed Radioactive Materials, sealed sources, radioactive gases, X-Ray Radiation Machines, or other radiation-generating equipment is designed to ensure that only qualified personnel handle ionizing radiation under conditions that comply with state and federal regulations. All uses of licensed Radioactive Material and registered Radiation Machines at New Mexico Tech must be conducted under the applicable University Radioactive Material license or radiation-machine registration, as appropriate, and in accordance with applicable NMED requirements and institutional authorizations.

5.1 Application Submission

Any faculty member, staff member, or other approved individual who wishes to work with ionizing radiation and/or Radiation Machines must submit a Radioactive Material Use Authorization (RMUA) application (Form RS-1) to the RSO for initial review.

The application must include all licensed Radioactive Materials and devices to be possessed under the Radiation Use Permit, together with generally licensed or license-exempt radioactive sources or devices when required by institutional policy. No acquisition, possession, or use of Radioactive Material subject to the Radiation Use Permit process may begin until the application has been reviewed and approved by the RSO and a Use Permit has been issued.

5.2 Application Review and Approval

RSO Review: The RSO evaluates each application for technical completeness, adequacy of facilities, radiation safety controls, and the applicant's training and experience. The RSO may request additional information or modifications before forwarding the application to the RSC.

RSC Review: The RSC reviews the application for regulatory and safety compliance. They may conduct a full meeting review or, if appropriate, an expedited "in-between-committee" electronic review with a mail ballot vote, with formal action recorded at the next RSC meeting.

Permit Issuance: Upon approval, the RSO issues a written Radiation Use Permit identifying the radionuclides, forms, and quantities authorized, the locations of use and storage, and the specific conditions of approval. The Radiation Use Permit may include additional conditions or restrictions necessary to ensure compliance with applicable regulations, license conditions, institutional policies, and ALARA principles. Such conditions may include, but are not limited to, possession limits, authorized radionuclides, approved locations of use, personnel monitoring requirements, survey frequencies, engineering controls, or other administrative controls appropriate to the authorized activities.

5.3 Required Application Content

Each application must include, at a minimum:

- The completed application form and copies of all experimental or operational protocols involving licensed Radioactive Materials or devices.
- The radionuclides, chemical or physical form, manufacturer, model number, activity, and configuration of each source or device.
- Exact location(s) of use and storage by building and room number, with a description of access control and security provisions.
- A detailed justification for the type and quantity of material requested.
- Documentation of applicant and user training (provided by NMT compliance office), education, and prior experience relevant to the proposed work. If the applicant has been previously listed as an Authorized User on another license, a copy of that license should be attached.
- Descriptions of the radiation detection and monitoring instruments to be used, including type, range, and calibration frequency.

- Engineering and administrative controls, including shielding, fume hoods, glove boxes, or filtration systems for any volatile or aerosol-forming isotopes.
- The applicant's radiation safety program description, including procedures for contamination control, PPE, labeling, posting, emergency response, and waste handling.
- Waste management details, including the expected waste types, methods of segregation, minimization strategies, and a statement that mixed waste (radioactive and hazardous) will not be generated unless specifically authorized.
- A list of all personnel who will work with licensed Radioactive Materials under the AU, accompanied by a completed Statement of Training and Experience Form (RS-3) for each individual.
- The name of an Alternate AU who will assume responsibility in the AU's absence, with written acceptance of this role.

5.4 RSO Assessment and Laboratory Readiness

Prior to final approval, the RSO inspects the proposed laboratory to verify that adequate radiation safety controls are in place. This includes confirmation of segregated work areas, secure storage of sources, spill trays, appropriate shielding, availability of PPE, and properly labeled radioactive waste containers. The RSO provides any additional procedural guidance necessary to achieve full compliance before recommending final approval to the RSC.

Laboratory Classification and Facility Evaluation:

Laboratories authorized for the use of licensed radioactive material shall be evaluated and classified by the RSO according to the radiological hazards associated with the proposed activities. The classification shall consider:

- the type and radiological characteristics of the radionuclide(s), including radiation type and energy;
- the relative radiotoxicity and potential internal and external exposure hazards;
- the quantity and activity of radioactive material requested;

- the physical and chemical form of the material, including whether it is sealed, unsealed, volatile, dispersible, or capable of producing airborne contamination;
- the nature and frequency of the proposed operations and the potential for contamination or release; and
- the administrative controls available within the facility.

Based on these factors, laboratories shall be classified as low, moderate, or high radiological hazard. The classification will be used to establish appropriate facility requirements, including shielding, containment, ventilation, access controls, contamination controls, survey instrumentation and frequency, PPE, waste-management provisions, and emergency procedures.

The RSO shall document the evaluation as part of the Radiation Use Permit review and provide the classification and recommended controls to the RSC for review and approval.

5.5 Special Conditions

The regulatory status of radioactive material as exempt from licensing requirements, generally licensed, or subject to New Mexico Tech's specific radioactive-material license shall be determined or verified by the RSO based on the applicable regulations, the material's composition, quantity, physical and chemical form, intended use, and manner in which the material was obtained.

Possession or use of radioactive material that qualifies for an applicable licensing exemption does not, by itself, require authorization under New Mexico Tech's specific radioactive-material license. However, exemption from licensing requirements does not necessarily exempt the material or activity from applicable institutional radiation-safety, inventory, contamination-control, transfer, transportation, or disposal requirements. The RSO shall determine the controls applicable to the material and its intended use.

Radioactive material possessed under a general license shall be used, transferred, and disposed of in accordance with the conditions and limitations of the applicable general license. Material possessed under a general license shall not be

considered license-exempt solely because the quantities involved are below the limits applicable to that general license.

Naturally occurring uranium- or thorium-bearing geological materials shall be evaluated and managed in accordance with Section 15 of this Manual. Exempt and generally licensed sealed sources shall also remain subject to the applicable inventory, security, leak-testing, and other requirements specified elsewhere in this Manual.

Radioactive material received or possessed under New Mexico Tech's specific radioactive-material license shall remain subject to the applicable license and regulatory requirements unless an authorized transfer, disposal, or other regulatory pathway permits its removal from licensed possession. Radioactive decay alone shall not be used as the basis for reclassifying licensed radioactive material as license-exempt. Any proposed change in regulatory status shall be evaluated by the RSO and must be supported by an applicable regulatory provision or authorization.

Authorized Users shall notify the RSO of exempt radioactive sources and devices under their responsibility to ensure appropriate institutional inventory and oversight. Such notification allows the RSO to distinguish exempt sources from licensed radioactive materials and to provide guidance on applicable requirements for safe handling, storage, transfer, and disposal.

Exempt radioactive materials shall be handled using appropriate practices to minimize radiation exposure and prevent the spread of contamination or inadvertent ingestion or inhalation. Disposal of exempt radioactive materials shall be coordinated with the RSO to ensure compliance with applicable regulatory requirements and institutional procedures.

The RSO shall provide or approve appropriate requirements for the safe use, storage, labeling, transfer, and disposal of exempt or generally licensed radioactive material when such controls are necessary.

5.6 Authorization Renewal and Modifications

Radiation Use Permits are reviewed periodically to ensure continued compliance with applicable regulations, license conditions, and institutional policies. Authorized Users shall obtain prior written approval before making any substantive

change to their authorized activities. Such changes include, but are not limited to, acquiring additional radionuclides or sealed sources; increasing possession limits; changing the physical or chemical form of licensed Radioactive Material; adding or modifying authorized use or storage locations; relocating licensed Radioactive Material to a different authorized use or storage location; introducing new radiation-producing equipment subject to the Radiation Safety Program; modifying approved procedures in a manner that could affect radiation safety; or making any other change that may affect radiation safety, regulatory compliance, or the conditions of the Radiation Use Permit. (Form RS-2).

5.7 Application for Radiation Machines

This section applies only to radiation-producing equipment that is registered under the New Mexico Tech Radiation Safety Program and is subject to oversight by the Radiation Safety Officer (RSO). A separate authorization process is required before any such radiation machine may be operated. Covered equipment includes, but is not limited to, research X-Ray systems, cabinet X-Ray units, analytical X-Ray Radiation Machines, X-Ray diffraction (XRD) systems, X-Ray fluorescence (XRF) systems, and other radiation-producing equipment required to be registered with the New Mexico Environment Department (NMED) under 20.3.2 NMAC (Registration of Radiation Machines and Services). Where applicable, these devices are also subject to the requirements of 20.3.6 NMAC (X-Rays in the Healing Arts) and 20.3.8 NMAC (Analytical X-Ray Equipment). Applicants must submit a completed Radiation Machine Authorization Form (RS-4) to the RSO for initial technical review. The RSO shall evaluate the technical specifications, proposed location, shielding, and safety features associated with the equipment before forwarding the application to the RSC for review and approval. No radiation machine subject to this section may be operated until all required registrations and institutional authorizations have been completed, the RSC has approved the application, and the RSO has issued a Radiation Machine Use Permit. Each application must include detailed information about the system and its intended use, including:

- Machine specifications, such as kVp (kilovolt peak), beam current (mA - milliampere), exposure time, target material, beam dimensions, and operating range.
- Associated equipment and safety features, including ventilation, shielding, warning lights, interlocks, and radiation monitoring instruments.
- A detailed description of the proposed use and utilization, including anticipated workloads, operating procedures, and frequency of operation.
- A complete analysis of potential radiation hazards and methods of control, referencing applicable dose limits and ALARA principles.
- Preventive maintenance and quality assurance programs, including periodic performance checks and calibration schedules.
- Interlock and radiation monitoring systems, describing their configuration and operational testing frequency.
- Shielding design and facility layout, shown on a floor plan. Where required, shielding plans shall be reviewed and approved by the NMED Radiation Control Bureau before installation or operation.
- Administrative and engineering controls to minimize radiation exposure to personnel and members of the public, consistent with 20.3.4 NMAC (Standards for Protection Against Radiation).

Prior to initial operation, the RSO shall inspect the installation site to verify that shielding, access controls, warning systems, interlocks, and other required safety features are properly installed and functioning. The RSO shall also verify that all operators have completed the radiation safety training appropriate for the specific class of equipment. Following satisfactory completion of these requirements, the RSO shall issue the Radiation Machine Use Permit in accordance with the approval granted by the Radiation Safety Committee.

6. Training

6.1 Purpose

All personnel whose duties involve, or may involve, exposure to ionizing radiation shall receive instruction commensurate with their responsibilities and potential radiation risk. Training ensures that all individuals understand radiation hazards, proper work practices, emergency procedures, and regulatory requirements, thereby maintaining exposures ALARA.

6.2 Initial Training

Authorized Users and all Radioactive Material and/or Radiation Machine Users: Shall complete initial radiation safety training prior to handling or supervising the use of licensed Radioactive Materials or Radiation Machines.

Training is delivered through Collaborative Institutional Training Initiative (CITI), or an equivalent program approved by the RSO, and includes:

- Fundamentals of ionizing radiation and biological effects.
- Regulatory framework and NMT license conditions.
- ALARA principles.
- Proper use of survey meters and dosimeters.
- Contamination control, waste handling, and emergency procedures.
- Security of sources and access control.

Completion of this course is required before a Radiation Use Permit is issued.

Support Personnel and Students in Posted Labs (Non-Users): Personnel who work in or routinely access posted laboratories but do not handle licensed Radioactive Materials shall complete the basic radiation safety course delivered through CITI, or equivalent training approved by the RSO, before beginning their assigned activities. They shall also receive laboratory-specific safety instruction provided by the Authorized User (AU) or a qualified designee, as appropriate to their duties and potential exposure risks.

These individuals shall not independently handle licensed Radioactive Materials and shall comply with applicable access restrictions, supervision requirements, and laboratory safety procedures.

Special Groups:

- Shipping and Receiving Staff: receive initial and recurrent training on radioactive-package receipt, monitoring, and documentation in accordance with applicable requirements of 49 CFR 172 Subpart H. Recurrent training shall be completed at least once every three years.
- Procurement Personnel**:** receive guidance from the RSO to prevent unauthorized purchases of licensed Radioactive Materials.

6.3 Lab-Specific Training

Each Authorized User (AU)/Principal Investigator (PI) is responsible for providing, documenting, and maintaining records of function-specific, on-the-job radiation safety training for personnel working under their authorization. Training shall cover, as applicable:

- Standard operating procedures.
- Radiation detection and survey instrument use.
- Area postings, shielding, and security.
- Radioactive waste segregation and labeling.
- Decontamination and spill response.

The AU/PI shall maintain lab-specific training records and make them available to the RSO upon request. The RSO or RSC may review these records during inspections or audits to verify compliance with applicable training requirements.

6.4 Annual Radiation Protection Program Review

In accordance with 20.3.4.404(C) NMAC, the content and implementation of NMT's Radiation Protection Program shall be reviewed with applicable employees before they begin duties involving sources of radiation and annually thereafter. The

annual review may be incorporated into radiation-safety refresher training or provided through another documented method established by the RSO.

Additional or refresher training may be required by the RSO when necessary based on changes in regulations, license or registration conditions, procedures, equipment, assigned duties, or identified radiation-safety concerns.

Training Program Review and Revision: The RSO shall periodically evaluate the Radiation Safety Training Program and propose revisions as necessary based on changes in regulatory requirements, license or registration conditions, institutional procedures, equipment or operations, audit findings, or identified radiation-safety concerns. Substantive revisions to training requirements or program content shall be reviewed and approved by the RSC. Following RSC approval, the RSO shall implement the revised training requirements and ensure that affected personnel receive the appropriate training. The specific changes and RSC approval shall be documented and maintained as part of the Radiation Safety Program records.

6.5 Specialized Training

Declared Pregnant Workers: receive counseling on fetal-dose limits and protective measures per 20.3.4.412 NMAC.

Minors or Visitors: may enter controlled areas only under direct supervision after receiving brief safety instruction from the RSO.

Emergency Responders: Facilities Management, Campus Police, and Environmental Health & Safety staff receive annual training in radiological hazard recognition and emergency procedures.

6.6 Records and Verification

The RSO maintains radiation training records in accordance with applicable regulatory requirements and institutional record-retention requirements. NMT retains these records for the lifetime of the license. Training records include:

- Participant's name.

- Completion date.
- Instructor or platform.
- Course title and content summary.
- Exam or performance verification results.

Training compliance is verified during audits and prior to permit renewals.

7. Radiation Exposure Risks, Monitoring, and Dose Limits

Implemented in compliance with 20.3.4.405 NMAC (Occupational Dose Limits for Adults), 20.3.4.411 (Dose limit for minors), 20.3.4.412 (Dose Equivalent for Embryo/Fetus), 20.3.4.413 NMAC (Dose Limits for Individual Members of the Public), and 10 CFR Part 20, Subpart C. These requirements ensure that individual radiation doses remain within regulatory limits and are maintained ALARA.

Personnel may receive external exposure (radiation from sources outside the body), internal exposure (intake of Radioactive Material), or both. Because any dose is assumed to increase risk, all exposures must be kept ALARA in accordance with 20.3.4.404 NMAC and the corresponding provisions of 10 CFR Part 20 (Standards for Protection Against Radiation). In implementing ALARA principles, NMT considers radiological risk, operational requirements, the practicality of control measures, and the effectiveness of exposure reduction measures, consistent with the purpose of the licensed activity. Work that involves radiation is justified only when the expected benefit outweighs the associated risk.

NMT, as the employer, provides a safe and compliant work environment; however, each worker is primarily responsible for maintaining their own exposure ALARA by understanding and following AU-approved procedures and controls.

7.1 Exposure Limits and Action Levels

Annual occupational and public dose limits are summarized below. Individual monitoring shall be provided when required by 20.3.4.417 NMAC. For adults, individual monitoring of external occupational dose is required when an individual is likely to receive, in one year, a dose from external sources in excess of 10 percent of the applicable limits in 20.3.4.405 NMAC. NMT may also require personnel monitoring at lower anticipated exposures when determined appropriate by the RSO for ALARA or risk-management purposes. NMT establishes administrative ALARA action levels as shown below. Exposures exceeding an applicable NMT action level shall be reviewed by the RSO to determine whether investigation or corrective action is warranted.

State of New Mexico / Federal Occupational Dose Limits (20.3.4 NMAC)		
	Annual Limit (mrem/yr)	**ALARA Action Level (mrem/yr)**
Total Effective Dose Equivalent (Whole Body)	5000	500
Shallow Dose Equivalent (Skin) or Extremity	50,000	5,000
Deep Dose Equivalent + Committed Dose Equivalent to any individual organ or tissue (other than lens)	50,000	5,000
Eye Dose Equivalent	15,000	1,500
Declared Pregnant Worker (Fetal Dose)	500/gestation	Any measurable dose investigated
Minor (< 18 years)	10% of the applicable adult occupational dose	Any measurable dose investigated
Member of Public (MOP)	100	Any measurable dose investigated

7.2 Personnel Monitoring and Dosimetry

NMT operates a dosimetry program consistent with 20.3.4 NMAC. Personnel monitoring is also implemented for risk-management purposes when deemed appropriate by the Radiation Safety Officer. Before the use of Radioactive Material and/or Radiation-generating Devices, Form RS-5 (Personnel Dosimetry Enrollment and Evaluation) must be completed.

7.2.1 Type of External Dosimeters

External dosimeters are used to measure the dose of ionizing radiation received from sources outside the body. At NMT, external dose monitoring is performed using Optically Stimulated Luminescence (OSL) and Thermoluminescent Dosimeter (TLD) technology, supplied by a National Voluntary Laboratory Accreditation Program

(NVLAP)-accredited vendor, when required. The type and placement of each dosimeter depend on the radiation type, the work being performed, and the body region of concern.

Optically Stimulated Luminescence (OSL) Badges: OSL badges are the most common dosimeters used for whole-body monitoring. They measure exposure from medium- to high-energy beta, gamma, and X-Ray radiation, and can also respond to neutron radiation when fitted with the appropriate detector element. OSL badges contain aluminum-oxide (Al_2O_3) detectors that trap energy when exposed to radiation; the energy is later released as light when stimulated by a laser, and the emitted light intensity is proportional to dose. They are typically worn on the front of the torso, between the shoulders and waist, on the outermost layer of clothing to measure the deep-dose equivalent (DDE), which represents whole-body exposure at a tissue-equivalent depth of 1 cm. All dosimeters must be protected from heat, moisture, and mechanical damage and should be stored in a low-background area when not in use.

Thermoluminescent Dosimeter (TLD) Ring Badges: TLD rings or wrist badges are used for extremity monitoring to measure doses received by the hands or forearms during the manipulation of licensed Radioactive Materials or Radiation Machines. These dosimeters contain lithium fluoride (LiF) or similar phosphors that emit light when heated after exposure. TLD rings are worn on the hand most likely to receive the highest dose, with the label facing the palm.

Eye-Dose Equivalent (EDE) Monitoring: Eye exposure is measured using the same whole-body OSL badge positioned at collar level, providing an estimate of the eye-dose equivalent (EDE) at a tissue-equivalent depth of 0.3 cm. This position is particularly relevant for workers operating X-Ray machines or performing procedures near open radiation beams.

Special Dosimetry Arrangements: In some situations, alternative or additional dosimeters may be required:

- Lead Apron Use: Personnel using protective lead aprons (e.g., in X-Ray or fluoroscopy settings) may be assigned two dosimeters:

    - One worn outside the apron at collar level to record potential dose to the head, neck, and lens of the eye, and
    - One worn under the apron at waist level to record the deep-dose equivalent to the torso.
- Declared Pregnant, Radiation Workers are issued an additional fetal monitor, worn under the apron at the abdomen, to ensure the embryo/fetus dose remains within the 0.5 rem (5 mSv) gestational limit set by 20.3.4.412 NMAC.
- Alternate Positions: For unique operations, the RSO may authorize other dosimeter locations to better characterize exposure geometry (e.g., on the forearm, head, or back).

Dosimeters provide official occupational exposure records and do not provide real-time alarms or protection from radiation. Their sole function is to measure and document occupational dose. Personnel must therefore follow all prescribed safety controls and work practices in addition to wearing dosimeters.

7.2.2 Enrollment and Training

Personnel who work in, or frequently enter, controlled or posted areas must complete a Personnel Dosimetry Enrollment and Evaluation Form (RS-5), which is reviewed by Radiation Safety to determine whether personnel monitoring is required under 20.3.4.417 NMAC or warranted as an institutional ALARA or risk-management measure.

New participants must complete Dosimetry Training within 30 days of assignment, covering the correct use and care of badges, ALARA expectations, and work-specific operating practices.

7.2.3 Conditions Requiring a Dosimeter

NMT will issue a badge or dosimeter when one or more of the following apply, including when required by 20.3.4.417 NMAC or as an institutional ALARA measure:

- Reasonable potential to exceed 10% of an occupational limit (20.3.4.405).
- Minors who are likely to receive, in one year, a deep-dose equivalent in excess of 100 mrem, a lens-dose equivalent in excess of 150 mrem, or a shallow-dose equivalent to the skin or extremities in excess of 500 mrem.
- All declared pregnant Radiation Workers, as an NMT institutional ALARA measure; individual monitoring is required by 20.3.4.417 NMAC when the applicable regulatory threshold is met.
- Individuals entering high or very high radiation areas as defined in 20.3.4.418 and .419 NMAC**.**
- Any individual for whom the RSO determines dosimetry is warranted for risk-management purposes.

7.2.4 Rules for Dosimeter Use

- Assigned dosimeters must be worn whenever performing work or entering areas for which dosimetry has been required by the RSO.
- Wear the badge on the torso between the collar and waist, facing the radiation source.
- When protective lead aprons are worn, badges must be placed over the apron at the collar level. The fetal monitor for a declared pregnant worker is worn beneath the apron at waist level.
- Do not share, loan, or substitute badges; each badge is individually assigned.
- Return badges at the end of each monitoring period (monthly or quarterly, depending on risk).
- Personnel shall promptly report missing or damaged dosimeters to the RSO and complete the Lost or Damaged Personnel Dosimeter Report (Form RS-5A), as directed by the RSO.

- Never wear a dosimeter during personal medical or dental procedures involving radiation.
- Ring dosimeters, when issued, must be worn on the hand most likely to receive the highest dose, with the label facing the palm.

7.2.5 Monitoring Devices and Bioassays

For most operations, dosimetry is not required for work with low-energy beta emitters such as ^{3}H (tritium) or ^{14}C (carbon-14), or for alpha emitters contained in sealed sources. Personnel handling high-energy beta emitters (e.g., ^{32}P) or gamma-emitting radionuclides shall be evaluated by the RSO to determine whether personnel dosimetry is required under 20.3.4.417 NMAC or warranted as an institutional ALARA measure.

Authorized Users employing tritium (^{3}H) in quantities ≥ 1 mCi in volatile or dispersible form must participate in the Tritium Bioassay Program. The RSO conducts periodic bioassays, maintains exposure records, and ensures compliance with ALARA.

7.3 Special Categories

Pregnant Radiation Workers: A worker may voluntarily declare her pregnancy in writing using Form RS-6. This information will remain confidential unless the worker chooses otherwise. Upon declaration, the Radiation Safety Officer (RSO) will provide counseling regarding occupational radiation exposure and applicable dose limits. Declared pregnant Radiation Workers will be issued an additional fetal dosimeter to be worn at waist level under protective garments, as applicable. The dose to the embryo/fetus shall not exceed 0.5 rem (5 mSv) during the entire gestation period, consistent with 20.3.4.412 NMAC. Declaration of pregnancy does not automatically require reassignment or exclusion from radiation work; work practices and assignments may be reviewed as necessary to maintain exposures ALARA and within regulatory limits.

Minors: Minors who are not specifically authorized to participate in an approved educational or research program may enter a posted laboratory only as visitors, under the direct supervision of an Authorized User and subject to any radiation-safety controls established by the RSO. The occupational dose limits for minors are 10 percent of the applicable adult occupational dose limits specified in 20.3.4.405 NMAC, as provided by 20.3.4.411 NMAC. Individuals under 18 years of age shall not use or handle licensed Radioactive Materials unless specifically authorized by the Radiation Safety Officer as part of an approved educational or research program and in accordance with applicable regulations, institutional policy, and the conditions of the University's Radioactive Material License.

Visitors: Visitors entering controlled or posted areas must obtain prior approval from the RSO. A temporary visitor badge may be issued to document any potential exposure.

7.4 Dosimetry Reports and Records

All exposure reports are received directly from the dosimetry vendor and reviewed by the RSO or designee. Each report is evaluated for consistency, potential anomalies, and ALARA compliance.

- Any exposure that approaches or exceeds an action level triggers an immediate investigation by the RSO.
- Confirmed exposures meeting applicable regulatory reporting criteria are reported to the NMED Radiation Control Bureau in accordance with 20.3.4.452–.457 NMAC, as applicable.
- The RSO maintains lifetime exposure records for all monitored individuals in compliance with 20.3.4.446 NMAC.
- Annual dose reports are provided in accordance with 20.3.10.1003 NMAC, including to monitored individuals whose occupational dose exceeds 100 mrem (1 mSv) Total Effective Dose Equivalent (TEDE) or 100 mrem (1 mSv) to any

individual organ or tissue during the monitoring year, and to monitored individuals who request an annual dose report.

- Terminating employees may request a final exposure summary. The RSO may also provide dose histories to new employers with the individual's written consent.

7.5 Program Oversight

The RSO administers the dosimetry program, reviews exposure trends quarterly, and reports significant findings to the Radiation Safety Committee. The RSC evaluates overall program performance annually, ensuring that personnel exposures remain ALARA and within the limits of 20.3.4 NMAC.

8. Access, Storage, and Use of Radioactive Material

The Radiation Safety Officer (RSO) shall maintain an accurate, current, and auditable inventory of Radioactive Materials and devices subject to institutional inventory control, including licensed Radioactive Material, sealed and unsealed sources, generally licensed devices or materials, and license-exempt sources or materials designated for institutional inventory by the RSO.

All licensed Radioactive Materials, whether sealed or unsealed, possessed under New Mexico Tech's Radioactive Material licenses must be used, stored, and secured in a manner that prevents unauthorized access, loss, or exposure, and that complies with the conditions of the NMT license and 20.3.3 and 20.3.4 NMAC. The AU shall ensure the security, safe handling, and recordkeeping of all licensed Radioactive Material authorized under the Radiation Use Permit. The AU shall also ensure that all work is conducted by trained personnel under approved procedures and in accordance with ALARA principles. All facilities that store or use Radioactive Material must be approved by the RSO prior to authorization.

8.1 Use of Radioactive Material

8.1.1 Supervision and Training

- Only trained, authorized individuals may handle Radioactive Material.
- Students or workers not yet fully authorized must work under direct supervision in accordance with applicable Radiation Use Permit conditions and institutional requirements.
- AUs must maintain standard operating procedures (SOPs) for each authorized protocol, outlining safe handling, contamination control, and waste management steps.

8.1.2 Best Practice for Safe Use

Apply the fundamental safety principles of Time, Distance, and Shielding:

- **Minimize exposure time:** By rehearsing the steps, you can do the real operation faster and more confidently once RAM is present.
- **Before beginning work, personnel should** confirm that equipment, shielding, and waste containers are properly positioned and functioning.
- **Reduce contamination risk:** practicing ensures that you don't spill or contaminate work areas due to unfamiliarity or poor organization.
- **Verify readiness** confirms that all required PPE, survey instruments, and secondary containment are available and correctly used.
- **Whenever practical, personnel should first perform the entire experimental or procedural sequence** without using any Radioactive Material, using water, dye, or other harmless substitutes to ensure the method, timing, and layout work correctly before introducing radioactivity.
- **Keep sources out of storage** only as long as necessary.
- **Use appropriate shielding** (e.g., Plexiglas for high-energy betas, lead for gamma emitters). Never place lead directly in front of beta sources to avoid bremsstrahlung generation.
- **Handle all work** on impervious, break-resistant trays lined with absorbent paper.
- **Wear** lab coats, safety glasses, and disposable gloves; never mouth-pipette or consume food/drink in RAM labs.
- Personnel handling unsealed Radioactive Material shall wash their hands before leaving the laboratory or designated work area and shall perform post-procedure contamination surveys as required by applicable procedures.

8.1.3 Procedural Control and Documentation

- All use of RAM must be monitored, with the isotope, activity, and date recorded in the Use Log maintained at the workstation.
- Authorized Users shall maintain accurate inventory records and comply with the inventory requirements established in Section 14.

- After-hours or solitary work with licensed Radioactive Materials is strongly discouraged. The RSO may require prior approval or additional safety controls for activities that, due to their radiological hazards or complexity, warrant heightened oversight.

8.2 Access and Security Controls

Access to radiation and high-radiation areas is maintained in accordance with 20.3.4.418 NMAC (Control of Access to High Radiation Areas) and 20.3.4.419 NMAC (Control of Access to Very High Radiation Areas), ensuring that only authorized personnel can enter controlled zones by barriers, administrative measures, and conspicuous warning signs to prevent unauthorized access.

8.2.1 Authorization and Access

- Access to RAM is restricted to individuals listed on the Radiation Use Permit or those under the direct supervision of an AU or trained radiation worker.
- Labs must remain locked or continuously attended when RAM is present.
- Visitors, custodial staff, or maintenance workers may enter only under supervision, with prior RSO or AU approval.

8.2.2 Physical and Procedural Barriers

- Radioactive Material must be secured from theft or unauthorized removal using locked refrigerators, freezers, cabinets, or safes.
- Both physical and administrative barriers must be in place to prevent unauthorized entry.
- Suspicious or unauthorized individuals observed in areas where licensed Radioactive Materials are used or stored shall be reported immediately to the

Authorized User (AU), Radiation Safety Officer (RSO), or Campus Police, as appropriate. Personnel should not place themselves at risk by attempting to confront individuals when doing so may be unsafe.

- The RSO must be notified immediately of any loss, theft, or suspected diversion of Radioactive Material in accordance with 20.3.4.451 NMAC.

8.2.3 Inspections, Inventories, and Audits

- The Radiation Safety Officer (RSO) and authorized representatives of the Radiation Safety Committee (RSC) may enter laboratories and other areas where licensed Radioactive Materials or registered Radiation Machines are authorized for use or storage, at reasonable times, to conduct compliance activities necessary to verify compliance with applicable regulations, license conditions, Radiation Use Permit conditions, and institutional policies. Authorized Users shall provide reasonable access to laboratories, licensed Radioactive Materials, registered Radiation Machines, and records required by this manual or applicable regulations to conduct these activities.
- During routine and annual inspections, the RSO may verify the presence, identity, location, security, and condition of licensed Radioactive Materials and sealed sources, as well as associated records, to confirm compliance with regulatory requirements, license conditions, and institutional policy.
- Authorized Users and Radiation Workers shall cooperate with inspections, inventories, audits, surveys, leak testing, and investigations conducted under the University's Radiation Safety Program. Failure to provide reasonable access to authorized use or storage areas, licensed Radioactive Materials, registered Radiation Machines, or records required by this manual may constitute non-compliance with the conditions of the Radiation Use Permit and this manual and may result in corrective actions, suspension of authorized activities, or other actions deemed necessary by the Radiation Safety Committee.

- Inspections and audits may be documented using the Radiation Safety Inspection / Audit Form (Form RS-15) or an equivalent inspection or audit record maintained by the RSO. Deficiencies shall be documented, and required corrective actions must be implemented by the AU.
- Any willful or repeated security violation may result in the temporary suspension of the Use Permit.

8.3 Storage of Radioactive Material

This section is governed by 20.3.4.425 NMAC (Security and Control of Licensed or Registered Material). All licensed or registered sources of radiation: sealed sources, unsealed sources, and devices are stored in locked, access-controlled facilities to prevent theft, loss, or unauthorized use.

8.3.1 Location and Configuration

- Radioactive Material shall only be stored in RSO-approved restricted areas listed on the AU's permit.
- Storage location shall be configured so that radiation levels in adjacent unrestricted areas do not exceed 2 mrem (0.02 mSv) in one hour, in accordance with 20.3.4.413 NMAC and the definition of "Unrestricted Area" in 20.3.4.7 NMAC. When necessary, shielding or distance must be used to maintain these levels.
- Rooms and cabinets used for Radioactive Material storage shall be locked when unattended**.**
- Storage areas shall be posted in accordance with Section 9 of this Manual.

8.3.2 Containers and Labeling

- All Radioactive Material shall be stored in closed, durable containers appropriate to its form.

- Containers of licensed or registered material shall be labeled as required by 20.3.4.430 NMAC, subject to the applicable exemptions in 20.3.4.431 NMAC. Required labels shall bear the radiation symbol and the words 'Caution, Radioactive Material' or 'Danger, Radioactive Material,' as applicable, and shall provide sufficient information to permit individuals handling or using the containers, or working in their vicinity, to take precautions to avoid or minimize exposure.
- In addition, NMT requires labels to indicate the date and contact information for the AU and RSO, as applicable.
- Containers holding liquids must have secondary containment sufficient to hold the full contents in the event of rupture.
- Refrigerators or freezers containing Radioactive Material shall be locked when unattended and labeled on the exterior door.

8.3.3 Engineering Controls

- Fume hoods used for licensed Radioactive Materials shall be inspected and tested at intervals established by the University and maintained in operating condition consistent with applicable institutional requirements and manufacturer recommendations.
- For sealed sources, lead pigs or approved shielding should be used to minimize external radiation; inventory logs shall track each source's removal, use, and return.

8.3.4 Waste Storage

- Radioactive waste shall be stored in RSO-approved containers per New Mexico Tech's Laboratory Safety Manual and Chemical Hygiene Plan, Section 13, Radioactive Waste Management (NMT Laboratory Safety Manual & Chemical Hygiene Plan.docx).

- Containers shall be lined, leakproof, labeled with isotope, activity, date, and warning symbol, and shielded as necessary.

8.3.5 Transport, Transfer, and Recordkeeping

- Transfers of Radioactive Material between authorized laboratories, buildings, or Authorized Users require prior RSO approval and appropriate secondary containment and labeling. Routine movement of Radioactive Material within an individual Authorized User's approved laboratory or authorized work area does not require prior RSO approval, provided it is performed in accordance with approved procedures. Off-site transfers or shipments must comply with 20.3.3.306 NMAC and 49 CFR 171-178 (DOT Hazardous Materials Regulations) and be conducted exclusively through the RSO (Form RS-7).
- The Authorized User (AU) shall maintain records of the receipt, use, transfer, inventory, and disposal of all licensed Radioactive Material, as required by this manual and applicable regulations. The RSO maintains centralized institutional records for the lifetime of the license. Authorized Users shall provide required records to the RSO upon request within the timeframe specified by the RSO, unless an immediate response is required by regulation or to address an actual or suspected radiological hazard. Inventory verification and inspections shall be conducted in accordance with Section 8.2.3.

9. Posting and Labeling

Implemented per 20.3.4.428 NMAC (Posting Requirements) and 20.3.10 NMAC (Notices, Instructions and Reports to Workers). Areas and rooms shall be posted as required by 20.3.4.428 NMAC and subject to the applicable exceptions in 20.3.4.429 NMAC. NMT may require additional posting of laboratories, storage areas, or other locations containing Radioactive Material as an institutional radiation-safety control. Signs include phrases such as "Caution, Radiation Area," "Caution, High Radiation Area," or "Danger, Radioactive Material," depending on the classification of the area as defined by dose rate or material presence. These postings are placed conspicuously at entrances and maintained in legible condition. Their placement and condition are verified during routine inspections and annual program audits to ensure continued compliance with applicable regulatory and institutional requirements.

9.1 Posting of Areas, Rooms, and Laboratories

NMT posts rooms, laboratories, and controlled areas as required by 20.3.4.427 NMAC (Caution Signs) and 20.3.4.428 NMAC (Posting Requirements). NMT may require additional posting of areas where sources of radiation are used or stored as an institutional radiation-safety control. Relevant federal worker-notice and employee-protection provisions are contained in 10 CFR Part 19, as applicable. Entrances bear the radiation symbol, with wording appropriate to the applicable hazard classification:

"Caution, Radioactive Material": Areas where licensed Radioactive Material is used or stored shall be posted as required by 20.3.4.428 NMAC, subject to the applicable exceptions in 20.3.4.429 NMAC. NMT may require additional "Caution, Radioactive Material" posting as an institutional radiation-safety control.

"Caution, Radiation Area" (≥ 5 mrem in any 1 hour at 30 cm) and **"Caution, High Radiation Area"** (≥ 100 mrem in any 1 hour at 30 cm), as applicable. Determination of applicability will be by measuring radiation levels and calculating potential doses or by calculation using the isotope, quantity,

gamma factor, and shielding criteria. Signs may also be posted around the perimeter(s) of these areas.

Signs are placed conspicuously at entrances, kept legible, and verified during routine inspections and annual program audits. Certain short-term, attended, or low-level conditions qualify for posting exceptions under 20.3.4.429 NMAC (e.g., <8 hours with constant attendance and precautions).

NMT also complies with 20.3.10 NMAC (Notices, Instructions, and Reports to Workers) by posting the NMED-045 “Notice to Employees” in sufficient locations for workers to see during normal passage to/from work areas.

The proper posting and legibility of signage at fixed locations will be reviewed during the annual RPP review and the annual internal audit. These reviews may be performed more frequently.

9.2 Labeling of Containers

Every container of licensed/registered material must bear a durable, clearly visible trefoil and the words “Caution, Radioactive Material” or “Danger, Radioactive Material,” plus information sufficient for safe handling (e.g., radionuclide(s), estimated activity and date, radiation levels, kind of material, and mass enrichment). Radiation Machines must also be labeled per 20.3.4.430 NMAC. In addition, NMT requires container labels to include appropriate AU and/or RSO contact information, as applicable.

Exemptions from full container labeling (e.g., quantities below Appendix C, concentrations below Table III, or containers under constant surveillance) are governed by 20.3.4.431 NMAC. Small items that cannot practically be labeled (e.g., vials) are placed in a labeled secondary container/tray. Before removing or disposing of an empty uncontaminated container to an unrestricted area, radioactive-material labels shall be removed or defaced, or the container shall otherwise be clearly identified as no longer containing Radioactive Material, in accordance with 20.3.4.430(B) NMAC. NMT may require an appropriate radiation or contamination survey before release; applicable survey records shall be retained in accordance with 20.3.4.442 NMAC.

9.3 Additional NMT Practices

Local postings. Refrigerators/freezers/cabinets, or any place storing Radioactive Material, and designated bench areas are additionally posted or delineated (with tape/signage) to cue contamination control.

Emergency information. Each RAM lab posts emergency spill notification instructions and RSO contact information alongside the NMED-045 notice (supporting 20.3.10 NMAC).

Program assurance. Posting/labeling condition and placement are checked during RSO inspections and the annual program review; deficiencies are corrected promptly and documented in audit files (records under 20.3.4.440–.448 NMAC).

10. Radioactive Waste Management (RAW)

10.1 Scope and Regulatory Basis

Radioactive waste at NMT is generated, handled, stored, and disposed of in accordance with applicable requirements of 20.3.4.433–.439 NMAC, applicable license conditions, and U.S. Department of Transportation requirements when radioactive waste is offered for transportation. Applicable federal requirements are followed where incorporated or otherwise applicable under New Mexico regulations or federal law.

10.2 Program Principles

Compliance and Control. Radioactive Waste is highly regulated and managed under RSO oversight, with procedures designed to protect workers, the public, and the environment.

Minimization. Because disposal, particularly of long-lived or mixed radioactive waste, is costly, NMT emphasizes waste minimization at the source by using non-radioactive alternatives where practical, using the smallest practical quantities of Radioactive Material, conducting dry runs before introducing Radioactive Material (RAM), using spill trays or secondary containment, and maintaining good housekeeping practices.

Segregation. To reduce cost and complexity, generators must segregate waste by physical form, half-life, radionuclide, and non-radiological hazards.

10.3 Segregation Requirements

By physical form: Maintain separate, clearly labeled containers for dry solid (DSW), aqueous liquid (ALW), and liquid scintillation vial (LSV) waste. Do not commingle solids, liquids, sharps, or scintillation media.

By half-life: Use distinct containers for approximate half-life groups: <30 d; 30–60 d; 61–120 d; >120 d.

Uranium/Thorium: Collect all U/Th-containing chemicals and residues separately; record gram quantities and identify any co-hazards.

Mixed waste (RAM + hazardous chemical): Prohibited unless pre-approved in writing by the RSO. If unavoidable, consult the RSO in advance; disposal may require specialized packaging and will be charged back to the generator.

10.4 Container Standards and Labeling

- Use RSO-approved, leak-tight containers with tight-fitting lids and a clear liner; keep closed when not in use and do not store on high shelves or in high-traffic areas.
- Each container must display: the trefoil and "Caution, Radioactive Material," radionuclide(s), estimated activity and date, generator/PI, room/building, and container ID. Provide shielding as necessary to maintain applicable dose limits and exposures ALARA. The RSO may establish additional administrative dose-rate criteria based on the radionuclide, radiation type, occupancy, and storage conditions.
- Affix an NMT Radioactive Waste Tag and complete the Radioactive Waste Container and Disposal Record (Form RS-8) before requesting pickup; record each addition on the waste entry log attached to the container.
- Inventory control: activity placed in waste remains part of the AU's on-hand inventory until Radiation Safety removes the container from the lab.

10.5 Decay-in-Storage (DIS) for Short-lived Waste

- Radioactive waste with a half-life ≤120 days may be held for decay-in-storage when authorized by the RSO and permitted by applicable license conditions and regulatory requirements.

- Before disposal as non-radioactive trash: survey (and wipe-test where appropriate) the container and contents with a suitable instrument on the most sensitive scale to verify radioactivity is indistinguishable from background. Remove or obliterate all radiation markings/labels.
- Maintain DIS records (isotope, start/end dates, surveys, instrument ID, initials) per recordkeeping requirements.

10.6 Long-lived Waste (>120 days)

Waste with T½ > 120 days is not eligible for Decay-in-Storage. It must be packaged, characterized, and transferred to the RSO for shipment via a licensed radioactive-waste broker to an authorized disposal facility. Because charges are weight/volume-based, laboratories must minimize nonessential mass and avoid placing non-radioactive items in Radioactive Waste containers.

Laboratories must notify the RSO and the Office of the VPAF immediately if the projected volume or type of long-lived waste requires specialized long-term financial funding or institutional budgetary adjustments beyond the scope of existing research grants.

10.7 Sewer Disposal (liquid releases)

NMT's default policy is no drain disposal of radioactive liquids unless specifically authorized on the Use Permit and permitted by the local sanitary authority. If authorized, liquid releases must meet all limits, monitoring, documentation, and notification provisions and be performed only in accordance with RSO-approved procedures.

10.8 Waste-type Specifics

10.8.1 Dry Solid Waste (DSW)

This section is for typical DSW items, including absorbent pads, paper, gloves, plasticware, and pipettes that are contaminated with RAM.

- Do not place free liquids, sharps, broken glass, lead, scintillation vials, and chemical waste in dry solid waste.
- Segregate by radionuclide and half-life; add shielding for high-energy beta/gamma emitters.
- Label and keep the log current.

10.8.2 Aqueous Liquid Waste (ALW)

ALW is primarily water; avoid organic solvents or salts that create mixed waste.

- No solids: pH 5–9 (unless RSO approves otherwise).
- Secondary containment is required; do not exceed ~90% fill; keep closed when not in use.
- Do not add scintillation cocktail; list minor non-aqueous constituents and chelators (>0.1%).
- Drain disposal is prohibited unless specifically authorized by the Use Permit and RSO.

10.8.3 Sharps

Collect blades, broken glass, and glass pipettes in rigid, puncture-proof sharps containers labeled “SHARPS – Radioactive” with a Radioactive Material label. Seal when full; use a tag from (Hazardous Waste Pick-Up Request Instructions, HAZMAT Pick Up Instructions - 2025 Update pdf.pdf).

10.8.4 Uranium and Thorium Wastes

Collect U/Th salts and solutions separately; do not combine with other chemicals (e.g., lead citrate). Record gram quantities and identify co-hazards on (Hazardous Waste Pick-Up Request Instructions, HAZMAT Pick Up Instructions - 2025 Update pdf.pdf).

10.8.5 Sealed Sources (end-of-life)

Upon obsolescence, Authorized Users shall transfer sealed sources to the Radiation Safety Officer for disposition in accordance with Section 17 of this Manual. Disposition may include return to the manufacturer, authorized transfer or redeployment, or disposal through an authorized radioactive-waste pathway, as applicable.
Note that exempt sealed sources are required to be disposed as radioactive waste and following the same safe procedures as described.

10.8.6 Storage, Pickup, and Transfer

- Designate a waste accumulation area in each authorized lab; do not store Radioactive waste in chemical fume hoods.
- Keep containers closed; apply shielding as needed; ensure security consistent with Radioactive Material control requirements.
- When ready for removal, complete (Hazardous Waste Pick-Up Request Instructions, HAZMAT Pick Up Instructions - 2025 Update pdf.pdf) and request pickup from RSO. Waste remains on the AU's inventory until removed by the RSO team.

10.8.7 Records and Audits

- AUs must maintain usage and disposal records (e.g., Material Usage Log or equivalent) documenting activity used, transfers, and waste disposition (DIS, broker shipment, manufacturer return, etc.).
- The RSO maintains centralized Radioactive waste records (inventories, surveys/wipes, DIS verifications, shipping manifests) per 20.3.4.448 NMAC.
- The waste stream, postings/labels, and records are reviewed during routine inspections and the annual Radiation Protection Program audit; deficiencies are corrected promptly and documented.

10.8.8 Prohibited Practices (summary)

- Creating mixed waste without prior written RSO approval.
- Placing lead or other hazardous materials into RAM waste streams.
- Overfilling containers (>~90%); leaving containers uncapped; storing in high-traffic or unstable locations.
- Drain disposal without specific authorization.
- Commingling Radioactive waste forms (e.g., sharps in Dry Solid Waste; Liquid Scintillation Vials in Aqueous Liquid Waste).

10.9 NMT Waste Management

10.9.1 Radioactive Waste Storage Facility

The storage facility consists of a Connex located in the NMT Facilities Management secured yard, located north of the Facilities Management Headquarters. The facility is a metal building secured by a padlock, and the secured yard consists of chain link fencing surrounding the building and locked gates during non-operational hours.

10.9.2 Storage Security for Campus-Licensed Radioactive Materials

Licensed radioactive materials shall be secured from unauthorized removal or access in accordance with 20.3.4.425 NMAC and applicable license conditions. When not under the constant surveillance and immediate control of authorized personnel, radioactive materials shall be secured in locked storage areas, cabinets, containers, or devices, as appropriate to the material and facility. Access shall be limited to Authorized Users and other personnel authorized under the applicable Radiation Use Permit and institutional procedures. Authorized Users are responsible for controlling keys or other means of access to radioactive-material storage areas and shall notify the RSO of changes affecting authorized access or security. Additional security measures may be required by the RSO based on the type, quantity, location, or security significance of the material.

11. Management of Required Records

Records associated with the use of licensed Radioactive Materials and Radiation Machines are maintained in accordance with 20.3.4.440 through 20.3.4.448 NMAC (Records Requirements), which specify the types of information that must be retained, the format of documentation, and the duration of record storage. Documentation encompasses all dosimetry reports, radiation and contamination survey data, calibration certificates, instrument service records, training records, inventory logs, and waste disposal manifests. These records are retained for the time periods mandated by NMED regulation, typically three years for most survey and calibration records, and until license termination for personnel dose, waste disposal, and radiation program documentation. All records are maintained under the control of the Radiation Safety Officer and are made available for inspection by the New Mexico Environment Department or other authorized agencies upon request.

11.1 Centralized Radiation Safety Records (RSO)

The Radiation Safety Officer maintains all official radiation safety records required by NMAC in a centralized, auditable repository.

- Records are organized by type, date, and Authorized User, and must remain legible, complete, and accessible to regulatory inspectors at all times.
- Radiological data and administrative information must be consistent with NMAC requirements and NMED license conditions.
- Centralized records include (but are not limited to):
    - Radioactive Material Licenses, amendments, and correspondence with NMED
    - Authorized User (AU) permits and modification Forms RS-1 & RS-2
    - Procurement and receipt documentation, including purchase/acquisition requests and package receipt and monitoring records
    - Inventories of sealed and unsealed sources
    - Personnel monitoring results

- Radiation surveys, contamination monitoring, and calibration records
- Waste manifests, decay-in-storage logs, and disposal records
- Program audits, internal surveillances, RSC meeting minutes
- Incident, spill, or overexposure investigation reports (per 20.3.4.452–458 NMAC)

All official records are retained for the life of the license unless otherwise specified by regulation, with secure electronic backups and paper archives.

11.2 Authorized User Laboratory Records

Each Authorized User must maintain a complete and current set of radiation safety records in the laboratory notebook or equivalent folder. These records must be available for inspection by the RSO, RSC, or NMED inspectors.
Required contents include:

- Current Radiation Use Permit issued by the RSO.
- Source inventory and accountability records, including sealed-source leak-test reports.
- Instrument calibration certificates and functional checks.
- Routine and post-use radiation and contamination surveys.
- Radioactive waste logs for each container.
- Personnel radiation-safety training certificates.
- Applicable Standard Operating Procedures (SOPs) and approved protocols.
- Access to the regulations (link to NMAC Title 20, Chapter 3 and 4) and this Radiation Safety Manual.

Copies of completed records shall be provided to the RSO in accordance with Section 14 or immediately upon request. Surveys and waste logs must be retained for at least three years by both the AU and the RSO.

Records of training, exposure, procurement, and disposals must be retained for the duration of the AU's authorization and by the RSO for the lifetime of the license.

11.3 External Reporting and Notifications

New Mexico Tech maintains a centralized regulatory reporting process to ensure that radiation safety incidents, exposures, and compliance matters are communicated to regulatory agencies in accordance with 20.3.4.452 through 20.3.4.458 NMAC and 20.3.10 NMAC.

Official regulatory notifications and reports required under NMAC shall be coordinated through the Radiation Safety Officer (RSO) to ensure accurate and consistent communication with the New Mexico Environment Department (NMED).

The RSO conducts formal investigations of reportable events and, when warranted, prepares the required notifications and written reports and maintains associated records in the centralized radiation safety files.

The RSO maintains communication with NMED, provides required follow-up documentation, and responds to regulatory inquiries. All notifications and reports are logged, dated, and archived in the centralized records repository.

Authorized Users and Radiation Workers shall immediately notify the RSO of incidents, unsafe conditions, suspected overexposures, loss of Radioactive Material, or other potentially reportable events so that appropriate institutional and regulatory actions can be taken.

This administrative reporting structure does not restrict any worker's right to report safety concerns or regulatory issues directly to appropriate regulatory agencies in accordance with 20.3.10 NMAC and applicable employee protection provisions, including 10 CFR 19.20.

11.4 Record Format, Retention, and Access

- Records may be maintained in paper or secure electronic format, provided that authenticity and readability are preserved.

- Electronic backups are created regularly and stored separately from the primary files.
- Records shall include, as applicable, the date, name or signature of the responsible individual, facility or room number, radionuclide(s) involved, and relevant results or findings.
- The RSO ensures that current and historical records are accessible for inspection by NMED, DOE, NRC, or other agencies as applicable.

11.5 Record Audits

- The RSO performs annual internal audits of both centralized and laboratory records to confirm compliance with retention schedules and accuracy requirements.
- Deficiencies are documented in an Audit Corrective Action Report reviewed by the RSC.
- Records are protected from unauthorized alteration, loss, or disposal.
- When an AU terminates authorization, all associated documents, inventory, survey, and waste logs must be submitted to the RSO for final archiving.

12. Emergency Procedures and Incident Reporting

In accordance with 20.3.4.452 NMAC (Notification of Incidents), NMT shall notify the New Mexico Environment Department (NMED) of events meeting the applicable immediate or twenty-four-hour notification criteria. Pursuant to 20.3.4.453 NMAC (Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Constraints or Limits), NMT shall submit a written report to NMED within thirty days of learning of an occurrence meeting the applicable reporting criteria. Radiation Workers and Authorized Users shall immediately report actual or suspected radiation-safety incidents to the RSO so that reportability can be evaluated and required notifications made.

12.1 General Emergency Principles

All personnel must know how to respond to radiation emergencies before beginning work with Radioactive Material.

Protect life first. No radiological procedure, including decontamination, should delay life-saving medical care. After medical needs are stable, control contamination and secure the scene, then notify the RSO.

12.2 Emergency Contacts

Contact		Phone Number	Location
Stacy Kuykendall	Radiation Safety Officer	(575) 835-5020	EMRTC 57
Julia Ricci	Radiation Safety Officer	(505) 361-8097	Bureau 133
NMT Police / Fire		Emergency: 911 or 575-835-5555 Non-Emergency: 575-835-5011	
New Mexico Department of Public Safety		505-827-9329 (24 Hours Emergency)	

12.3 Immediate Emergency Response

1) Stop work, warn others, and control access (close doors, post “Do Not Enter” or tape).
2) Prevent spread: remove contaminated gloves or outer garments; avoid tracking contamination.
3) Call the Authorized User (AU) and the RSO immediately; provide location, isotope(s), activity, what happened, and who is involved.
4) Do not begin cleanup until the RSO authorizes it. Stay nearby for surveys or instructions.

12.4 Emergency Reactions

12.4.1 Spill or Contamination

1) **Stop work** immediately: do not spread contamination.
2) If safe, stop the source (e.g., upright the vial or close the valve) and limit the spread: cover liquids with absorbent material; gently dampen powders; and shut down local ventilation if it worsens dispersion.
3) Shield only if it can be done without spreading contamination or increasing dose.
4) **Evacuate non-essential personnel**; have individuals remain in a designated area for surveys.
5) **Warn others** in the area; restrict entry and post “Do Not Enter” signs or tape.
6) **Remove contaminated clothing** and wash affected skin with mild soap and water.
7) **Secure the area** and prevent unauthorized entry.
8) **Call the Authorized User** and the **Radiation Safety Officer** at once.
9) **Do not clean up** until directed by the RSO.
10) Remain nearby for surveys or bioassay as instructed.

12.4.2 Personal Exposure or Suspected Injury

1) **Remove the individual** from the radiation source.

2) **Provide first aid** and call **Campus Police** for medical assistance.
3) Wear disposable gloves; provide responders basic radiological information (isotope, form, activity, route of exposure).
4) If contamination is suspected, notify the receiving clinic/ER before transport.
5) **Notify the RSO immediately.** The RSO will coordinate surveys, dosimetry, and decontamination guidance.
6) Preserve all materials and equipment for later survey and evaluation.

12.4.3 Personnel decontamination (skin/clothing)

1) Notify the RSO if decontamination is needed beyond removing a lab coat or washing hands.
2) Remove contaminated clothing into a plastic bag, label for Radioactive Material Waste.
3) Wash affected skin with lukewarm water and mild soap; avoid abrasion. Re-survey after each wash; repeat if levels decrease.
4) For nails/fingertips, clip nails short; for persistent activity, induce perspiration (occlusive cover 10-15 minutes) then rewash.
5) Stop if clean, if successive readings no longer decrease, or if erythema occurs. Document actions and results.

12.4.4 Fire or Facility Emergency

1) Follow normal fire-alarm evacuation procedures.
2) **Do not re-enter** the area until cleared by emergency responders and the RSO.
3) The RSO will survey responders and equipment before release from the scene.

12.4.5 Lost, Stolen, or Damaged Radioactive Material

1) **Secure the area** to prevent further access.
2) **Notify the RSO and Campus Police immediately.**
3) Provide isotope, quantity, serial number (if sealed source), and last known location.

4) Await further instructions; do not attempt recovery without RSO authorization.

12.5 Incident Report

12.5.1 Definition

A radiation incident is any unplanned occurrence involving Radioactive Material or Radiation Machines that may result in:

- Actual or suspected personnel exposure or contamination requiring evaluation.
- Loss, theft, or unauthorized removal of Radioactive Material.
- Spills, releases, or contamination outside designated areas.
- Malfunction or failure of shielding, interlocks, or ventilation systems.
- Discovery of a leaking sealed source.
- Property damage or environmental contamination related to radiation sources.

12.5.2 Notification and Communication Chain

- Worker → AU → **RSO (immediate)**.
- RSO notifies Environmental, Health, and Safety leadership and, if criteria are met, NMED RCB per 20.3.4.452 NMAC.
- RSO briefs the Radiation Safety Committee, coordinates internal communications, and follows up.
- The RSO serves as the primary institutional point of contact for regulatory communications related to radiation safety incidents in order to ensure timely and coordinated notification and response. This administrative structure does not preclude any worker from contacting a regulatory agency regarding a safety concern or protected matter.

- The RSO shall notify appropriate university leadership, including the Vice President for Research and, when warranted by the significance of the event, the Office of the President, regarding reportable incidents, significant regulatory communications, or events with potential institutional, public, or media impact.
- For significant reportable events or incidents with potential institutional, regulatory, security, or legal implications, the RSO shall coordinate, through the Office of the Vice President for Administration and Finance (VPAF), notification of the Chief of Campus Police and University Legal Counsel, as appropriate.

12.6 Reportability Thresholds and Timelines

12.6.1 Immediate (Telephone) Notification to NMED

Under 20.3.4.452 NMAC, the RSO must notify the NMED RCB immediately if any of the following occur:

- Actual or suspected individual exposure exceeding:
    - a total effective dose equivalent of 25 rems (0.25 sievert) or more; or
    - a lens dose equivalent of 75 rems (0.75 sievert) or more; or
    - a shallow dose equivalent to the skin or extremities or a total organ dose equivalent of 250 rads (2.5 grays) or more.
- The release of Radioactive Material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the occupational ALI; this provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

12.6.2 Twenty-Four-Hour Notification

According to 20.3.4.452, the RSO shall, within 24 hours of discovery of the event, report to the department each event involving loss of control of a licensed or

registered source of radiation possessed by the licensee or registrant that may have caused, or threatens to cause, any of the following conditions:

- An individual is to receive, in a period of 24 hours:
    - a total effective dose equivalent exceeding 5 rems (0.05 sievert); or
    - a lens dose equivalent exceeding 15 rems (0.15 sievert); or
    - a shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding 50 rems (0.5 sievert)
- The release of Radioactive Material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational Annual Limit on Intake (ALI); this provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

Required notifications under 20.3.4.452 NMAC shall be made to the Department by telephone, and the initial contact shall be confirmed by e-mail in accordance with 20.3.4.452(D) NMAC. Reports made pursuant to 20.3.4.452 NMAC shall be prepared so that the names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

12.6.3 Thirty-Day Written Reports

Per 20.3.4.453 NMAC, the RSO must file a written report within 30 days after learning of any of the following occurrences:

- Any incident reports in Section 12.6.2, in accordance with 20.3.4.452.
- Any exposure or concentration exceeding any of the following:
    - The occupational dose limits for adults per 20.3.4.405 NMAC
    - The occupational dose limits for a minor, of 10% of adult exposure limitation, per 20.3.4.411 NMAC
    - The occupational dose limits for an embryo/fetus of a declared pregnant woman per 20.3.4.412 NMAC
    - The dose limits for an individual member of the public per 20.3.4.413 NMAC

- The limit in the license or registration.
- The ALARA constraints for air emissions established under 20.3.4.404(D) NMAC.

- Levels of radiation or concentrations of Radioactive Material in:
  - a restricted area in excess of applicable limits in the license or registration; or
  - an unrestricted area in excess of 10 times the applicable limit set by 20.3.4 NMAC or in the license or registration, whether or not involving exposure of any individual in excess of the limits in 20.3.4.413 NMAC

The report submitted must detail the nature and extent of any excessive radiation exposure or release. Each report shall include estimates of individual doses, the radiation levels or concentrations involved, the cause of the elevated exposure, and corrective measures taken or planned to prevent recurrence, with an implementation schedule. Reports must also identify any occupationally overexposed individuals by name, date of birth, and Social Security number, listed in a detachable section to protect confidentiality.

12.7 RSO Investigation and Corrective Actions

The RSO shall:

- Conduct a full radiological assessment, including contamination and dose surveys.
- Estimate doses to involved personnel and determine medical follow-up.
- Direct or oversee cleanup and verify decontamination.
- Document the event on the Incident Report Form (Form RS-9), obtain the AU signature, and archive the report.
- Present a summary and lessons learned to the Radiation Safety Committee.
- Maintain copies of all reports for the life of the license.

12.8 Post-Incident Review and Preventive Measures

- The RSO and AU implement corrective actions and verify their effectiveness.

- Additional training is provided when a human or procedural error contributed.
- Significant events are discussed during RSC meetings.
- The RSC reviews all incidents annually to evaluate program performance and recommend improvements.

12.9 Worker Information and Posted Procedures

Consistent with 20.3.10 NMAC, NMT shall post the current 'Notice to Employees' in sufficient locations to permit individuals engaged in licensed or registered activities to observe it on the way to or from their place of work. Radiation laboratories and storage areas shall display emergency procedures and contact information, instructions for reporting unsafe conditions, and other safety information as required by institutional policy.

13. Purchasing, Receiving, and Shipping Radioactive Material:

The receipt and shipment of licensed Radioactive Materials at the university are performed in accordance with 20.3.3.306 NMAC, applicable requirements of 10 CFR Part 71, and applicable U.S. Department of Transportation requirements in 49 CFR Parts 171–178. All incoming and outgoing packages are handled only by trained and authorized personnel under the oversight of the Radiation Safety Officer (RSO). Upon receipt, packages are visually inspected for damage and surveyed for external radiation levels and removable contamination as required by 20.3.4.432 NMAC. Prior to shipment, each package is verified for proper labeling, documentation, and radiation limits to ensure compliance with applicable DOT and NMED requirements. Shipping papers identifying the radionuclide, activity, Transport Index, and other required information, as applicable, are maintained with the shipment and retained in the radiation safety records. The RSO is responsible for overseeing all transfers, ensuring that licensed Radioactive Materials are packaged, labeled, and transported safely and securely in accordance with applicable state and federal regulatory requirements.

No Radioactive Material or device may be ordered, received, transferred, or shipped without prior written authorization from the RSO.

13.1 Procurement Authorization

Only Authorized Users or individuals listed under an approved Radiation Use Permit may request licensed Radioactive Materials or Radiation Machines.

Before any purchase:

- The proposed material must be authorized under an applicable Radiation Use Permit.
- A Radioactive Material Purchase / Acquisition Request (Form RS-13) must be submitted to the RSO for review and approval before the material is ordered, purchased, accepted, or otherwise acquired.

- The RSO must verify that the requested material is authorized under the applicable Radiation Use Permit and NMT Radioactive Material license or other applicable authorization, and that applicable possession limits will not be exceeded.
- An authorization code is issued by the RSO, which must appear on all purchase orders, requisitions, or procurement card transactions.
- Orders without an authorization code will not be processed.

All licensed Radioactive Materials must be shipped under the RSO's address. Direct shipments to laboratories are prohibited.

13.2 Receiving and Package Inspection

Upon notification from NMT Shipping and Receiving, the RSO (or a trained designee) will immediately retrieve any radioactive package and transfer it to the authorized facility.

The Radiation Safety Office shall ensure that packages requiring monitoring under 20.3.4.432 NMAC (Monitoring of Packages Containing Licensed Material) are monitored as soon as practicable after receipt, but no later than three hours after receipt during normal working hours. If a package is received after working hours, required monitoring shall be completed no later than three hours from the beginning of the next working day.

Packages requiring monitoring under 20.3.4.432 NMAC shall be monitored for:

- **External radiation levels**, to verify compliance with applicable package radiation limits.
- **Removable contamination**, verified via wipe testing.

Other packages shall be visually inspected and evaluated as appropriate based on package type, labeling, contents, and radiological conditions. Package integrity and labeling shall also be verified, as applicable, in accordance with 49 CFR 172.403 and 172.436–172.440, and applicable transportation requirements.

If contamination, excessive radiation levels, package damage, or other abnormal conditions are detected, the RSO shall immediately secure the material,

evaluate the condition, and make any notifications required by 20.3.4.432, 20.3.4.452–453 NMAC, and applicable transportation requirements.

All monitoring results shall be recorded on the Radioactive Material Package Receipt & Monitoring Record (Form RS-10) and maintained in the central radiation safety records.

13.3 Delivery to Authorized Users

After a successful inspection, the RSO delivers the package directly to the Authorized User or trained alternate. The recipient must verify package contents against the shipping documentation and report discrepancies to the RSO. All packing materials are monitored for contamination; if clean, radiation labels are removed or defaced prior to disposal. Contaminated materials are treated as radioactive waste.

Sealed sources subject to leak-testing requirements shall not be placed into service unless a current leak-test record is available or the required leak test has been completed in accordance with applicable license conditions, regulations, and sealed-source/device registration requirements.

13.4 Internal Transfers

Transfer of licensed Radioactive Materials or devices between AUs within NMT requires prior written approval from the RSO (RS-7). Materials must be packaged using secondary containment and appropriate shielding. A transfer record must document isotope, activity, date, and personnel involved.

These measures ensure continuous accountability and compliance with 20.3.4.425 NMAC (Security and Control of Licensed or Registered Material).

13.5 External Transfers and Shipping

No Radioactive Material may be shipped or transferred outside NMT without the RSO's written authorization (Form RS-7). The receipt and shipment of licensed radioactive materials at the University are performed in accordance with 20.3.3.306

NMAC, applicable requirements of 10 CFR Part 71, and applicable U.S. Department of Transportation requirements in 49 CFR Parts 171–178.

Requests for outbound shipment of Radioactive Material shall be submitted to the RSO using the Radioactive Material Shipping Request Form (Form RS-12).

All incoming and outgoing packages are handled only by trained and authorized personnel under the RSO's oversight.

Prior to shipment, each package is verified for proper classification, labeling, documentation, and radiation limits.

Shipping papers and associated transportation records shall be prepared and retained in accordance with applicable requirements of 20.3.3.306 NMAC, 10 CFR Part 71, 49 CFR Parts 171–178, and, for applicable low-level radioactive waste shipments, Appendix G of 20.3.4 NMAC.

13.6 Recordkeeping

The Radiation Safety Office maintains all records associated with procurement, receipt, transfer, shipment, and disposal of Radioactive Material. Each record includes, as applicable, the radionuclide, activity, chemical or physical form, vendor, lot or serial number, date of receipt, user, and final disposition. These records are retained for the life of the license and made available for inspection by the NMED RCB.

14. Inventory

14.1 Inventory Control and Accountability

The Radiation Safety Officer maintains a centralized, auditable record of Radioactive Materials subject to institutional inventory control at New Mexico Tech, including licensed Radioactive Material, sealed and unsealed sources, generally licensed devices or materials, and license-exempt sources or materials designated for institutional inventory by the RSO.

This inventory supports continuous accountability and verification of compliance with possession limits established in NMT's Radioactive Material license, applicable regulatory requirements, and institutional policy.

Each Authorized User (AU) is responsible for maintaining accurate records of Radioactive Material within their authorized area. The RSO tracks every acquisition from receipt through final disposition, recording the radionuclide, activity, physical or chemical form, supplier, date of receipt, laboratory location, and responsible AU. The combined campus inventory provides real-time accountability for demonstrating compliance with license limits and state regulations.

Every Radiation Use Permit issued under the university's license specifies the isotopes and the maximum activity (in millicuries or microcuries) that may be possessed. Authorized Users must ensure that these limits are not exceeded at any time, including material held in active use, storage, or decay-in-storage waste containers.

14.2 Laboratory-Level Inventory Records

Each AU must maintain a current and complete record of all licensed Radioactive Materials in its laboratory. These local records must include:

- Identification of each radionuclide and its physical or chemical form;
- Activity at the time of receipt and calculated decay-corrected activity at each use;
- The date, quantity, and purpose of each aliquot removed from stock;

- Name of the individual using or transferring material; and
- Final disposition (used, transferred, decayed, or disposed of as waste).

Laboratory-level inventory records shall support and remain consistent with the centralized radioactive material inventory maintained by the RSO using the Radioactive Material Inventory (Form RS-11) or an equivalent inventory system. Stock-vial tracking logs should be maintained adjacent to each working area and updated immediately following use. Waste activity must be included in the total radionuclide inventory until final pickup or transfer by the RSO.

14.2.1 Semiannual Inventory Verification

To meet license and NMED requirements, a semiannual Radioactive Material inventory verification is conducted for each AU.

The RSO issues a Radioactive Material Inventory Verification and Self-Audit (Form RS-11A) twice each year, listing all materials on record under that permit. The AU must:

1. Compare the RS-11A inventory entries to materials physically present in the laboratory;
2. Reconcile and document any discrepancies; and
3. Sign and return the verified report to the RSO within the specified time frame.

The RSO reviews and reconciles all reports with purchase, transfer, and disposal records. Any unresolved differences are investigated promptly, and corrective actions are documented to ensure continuous accountability in compliance with 20.3.4.425 NMAC (Security and Control of Licensed or Registered Material).

14.2.2 Record Retention

All Radioactive Material inventory records, including RS-11A inventory verification records, acquisition logs, and disposal documentation, are retained by the RSO in a secure and auditable format for the lifetime of the university's Radioactive Material license.

Authorized Users must retain copies of their laboratory inventory and usage records for at least three years or until notified by the RSO that archival transfer is complete.

These records must be available for review by the RSO and the New Mexico Environment Department Radiation Control Bureau upon request.

15. Naturally Occurring Radioactive Geological and Environmental

15.1 Scope and General Principles

Geological, mineral, environmental, and other naturally occurring materials encountered at New Mexico Tech (NMT) may contain naturally occurring radionuclides, including uranium, thorium, radium, potassium-40 (^{40}K), and their associated decay products.

Such materials may include:

- drill core and core samples;
- rocks and mineral specimens;
- soils, sediments, and mining wastes;
- environmental samples;
- geological materials prepared for laboratory analysis;
- museum and educational specimens; and
- historical materials containing naturally occurring radionuclides.

The presence of naturally occurring radionuclides does not, by itself, determine whether a material is subject to radioactive-material licensing requirements. Regulatory status depends on the radionuclides present, concentration, physical and chemical form, processing history, intended use, and applicable exemptions.

A material's exemption from radioactive-material licensing requirements does not establish that the material or an activity involving the material presents no radiological hazard. NMT may apply institutional radiation-safety controls to naturally occurring Radioactive Materials when necessary to protect workers, students, members of the public, facilities, or the environment.

15.2 Uranium and Thorium - Source Material

Under 20.3.1.7 NMAC, “source material” includes uranium or thorium, or any combination thereof, in any physical or chemical form, and ores containing 0.05 percent or more by weight of uranium, thorium, or any combination thereof.

The designation of uranium- or thorium-bearing ore as source material does not, by itself, mean that a radioactive-material license is required.

Under 20.3.3.301(B) NMAC, a person is exempt from the requirements of 20.3.3 NMAC to the extent that the person receives, possesses, uses, or transfers unrefined and unprocessed ore containing source material, provided the ore is not refined or processed except as authorized by a specific license.
Accordingly, uranium- or thorium-bearing geological material may meet the regulatory definition of source material while also qualifying for an applicable licensing exemption.

15.3 Preparation of Geological Samples for Laboratory Analysis

For purposes of 20.3.3 NMAC, “unrefined and unprocessed ore” means ore in its natural form prior to processing, such as grinding, roasting, beneficiating, or refining.

20.3.3.7(F) NMAC further specifies that:

> *“Processing does not include sieving or encapsulation of ore or preparation of samples for laboratory analysis.”*

Accordingly, preparation of uranium- or thorium-bearing geological samples for laboratory analysis does not, solely by virtue of such preparation, cause otherwise exempt unrefined and unprocessed ore to lose the exemption provided by 20.3.3.301(B) NMAC.
This regulatory exemption does not eliminate potential radiation-safety concerns associated with sample preparation. Cutting, crushing, grinding, pulverizing, sieving, or other preparation may change the physical form of the material and generate dust,

powders, aerosols, slurry, fines, or residues, thereby increasing the potential for internal exposure, removable contamination, or spread of Radioactive Material.

Beneficiation, refining, deliberate concentration or extraction of uranium or thorium, or other activities that may extend beyond preparation for laboratory analysis, shall be evaluated by the RSO before work begins to determine applicable regulatory requirements.

15.4 Notification and RSO Evaluation

NMT requires Radiation Safety evaluation of naturally occurring Radioactive Materials when their composition, radiation levels, quantity, physical form, or proposed use may warrant additional radiation-protection measures.

Known uranium- or thorium-bearing geological materials containing 0.05 percent (500 ppm) or more by weight of uranium, thorium, or any combination thereof shall be reported to the RSO before cutting, crushing, grinding, pulverizing, or other activities capable of generating dust, powder, slurry, aerosols, or other dispersible material.
The 0.05 percent concentration is used by NMT as an administrative notification threshold because it corresponds to the concentration specified for uranium- and thorium-bearing ores in the definition of “source material” under 20.3.1.7 NMAC. This concentration is not, by itself, a radiation-hazard, dose, PPE, or personnel-dosimetry threshold.

RSO evaluation may also be required regardless of uranium or thorium concentration when one or more of the following conditions apply:

- field or laboratory measurements indicate elevated radiation levels;
- the material contains visible or suspected uranium- or thorium-bearing minerals;
- the material originates from uranium mining, milling, mine waste, mineralized deposits, or other locations reasonably expected to contain elevated naturally occurring radionuclides;

- significant quantities of material will be handled or stored;
- work may generate airborne or dispersible material;
- contamination of shared equipment or facilities is reasonably foreseeable; or
- the RSO otherwise determines that evaluation is warranted for radiation protection.

Principal Investigators, laboratory supervisors, and personnel responsible for the material shall provide Radiation Safety with available analytical data, field measurements, sample information, and proposed work activities necessary to conduct the evaluation.

The determination that material is exempt from radioactive-material licensing does not exempt the activity from institutional radiation-safety review or controls established under this section. Individuals responsible for materials subject to evaluation under this section shall provide the RSO or designee reasonable access to the materials and associated storage or use areas as necessary to conduct radiation-safety evaluations, surveys, or other required assessments.

15.5 Radiation-Safety Controls

The RSO shall determine appropriate radiation-safety controls based on the radiological characteristics of the material and the work being performed.

The evaluation may consider:

- radionuclide or elemental concentration;
- radiation dose-rate and contamination surveys;
- quantity and physical form of material;
- duration and frequency of handling;
- potential external exposure;
- potential inhalation or ingestion;
- generation of dust, aerosols, powders, slurry, or fines;
- contamination of equipment, work surfaces, clothing, or personnel;
- occupancy and use of surrounding areas;

- storage conditions; and
- generation and disposition of residues and waste.

Based on the evaluation, the RSO may require engineering controls, work-practice controls, PPE, designated work areas, contamination controls, radiation or contamination surveys, training, personnel monitoring, access restrictions, equipment decontamination, or other measures necessary to maintain exposures ALARA.

Where appropriate, controls may include wet cutting, local exhaust ventilation, containment of powders or fines, gloves, protective clothing, eye protection, collection and control of cutting fluids and slurry, and surveys of shared equipment following work with elevated materials.

Use of a licensing exemption does not preclude these institutional radiation-protection requirements.

15.6 Personnel Monitoring

Personnel dosimetry is not required solely because an individual handles naturally occurring Radioactive Material or because a geological sample exceeds 0.05 percent uranium or thorium.

The RSO shall determine the need for personnel monitoring based on the potential occupational exposure associated with the material and activity. The RSO shall determine the need for personnel monitoring in accordance with the applicable requirements of 20.3.4.417 NMAC and the personnel-monitoring requirements established in Section 7 of this Manual. NMT may also require personnel monitoring at lower anticipated exposures when determined appropriate by the RSO for ALARA or risk-management purposes.

Where the primary potential exposure pathway is inhalation or ingestion of Radioactive Material, the RSO shall evaluate appropriate engineering controls, work

practices, contamination monitoring, and other measures in addition to, or instead of, external dosimetry.

15.7 Storage, Surveys, and Equipment

Materials subject to RSO controls under this section shall be stored and handled in a manner appropriate to their radiological characteristics, quantity, and physical form. The RSO may require:

- identification of containers or storage locations;
- closed containers for powders, soils, fines, or other dispersible materials;
- separation from routinely occupied areas;
- access controls;
- radiation surveys;
- removable-contamination surveys;
- dedicated or controlled processing equipment; and
- documented decontamination or release surveys of shared equipment.

Radiation measurements used to make radiation-protection or compliance determinations shall be performed with instrumentation appropriate for the radiation being measured and maintained and calibrated as required by the Radiation Safety Program.

Routine geological specimens containing only ordinary levels of natural radioactivity do not require special radiation-safety controls solely because natural radioactivity is detectable.

15.8 Other Naturally Occurring Radionuclides and Materials

Naturally occurring geological and environmental materials may contain radionuclides other than uranium and thorium. These radionuclides are not “source material” solely because they are naturally occurring and may be subject to different regulatory requirements or exemptions.

Potassium-bearing geological materials may produce measurable radiation due to naturally occurring ^{40}K. The presence of measurable natural radioactivity alone does not determine whether additional radiation-safety controls are necessary.

Radium-bearing materials, historical artifacts, mineral specimens, nuclear-test-related materials, mine or processing residues, and other unusual materials shall be referred to the RSO when their regulatory status or radiological significance is uncertain.

15.9 Transportation, Transfer, and Disposal

Exemption from radioactive-material licensing requirements does not necessarily constitute exemption from applicable transportation, waste, or other regulatory requirements.

Shipments of naturally occurring Radioactive Material shall be evaluated as necessary to determine applicable U.S. Department of Transportation requirements under 49 CFR Parts 172 and 173, as well as applicable carrier requirements. Qualifying Radioactive Material may be eligible for shipment as UN2910, Radioactive Material, Excepted Package – Limited Quantity of Material, when the applicable requirements of 49 CFR 173.421 and related provisions are satisfied. Existing procedures for geological samples shall be followed where applicable.

Transfer of unrefined and unprocessed ore containing source material shall be conducted consistent with the applicable exemption under 20.3.3.301(B) NMAC and any other applicable regulatory requirements.

Materials subject to this section shall not be disposed of as ordinary laboratory or municipal waste solely on the assumption that naturally occurring or license-exempt material is unrestricted for disposal. Disposal requirements shall be evaluated based on the material's regulatory status, radionuclide content, quantity, physical and chemical form, processing history, and applicable radioactive-material, environmental, hazardous-waste, or institutional requirements. Materials for which

disposal or transfer requirements are uncertain shall be referred to the RSO before disposal or transfer.

16. Radiation Survey

Radiation surveys, contamination checks, and equipment inspections are conducted at New Mexico Tech in accordance with applicable radiation-safety standards to ensure that exposures are maintained ALARA and to demonstrate adherence to 20.3.4.416 NMAC (General Requirements for Survey and Monitoring) and 20.3.4.413 NMAC (Dose Limits for Individual Members of the Public), as applicable.
All surveys used for radiation-protection or regulatory compliance determinations must be performed with appropriate radiation detection instruments maintained and calibrated in accordance with Section 16.2 of this Manual. Survey results shall be documented and retained in accordance with applicable recordkeeping requirements.

16.1 Survey Types and Frequency

16.1.1 Storage Area Surveys

Radiation storage facilities and laboratory storage locations shall be surveyed at a frequency sufficient to evaluate radiological conditions and demonstrate compliance with applicable regulatory and license requirements. The RSO may establish specific survey frequencies based on the type and quantity of material stored, shielding, occupancy, previous survey results, and other relevant radiological conditions. Surveys may include measurement of external dose rates and evaluation for contamination, shielding degradation, or other relevant radiological conditions, as appropriate.

- Surveys are performed by the RSO, Associate RSO (ARSO), or a qualified Authorized User (AU).
- Results are documented in the units appropriate to the survey method (e.g., mrem/hr or cpm, as applicable) and evaluated against applicable regulatory requirements, license conditions, and established radiation-safety criteria, including applicable public dose limits under 20.3.4.413 NMAC.
- If dose rates in unrestricted areas exceed limits, the RSO will:
    - Restrict access until storage conditions are corrected; or

- Use occupancy factors and calculations to demonstrate compliance and adjust area boundaries or shielding accordingly.

16.1.2 Use Area Surveys

Radiation-use areas (e.g., laboratory benchtops, hoods, or experimental setups) shall be surveyed at a frequency appropriate to the radionuclides and quantities used, physical form, frequency of use, contamination potential, previous survey results, and other relevant radiological conditions. The RSO may establish specific survey frequencies through Radiation Use Permits or Radiation Safety procedures. Additional surveys shall be performed following spills, leaks, suspected contamination events, or other circumstances in which radiological conditions may have changed.

Authorized Users shall record required survey results in units appropriate to the survey method and document corrective actions when applicable action levels or other established radiation-safety criteria are exceeded.

16.1.3 Contamination (Wipe) Surveys

Removable contamination monitoring shall be performed using wipe tests analyzed with an instrument and counting method appropriate for the radionuclides of concern and sufficiently sensitive to evaluate compliance with the applicable contamination limits or administrative action levels.

The RSO shall determine or approve the appropriate analytical method and shall coordinate or provide access to suitable counting capabilities when the Authorized User does not have appropriate instrumentation available.

Wipe-test results shall be corrected for instrument background and, when expressed as activity, converted to disintegrations per minute (dpm) using an appropriate counting efficiency for the radionuclide and measurement method. Survey results shall be evaluated against applicable regulatory requirements, license conditions, approved Radiation Use Permit criteria, and radionuclide-specific administrative action levels established by the RSO.

When removable contamination exceeds an applicable action level, the affected area shall be controlled, decontaminated as appropriate, and resurveyed until acceptable conditions are demonstrated.

16.1.4 Vehicle and Field Surveys

Radiation surveys of transport vehicles, field-use containers, or portable radiation-source equipment shall be performed when required by applicable transportation requirements, license conditions, Radiation Safety procedures, or the RSO based on the type and quantity of material and the nature of the activity. Results shall be documented and retained as required.

16.2 Radiation Survey Instruments

- Instruments used for surveys shall be appropriate for the type and energy of radiation present (e.g., GM detector for beta/gamma, ion chamber for X-Ray or high-energy photons).
- Radiation survey instruments used to demonstrate compliance with regulatory requirements, license conditions, dose limits, contamination limits, or other quantitative radiation-safety criteria shall be calibrated at intervals not to exceed 12 months and after servicing that may affect instrument response, in accordance with applicable regulatory requirements.
- Survey instruments maintained solely for instructional, demonstration, qualitative screening, or other non-compliance purposes are not required to be maintained with current regulatory calibration, provided they are clearly identified as not approved for compliance measurements and are not used to make quantitative radiation-protection or regulatory compliance determinations. Such instruments shall be maintained in functional condition appropriate to their intended use.
- Instruments that have exceeded their required calibration period shall not be used for radiation-protection or compliance measurements until recalibrated and verified.

- RSOs can provide advice on resources for calibration by external entities.

Procedure Review and Revision: The RSO shall periodically evaluate procedures for radiation monitoring instrument selection and calibration and propose revisions as necessary. Substantive revisions shall be reviewed and approved by the RSC. Following approval, the RSO shall implement the revised requirements and ensure that affected personnel are informed. The specific changes and RSC approval shall be documented and maintained as part of the Radiation Safety Program records.

16.3 Equipment Inspection and Maintenance

The RSO or designee shall periodically inspect tools, devices, and associated transport containers containing licensed Radioactive Material at a frequency appropriate to the equipment, use, applicable license conditions, and institutional requirements.
The inspection includes verification of:

- Proper labeling and legibility of warning signs;
- Condition of sources, shielding, and containers; and
- Functional integrity of handling tools and safety interlocks.

Defective or unserviceable equipment must be removed from operation, labeled as "Out of Service", and not returned to use until appropriately repaired and verified to be functional.
All inspection results are documented and maintained in the RSO's records.

16.4 Recordkeeping

Records of radiation and contamination surveys shall be documented using the Radiation / Contamination Survey Record (Form RS-16)**,** or an equivalent record approved by the RSO. Records of surveys, wipe tests, and equipment inspections shall be maintained by both the AU (in the laboratory safety binder) and the RSO (in centralized records). These records must include:

- Date and type of survey;
- Instrument model and serial number;

- Measurement locations and results;
- Name of person performing the survey; and
- Corrective actions taken, if applicable.

Records of surveys, wipe tests, and equipment inspections shall be retained for the periods required by applicable regulations, license conditions, and this Manual. Records of sealed-source leak tests shall be retained in accordance with Section 17.

16.5 Performing a Removable Contamination Survey

Contamination surveys shall be performed in areas where radioactive contamination may reasonably occur and, as appropriate, in adjacent areas where contamination is not expected. Survey locations and frequency shall be appropriate to the radionuclides, quantities, physical forms, and activities involved.

Removable contamination shall be evaluated by wipe or swipe surveys using instrumentation appropriate for the radionuclide(s) of interest and sufficiently sensitive to detect the applicable contamination limits. Direct surveys may also be performed using an appropriately selected and calibrated survey instrument. Direct survey measurements do not, by themselves, distinguish removable from fixed contamination.

Survey records shall identify the location and date of the survey, the individual performing the survey, the instrument used, the locations surveyed, background measurements as applicable, and survey results (Form RS-16). Wipe-survey results shall be corrected for background and, when reported as activity, converted using an appropriate counting efficiency.

Areas exceeding the applicable contamination limits or action levels specified in Section 16.1.3 shall be decontaminated or otherwise controlled as appropriate and resurveyed to verify the effectiveness of corrective actions. Survey records shall be retained in accordance with the radiation safety program's record-retention requirements.

17. Sealed Sources

All sealed radioactive sources at New Mexico Tech shall be inventoried and shall be used, stored, maintained, and leak-tested, as applicable, under the oversight of the Radiation Safety Officer (RSO) and in accordance with applicable institutional requirements, license conditions, and 20.3.4.415 NMAC.

All sealed sources possessed by New Mexico Tech, including licensed, generally licensed, and license-exempt sealed sources, shall be maintained in the RSO's centralized inventory and documented using the Sealed Source Inventory Record (Form RS-14A) or an equivalent centralized inventory record maintained by the RSO. Inventory records shall include, as applicable, the radionuclide, activity, manufacturer, model, serial number, location, responsible Authorized User or custodian, regulatory status, and leak-test status. Removal from the centralized inventory shall require documentation of transfer, return to manufacturer, disposal, or other final disposition reviewed and approved by the RSO in accordance with applicable requirements.

Authorized Users, custodians, and other individuals possessing or responsible for sealed sources shall provide requested inventory information and make such sources available to the RSO or designee for inventory verification, inspection, and leak testing, as applicable.

Before a sealed source subject to leak-testing requirements is placed into use, the required leak-test results shall have been received, unless a certificate from the transferor demonstrates that the source was tested within the applicable interval specified by 20.3.4.415(A) NMAC.

Except for sealed sources exempt from periodic leak testing under 20.3.4.415(B) NMAC, sealed sources not designed to emit alpha particles shall be tested for leakage or contamination at intervals not to exceed six (6) months, and sealed sources designed to emit alpha particles shall be tested at intervals not to exceed three (3) months, unless an alternative interval has been specified by the source manufacturer and approved by NMED, the NRC, or an Agreement State.

Sealed sources that are not being used and are identified as in storage are exempt from periodic leak testing while in storage. Before such a source is returned to use or transferred, the required leak test shall be performed and the results received unless the source has been tested within the applicable interval specified above.

A sealed source subject to leak testing shall also be tested before further use whenever there is reason to suspect that the source may have been damaged or may be leaking. Leak tests shall be performed by persons specifically authorized by NMED for that activity, as required by 20.3.4.415(C) NMAC.

The presence of 0.005 microcurie (185 Bq) or more of removable contamination on a test sample shall be considered evidence that a sealed source is leaking. A leaking sealed source shall be immediately withdrawn from use and controlled to prevent the spread of contamination. The source shall be repaired or disposed of in accordance with applicable requirements, and a report shall be submitted to NMED within five (5) days in accordance with 20.3.4.458 NMAC.

Sealed sources shall be secured against unauthorized access or removal and stored in appropriately labeled locations or containers, with shielding provided as necessary to maintain applicable radiation dose limits and ALARA.

Transfers, repairs, or disposal of sealed sources shall be coordinated through the RSO and conducted in accordance with applicable regulatory and license requirements.

Records of leak tests required by 20.3.4.415 NMAC shall be documented using the Sealed Source Leak-Test Record (Form RS-14B) or equivalent documentation containing the required leak-test information, maintained in units of microcurie or becquerel, and retained for five (5) years after the records are made, in accordance with 20.3.4.443 NMAC.

18. Appendix

18.1 Notice to Employees

State of New Mexico

NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION
(20.3.4 NMAC)
NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS: INSPECTIONS
(20.3.10 NMAC)

Environment Department

YOUR EMPLOYER'S RESPONSIBILITY
Your employer is either licensed or registered to utilize sources of radiation in accordance with the New Mexico Radiation Protection Regulations (20.3 NMAC).

Your employer is required to:
- Apply the regulations to work involving sources of radiation.
- Post or make available to you a copy of the regulations, license, and operating procedures that apply to work you are engaged in, and explain their provisions to you; post Notices of Violation involving radiological working conditions and orders.

If a company violates the requirements, it can be fined or have its license modified, suspended or revoked.

YOUR RESPONSIBILITY AS A WORKER
You should familiarize yourself with those provisions of the regulations and the operating procedures that apply to the work you do. You should observe their provisions for your own protection and the protection of your co-workers. If you observe a violation, you should report it.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY
[20.3.10.1003] If requested, your employer must, within 30 days:
- Notify you of exposures in excess of any dose limits in 20.3 NMAC,
- Advise you of your dose annually, and
- Give you a written report of your radiation exposure upon termination of your employment.

INSPECTIONS
All licensed and registered activities are subject to inspection by representatives of the Environment Department. During inspections, Department inspectors may confer privately with workers. During the course of an inspection, any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or caused any violation. A worker, or representative of workers, may request an inspection by sending a signed notice of the alleged violation of the Act, regulations, or license condition.

CONTACTING THE RADIATION CONTROL BUREAU
You can contact the Radiation Control Bureau of the New Mexico Environment Department at the address and phone number listed below:

RADIATION CONTROL BUREAU

Mail to: P.O. Box 5469
Santa Fe, NM 87502-5469
Telephone (505) 476-8600
Fax (505) 476-8654

REGULATIONS
Title 20.3 NMAC is available on the internet web page:
https://www.env.nm.gov/rcb/
24 / 7 EMERGENCY NUMBER: 911 or NMDPS (505) 827-9329

NMED 045 Revised 3/2016	**POSTING REQUIRED**	**Copies of this notice must be posted in a sufficient number of places to permit employees working in or frequenting any portion of a restricted area to observe a copy.**

18.2 Forms and Standard Record Templates

The following forms and standard record templates are used, as applicable, to document activities conducted under the NMT Radiation Safety Program. Current versions are maintained by the Radiation Safety Office and shall be used where required by this Manual, an applicable Radiation Use Permit, or Radiation Safety procedures.

Form ID	Title / Purpose	Maintained by
RS-1	Authorized User Application Form	AU / RSO
RS-2	Radiation Use Permit Modification Form	AU / RSO
RS-3	Statement of Training and Experience	Individual / AU / RSO
RS-4	Radiation Machine Authorization Application Form	Applicant / RSO
RS-5	Personnel Dosimetry Enrollment and Evaluation Form	Individual / RSO
RS-5A	Lost or Damaged Personnel Dosimeter Report	Individual / RSO
RS-6	Voluntary Declaration of Pregnancy	Individual / RSO – Confidential
RS-7	Radioactive Material Transfer and Shipment Authorization Form	AU / RSO
RS-8	Radioactive Waste Container and Disposal Record	AU / RSO
RS-9	Radiation Incident Report	RSO
RS-10	Radioactive Material Package Receipt & Monitoring Record	AU / RSO
RS-11	Radioactive Material Inventory	AU / RSO
RS-11A	Radioactive Material Inventory Verification and Self-Audit	AU / RSO

Form ID	Title / Purpose	Maintained by
RS-12	Radioactive Material Shipping Request Form	Requestor / RSO
RS-13	Radioactive Material Purchase / Acquisition Request	AU / RSO
RS-14A	Sealed Source Inventory Record	AU/Custodian / RSO
RS-14B	Sealed Source Leak-Test Record	RSO
RS-15	Radiation Safety Inspection / Audit Form	RSO
RS-16	Radiation / Contamination Survey Record	AU / RSO

These forms are available through the Compliance office webpage or directly from the R

RS-1 / Authorized User Application Form

(For Use Under the Institutional Radioactive Materials License)

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Authorized User Status

Authorized Users are generally the principal investigators in laboratories using radioactive materials and are responsible for supervising the proper purchase, use, security, and disposal of radioactive materials within their individual laboratories. Authorized Users, along with the RSO, are responsible for the training of all others using radioactive materials within their individual laboratories. Authorized users will take action to restrict exposure to radioactive materials. This is in keeping with the need to limit exposure to as low as reasonably achievable (ALARA).

Date: _____

SECTION 1a – Applicant Information

Full Name: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

NEW MEXICO TECH

SECTION 1b – Alternate Authorized User

Provide information for a faculty/staff member who will assume responsibility for the radioactive material and supervision of authorized personnel in the absence of the primary Authorized User.

Full Name: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

SECTION 1c – Authorized Personnel

List all personnel, other than the primary applicant and the Alternate Authorized User, who will handle radioactive material or perform activities under this authorization. List additional personnel on a separate attachment if necessary.

Name	Title	Email	Phone	Training & Experience status

Training and experience requirements are described in the NMT Radiation Safety Manual. Submit a Statement of Training and Experience for each individual named on this application. Where appropriate, include copies of radioactive materials licenses and previous radiation permits as part of your application. All training and experience will be reviewed and verified prior to issuing a permit for the use of ionizing radiation

SECTION 2 – Type of Authorization Requested

☐ New Authorized User

☐ New Radiation Use Permit for an Existing Authorized User

SECTION 3 – Education and Professional Experience

Highest relevant degree: _____

Institution: _____

Field / discipline: _____

Year: _____

Current curriculum vitae attached: ☐ Yes ☐ No

Institution / Employer	Position / Training	Radiation-Related Experience	Dates

SECTION 4 – Radiation Training and Experience

a. Radiation Safety Training Completed

☐ Institutional Radiation Safety Training

Date completed: _____

☐ Previous institutional radiation-safety training

Institution: _____ Date: _____

☐ Other relevant radiation-safety training: _____

b. Experience with Radioactive Materials

Describe previous experience involving radioactive material, including radionuclides, approximate quantities, physical/chemical forms, types of procedures performed, duration of experience, and level of responsibility.

_____

_____

_____

_____

Attach CV if required.

c. Experience with Radiation-Safety Practices

☐ Radiation and contamination surveys

☐ Survey meter operation

☐ Wipe testing/contamination monitoring

☐ Radioactive material inventory and accountability

☐ Radioactive-waste management

☐ Spill/contamination response

☐ Sealed-source handling

☐ Personnel dosimetry

☐ Other:_____

SECTION 5a – Radioactive Materials

Describe the radioactive material(s) for which you are seeking permit authorization. Attach additional pages if necessary.

License Item	Radionuclide	Chemical/Physical Form	Requested Possession Limit (mCi)	Use Location

SECTION 5b – Purpose and Description of Use

Provide a short description of the proposed work, including:

- Nature of research or instruction
- Frequency of use
- Experimental procedures
- Potential radiation hazards

Please include appropriately truncated written protocols as a separate attachment to your application.

Description: _____

_____

_____

_____

_____

_____

_____

SECTION 5c – Facilities and Equipment

List laboratory location(s): _____

_____

Confirm the following are available and functional:

☐ Approved radiation survey meter

Type of instrument(s) (Make, Model & Serial #): _____

☐ Contamination monitoring supplies

☐ Shielding (if applicable)

☐ Proper storage and security

☐ Waste collection containers

☐ Posting and labeling in compliance with regulations

SECTION 6 – Waste Management Plan

Describe anticipated waste types (solid, liquid, scintillation, sharps, etc.) and disposal method in accordance with institutional procedures:

_____

_____

_____

_____

_____

**New Mexico Tech must take precautions to avoid the generation of mixed waste. Mixed waste contains both radioactive material and hazardous waste regulated under the Resource Conservation and Recovery Act (RCRA). Mixed waste shall not be generated without prior written approval from the Radiation Safety Officer. Contact the RSO before beginning any procedure that may generate mixed waste, and consult the NMT Radiation Safety Manual for requirements applicable to radioactive waste management.*

SECTION 7 – ALARA and Safety Controls

Describe engineering controls, administrative controls, and personal protective equipment to minimize exposure:

_____

_____

_____

SECTION 8 – Acknowledgment and Certification

By signing this form, the Applicant and, if applicable, Alternate Authorized User certify that the information provided in this application to possess, use, store, and transfer licensed radioactive material at New Mexico Tech is accurate and complete to the best of their knowledge.

The Applicant and Alternate Authorized User, if applicable, certify that they:

- ☐ have read and understand the Radiation Safety Manual.
- ☐ agree to comply with all institutional radiation safety policies, state and federal regulations.
- ☐ will ensure all personnel under their supervision receive the required training.
- ☐ will maintain inventory and use records as required.
- ☐ will immediately report incidents, spills, or abnormal exposures that might affect the safety of faculty, staff, and students of New Mexico Tech, as well as visitors and members of the public.
- ☐ will promptly report known or suspected radiation-safety violations, unsafe conditions, or other conditions requiring RSO attention.
- ☐ will ensure the appropriate segregation and minimize volumes of radioactive wastes generated while conducting authorized activities, and avoid the generation of mixed waste(s) whenever possible

Applicant Signature: _____ Printed Name: _____

Date: _____

Alternate Authorized User Signature: _____ Printed Name: _____

Date: _____

SECTION 9 – Radiation Safety Officer Review

Qualifications reviewed:

☐ Radiation-safety training

☐ Radioactive material experience

☐ Supporting documentation / CV

☐ Facilities Inspected

☐ Instrumentation Verified

☐ Dosimetry Required

☐ Additional training or supervision required

RSO determination:

☐ Recommend approval as Authorized User

☐ Recommend approval subject to conditions below

☐ Additional information/training required

☐ Do not recommend approval

Recommended scope/limitations: _____

_____

Comments: _____

RSO signature: _____ Date: _____

Printed Name: _____

SECTION 10 – Radiation Safety Committee Action

RSC Meeting / Approval Date: _____

☐ Approved as Authorized User and proposed use authorized

☐ Approved subject to conditions

☐ Additional information required

☐ Not approved

Scope/conditions of AU approval: _____

RSC Chair / Authorized RSC Representative: _____

Signature: _____

Date: _____

RS-2 / Radiation Use Permit Modification Form

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Authorized User / Permit Information

Authorized User: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Radiation Use Permit No.: _____

SECTION 2 – Requested Permit Modification

☐ Add laboratory / authorized use location _____
RSO review and inspection required before use, as applicable *Building Name / Room Number*

☐ Remove laboratory / authorized use location _____
RSO survey or other release/decommissioning verification may be required *Building Name / Room Number*

☐ Add/remove personnel or change the Alternate Authorized User

Name(s) / requested change: _____

☐ Add / remove radionuclide(s); specify: _____

☐ Change possession limit: _____

_____

☐ Modify procedure/protocol

☐ Add/modify equipment or engineering control

☐ Other: _____

Detailed description of requested change: _____

_____

Reason for change: _____

_____

Radiation-safety impact/controls affected: _____

_____

Requested implementation date: _____

The requested change may not be implemented until approved by the RSO and, when applicable, the Radiation Safety Committee.

SECTION 3 – Change in Permit Status

☐ **Change Authorized User**

Current Authorized User: _____

Proposed Authorized User: _____

☐ RS-1 submitted for the proposed Authorized User

☐ **Place Permit on Inactive Status**

(e.g., sabbatical or extended period during which radioactive material will not be used)

Requested inactive date: _____

Anticipated reactivation date, if known: _____

Before inactive status is approved:

- Radioactive material and radioactive waste must be transferred, disposed of, or otherwise placed under an arrangement approved by the RSO.
- Required laboratory surveys and inventory verification must be completed to the satisfaction of the RSO.

☐ **Terminate Radiation Use Permit**

Requested termination date: _____

☐ Terminate specific radioactive-material activities: _____

☐ Terminate the Radiation Use Permit in its entirety

Permit termination is not effective until required inventory disposition, surveys, decommissioning activities, and RSO closeout have been completed.

SECTION 4 – Attachments

☐ Revised SOP / Protocol

☐ Layout / shielding information

☐ Training records

☐ Inventory information

☐ Other: _____

SECTION 5 – RSO/RSC Review and Approval

1. RSO Review

☐ Approved

☐ Approved with conditions

☐ Additional information required

☐ Not approved

Conditions/comments: _____

Approved effective date: _____

RSO signature: _____ Date: _____

Printed Name: _____

2. RSC Review, if required

☐ Approved

☐ Approved with conditions

☐ Not approved

☐ Not applicable

Conditions/comments: _____

RSC Chair / Representative: _____

Signature: _____

Date: _____

RS-3 / Statement of Training and Experience

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Individual Information

Full Name: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

SECTION 2 – Purpose of Statement

Attach additional pages, certificates, licenses, permits, or other supporting documentation as appropriate.

a. Submission Type

☐ Initial Statement of Training and Experience

☐ Updated Statement of Training and Experience

b. Purpose

☐ Individual who will work with radioactive material under an Authorized User's Radiation Use Permit

☐ Alternate Authorized User

☐ Applicant for Authorized User status *(RS-1 application required)*

☐ Other: _____

SECTION 3 – Previous Radiation Training and Experience

Describe previous formal training and practical/on-the-job experience related to the use, measurement, detection, or control of radioactive material and/or radiation-producing machines. If none, enter "None."

Course / Training / Experience	Radionuclides / Devices	Approx. Date(s)	Institution / Instructor	On-the-Job	Formal
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No
				☐ Yes ☐ No	☐ Yes ☐ No

SECTION 4 – NMT Radiation Safety Training

Training	Date Completed	Instructor / Platform
Radiation Fundamentals		
Properties of Ionizing Radiation		
Biological Effects of Radiation		
Principles of Radiation Protection		
Radiation Detection		
Radioactive Materials Regulations		
Radioactive Waste		
Emergency Response		

SECTION 5 – Radiation Work Qualification

Based on the training and experience documented above, the individual is:

☐ Qualified to perform authorized radiation work without direct supervision, within applicable Radiation Use Permit conditions

☐ Qualified to perform radiation work only under direct supervision

☐ Additional training and/or supervised experience required before performing radiation work

Restrictions / Conditions, if applicable: _____

SECTION 6 – Individual Certification

I certify that the information provided on this form is accurate and complete to the best of my knowledge. I understand that I may perform radiation work only within the scope of my documented training, applicable authorization, and Radiation Use Permit conditions, and that I must comply with the NMT Radiation Safety Manual and applicable radiation-safety procedures.

Individual Signature: _____ Date: _____

Printed Name: _____

SECTION 7 – Authorized User and RSO Review

Authorized User:

☐ Training and experience reviewed

☐ Required lab-specific/practical training completed, as applicable

SOPs / Procedures covered: _____

☐ Recommend work without direct supervision within applicable permit conditions

☐ Direct supervision required

☐ Additional training/experience required

Authorized User: _____ Date: _____

Printed Name: _____

RSO:

☐ Approved for work without direct supervision within applicable permit conditions

☐ Approved for work under direct supervision only

☐ Additional training/experience required

☐ Not approved for radiation work at this time

Restrictions/conditions, if applicable: _____

_____

RSO signature: _____ Date: _____

Printed Name: _____

RS-4 / Radiation Machine Authorization Application Form

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1a – Individual Information

Applicant: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

Submit Form RS-3, Statement of Training and Experience, for the applicant and each individual who will independently operate the radiation machine, as applicable.

SECTION 1b – Authorized Personnel

List personnel who will operate or perform work involving the radiation machine under this authorization. List additional personnel on a separate attachment if necessary.

Name	Title	Email	Phone	Training & Experience status

Training and experience requirements for radiation-machine operators are described in the NMT Radiation Safety Manual. Applicable training and experience shall be reviewed and verified before an individual is authorized to independently operate a radiation machine.

SECTION 2a – Equipment Type

☐ X-ray Diffraction (XRD)

☐ X-ray Fluorescence (XRF)

☐ Cabinet X-ray System

☐ Portable / Handheld X-ray System

☐ Other: _____

SECTION 2b – Equipment Information

Manufacturer: _____

Model: _____

Serial Number: _____

X-ray Tube Serial No.: _____

Date Manufactured, if known: _____

Date Installed: _____

NMED Registration No.: _____

Mode of use: ☐ Fixed ☐ Portable

SECTION 2c – Technical Specifications

Maximum kVp: _____

Maximum beam current (mA): _____

Operating range / anticipated workload: _____

Number of tubes: _____

SECTION 3 – Use and Storage Location

Utilization:

Building: _____ Room Number: _____

Storage:

Building: _____ Room Number: _____

SECTION 4 – Safety

Feature	Description / Specification	Test/Maintenance Frequency
Shielding		
Interlocks		
Warning lights / indicators		
Emergency shutoff		
Ventilation (if applicable)		
Radiation monitoring		
Access controls / security		

SECTION 5 – Purpose / Protocols

Describe the purpose for which the radiation machine will be used. Attach applicable SOPs, operating procedures, or manufacturer safety documentation as appropriate.

_____

_____

_____

_____

_____

SECTION 6 – Applicant Certification

I certify that the information provided in this application is accurate and complete and agree to operate the radiation machine only in accordance with the approved authorization, NMT Radiation Safety Manual, applicable procedures, and regulatory requirements.

Applicant Signature: _____ Date: _____

Printed Name: _____

SECTION 7 – Pre-Operation RSO Verification

☐ Registration verified

☐ Shielding/location acceptable

☐ Interlocks tested

☐ Warning systems tested

☐ Operators trained

☐ Required surveys completed

☐ Operating and emergency procedures reviewed

☐ Required postings/labels verified

Conditions / Restrictions, if applicable: _____

Radiation Machine Use Permit No.: _____

Approved effective date: _____

RSO signature: _____ Date: _____

Printed Name: _____

RS-5 / Personnel Dosimetry Enrollment and Evaluation Form

(Radiation Exposure Monitoring Program)

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Applicant Information

Full Name: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

SECTION 2 – Type of Dosimeter Requested

☐ Whole-Body (TLD/OSL badge)

☐ Extremity (ring dosimeter)

☐ Fetal Dosimeter (Form RS-6, Voluntary Declaration of Pregnancy, required)

☐ Neutron Dosimeter (if applicable)

☐ Replacement (Lost/Damaged)

If replacement, explain: _____

_____

_____

If a dosimeter is lost, submit Form RS-5A, Lost or Damaged Dosimeter Report.

SECTION 3 – Radiation Work Description

Radionuclides, radiation machines, or other radiation sources used: _____

_____

_____

Typical activity/procedure: _____

_____

Estimated frequency of use:

☐ Daily

☐ Weekly

☐ Monthly

☐ Infrequent

SECTION 4 – Prior Occupational Radiation Exposure

Have you previously been occupationally monitored for radiation exposure at another institution or employer?

☐ Yes ☐ No

If yes, provide:

Institution/employer: _____

Dates monitored: _____

Most recent monitoring period: _____

☐ Prior dose record attached

☐ Prior dose record requested

☐ Not available

SECTION 5 – Responsibilities Acknowledgment

By signing below, I acknowledge that:

- I will wear assigned dosimeter(s) as instructed.
- I will not intentionally expose my dosimeter to non-occupational radiation.
- I will not wear another individual's dosimeter.
- I will store the dosimeter in a radiation-free area when not in use.
- I will promptly report lost or damaged dosimeters.
- I understand that failure to follow dosimetry requirements may result in restriction or suspension of radiation work authorization.

Individual Signature: _____ Date: _____

Printed Name: _____

SECTION 6 – Supervisor / Authorized User Confirmation

I confirm that the radiation work described above is accurate and that the individual requires evaluation for personnel monitoring.

Supervisor / Authorized User's Name: _____

Signature: _____ Date: _____

SECTION 7 – RSO Dosimetry Evaluation and Assignment

Personnel monitoring required under applicable regulatory/institutional criteria:

☐ Yes ☐ No

Basis for determination:

☐ Potential external dose

☐ Extremity exposure

☐ Declared pregnancy/fetal monitoring

☐ Neutron exposure

☐ License/permit condition

☐ Precautionary/institutional monitoring

☐ Other: _____

Dosimeter(s) assigned:

☐ Whole-body

☐ Extremity

☐ Fetal

☐ Neutron

Assigned dosimeter ID(s): _____

Dosimetry vendor: _____

Exchange frequency: _____

Comments / conditions: _____

RSO signature: _____ Date: _____

Printed Name: _____

RS-5A / Lost or Damaged Personnel Dosimeter Report

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Applicant Information

Full Name: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

SECTION 2 – Lost or Damaged Dosimeter Information

a. Dosimeter Type

☐ Whole-body dosimeter

☐ Extremity / ring dosimeter

☐ Fetal dosimeter

☐ Neutron dosimeter

☐ Other: _____

b. Monitoring Period for Lost or Damaged Dosimeter

☐ Current monitoring period ☐ Previous monitoring period

Monitoring period, if known: _____ to _____

c. Loss or Damage

☐ Lost / missing

☐ Damaged

Date loss / damage discovered: _____

Approximate date last known to be in the individual's possession: _____

d. Replacement Required

☐ Yes ☐ No

SECTION 3 – Circumstances of Loss or Damage

Describe when, where, and how the dosimeter was lost or damaged, if known: _____

_____

_____

Radiation work performed during the period for which dosimetry results may be unavailable:

_____

_____

Radionuclides, radiation machines, or other radiation sources involved: _____

_____

_____

Could the dosimeter have been exposed to radiation while it was not being worn?

☐ No ☐ Yes ☐ Unknown

If yes or unknown, explain: _____

SECTION 4 – RSO Evaluation and Follow-Up

Replacement dosimeter required:

☐ Yes ☐ No Replacement dosimeter ID: _____

Dose evaluation required for the missing monitoring period:

☐ Yes ☐ No

Evaluation method / information considered:

☐ Available dosimetry records

☐ Work history / source-use records

☐ Coworker dosimetry

☐ Survey / exposure information

☐ Other: _____

Dose evaluation result / assigned dose, if applicable: _____

Comments / corrective actions: _____

RSO signature: _____ Date: _____

Printed Name: _____

RS-6 / Voluntary Declaration of Pregnancy

Date: _____

Important Information:

- The declaration of pregnancy is **voluntary**.
- An individual who is occupationally exposed to radiation may voluntarily declare pregnancy in writing in order to receive additional radiation protection considerations for the embryo/fetus.
- If pregnancy is declared in writing, the dose limit to the embryo/fetus becomes: **0.5 rem (5 mSv) total for the entire gestation period**, with efforts made to avoid substantial variation above a uniform monthly exposure rate.
- This declaration may be withdrawn at any time in writing.
- All information will be treated as confidential and shared only with individuals who need the information for radiation protection purposes.

SECTION 1 – Declaration

I, _____ (print name), voluntarily declare that I am pregnant.

I have been provided with NRC Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure," and have had the opportunity to review it. I understand that I may contact the NMT Radiation Safety Officers with questions concerning prenatal occupational radiation exposure.

I understand that, following my written declaration of pregnancy, NMT will take measures to ensure that the occupational dose to the embryo/fetus during the entire pregnancy does not exceed 500 millirem (5 millisieverts), in accordance with applicable regulatory requirements.

I understand that:

- This declaration is voluntary.
- I may withdraw this declaration at any time and for any reason in writing.
- The institution will take appropriate steps to limit radiation dose to my embryo/fetus in accordance with regulatory requirements and institutional policy.

I agree to promptly notify the NMT Radiation Safety Officers when the pregnancy ends or if I determine that I am no longer pregnant.

Estimated date of conception: _____

Anticipated due date: _____

Signature: _____ Department: _____

Printed Name: _____ Supervisor / Authorized User: _____

Date: _____

SECTION 2 – RSO Review and Action

Upon receipt of this declaration, the Radiation Safety Officer (RSO) will:

☐ Review current radiation work assignments

☐ Evaluate prior dose during current gestation period

☐ Ensure fetal dosimeter is assigned (if applicable)

☐ Evaluate projected embryo/fetal dose and applicable dose-control measures

☐ Recommend modifications to work practices if necessary

Comments / work modifications (if required): _____

_____

_____

RSO signature: _____ Date: _____

Printed Name: _____

SECTION 3 – Withdrawal of Declaration (Optional)

I withdraw my voluntary declaration of pregnancy.

Signature: _____

Date: _____

RS-7 / Radioactive Material Transfer and Shipment Authorization Form

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Authorized User / Permit Information

Authorized User: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Supervisor / Department Chair: _____

SECTION 2 – Transfer Type

☐ Internal transfer between NMT Authorized Users and/or authorized locations

☐ External transfer / shipment to another licensee or authorized recipient

☐ Return to manufacturer / supplier

☐ Transfer for disposal / waste processing

☐ Other: _____

SECTION 3 – Material

License Item / Permit Reference	Radionuclide	Form / Source Description	Activity / Quantity	Manufacturer / Model / Serial No.	Container / Package ID

SECTION 4 – Transfer Information

Transferor / current AU	
Current building / room	
Recipient / receiving organization	
Receiving building / room / address	
Recipient authorization to possess material verified, if applicable:	☐ Yes ☐ N/A Verified by: _____ Date: _____
Proposed transfer / shipment date	

SECTION 5 – Transfer / Transportation Review

☐ Material identity and activity/quantity verified

☐ Recipient authorization verified

☐ Appropriate containment / packaging verified

☐ Shielding provided, if required

☐ Required labels / markings applied, if applicable

☐ DOT applicability evaluated for external shipment

☐ Shipping documentation completed, if required

☐ Package radiation / contamination surveys completed, if required

☐ NMT radioactive-material inventory update required

☐ NMT radioactive-material inventory update not required

SECTION 6 – Authorized User Certification

I certify that the information provided on this form is accurate and complete. I understand that radioactive material may not be transferred from my authorized possession or location until the transfer has been reviewed and approved by the Radiation Safety Officer. For external transfers or shipments, I will comply with instructions provided by the RSO regarding packaging, handling, transportation, and transfer of the material.

Authorized user signature: _____ Printed Name: _____

Date: _____

SECTION 7 – RSO Authorization

a. RSO Determination

☐ Transfer authorized

☐ Transfer authorized subject to conditions listed below

☐ Additional information required

☐ Transfer not authorized

Conditions / comments: _____

RSO signature: _____ Date: _____

Printed Name: _____

b. Transfer Completion

Transfer / shipment completed by: _____

Date / time: _____

Shipping / tracking reference, if applicable: _____

Receipt / transfer confirmation obtained: ☐ Yes ☐ N/A

Radioactive-material inventory updated: ☐ Yes ☐ N/A

Date: _____

RS-8 / Radioactive Waste Container and Disposal Record

Instructions: A separate form is required for each radioactive waste container. Complete this form as waste is added to the container and securely attach or maintain the form with the container. When the container is ready for pickup or disposition, complete the applicable closure information and contact Radiation Safety. Follow the radioactive-waste requirements in the NMT Radiation Safety Manual. Submit the completed form electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Generator Information

Authorized User: _____ 900#: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Person Preparing Waste Container, if different from AU: _____

SECTION 2 – Waste Container Log

Date	Waste Description / Type	Radionuclide	Activity Added	Chemical / Special Hazards	Initials

**Activity estimates should be as accurate as practicable.*

Physical form:

☐ Dry solid

☐ Liquid

☐ Sharps

☐ Source vial / sealed source

☐ Other: _____

SECTION 3 – Hazards / Controls

Longest-lived radionuclide / half-life in container: _____ / _____ days

☐ Eligible for decay-in-storage

☐ Not eligible for decay-in-storage

☐ RSO determination required

☐ No mixed waste

☐ Mixed waste specifically approved by RSO

Approval reference: _____

Chemical constituents, if applicable**:** _____

☐ Shielding required ☐ Secondary containment required ☐ Sharps container

SECTION 4 – Container Closure / Pickup Request

Estimated total activity at closure: _____

Container closed date: _____

Prepared by: _____

Date: _____

☐ Ready for Radiation Safety pickup

☐ Request evaluation for decay-in-storage

☐ Other: _____

SECTION 5 – RSO Receipt and Disposition

Waste / Container No.: _____

Date received / picked up: _____

Received by: _____

Disposition:

☐ Decay-in-storage

☐ Transfer to licensed waste processor / broker

☐ Return to manufacturer / supplier

☐ Other authorized disposition: _____

Disposition / transfer date: _____

Manifest / shipment / disposal reference, if applicable: _____

Comments: _____

_____

_____

RSO signature: _____ Date: _____

Printed Name: _____

RS-9 / Radiation Incident Report

Report Preparation

Report prepared by: _____

Title / Department: _____

Signature: _____ Date: _____

Authorized User, if applicable: _____

SECTION 1 – Incident Information

Location of incident: _____
(Building / Room)

Date / time of incident: _____
(Date: MM/DD/YYYY, Time: AM/PM)

Radiation source involved:

☐ Radioactive material

☐ Sealed source/device

☐ Radiation machine

☐ Other: _____

Radionuclide(s), if applicable: _____

Estimated activity, if applicable: _____ mCi

Machine/device/source identification, if applicable: _____

SECTION 2 – Initial Notification

Date / time incident discovered: _____
(Date: MM/DD/YYYY, Time: AM/PM)

Date / time RSO notified: _____
(Date: MM/DD/YYYY, Time: AM/PM)

Person who notified RSO: _____

Person receiving notification: _____

Method of notification: ☐ Phone ☐ Email ☐ In person ☐ Other: _____

SECTION 3 – Incident Description and Initial Response

Provide a detailed description of the incident. Answer questions below, as applicable. If more space is needed, attach additional sheets.

Additional sheets attached? ☐ Yes ☐ No

What happened? _____

_____

_____

_____

_____

_____

_____

_____

_____

Name(s) of individuals present: _____

_____

_____

Injuries sustained? ☐ **Yes** ☐ **No** **(if yes, describe):** _____

_____

_____

_____

_____

Personnel contamination? ☐ **Yes** ☐ **No** **(if yes, describe):** _____

_____

_____

_____

Immediate actions taken: _____

_____

_____

_____

Equipment/property damage, if any: _____

_____

_____

_____

Area contamination suspected or confirmed? ☐ Yes ☐ No

If yes, describe: _____

_____

_____

Area secured/restricted? ☐ Yes ☐ No ☐ N/A

Contamination remaining after decontamination? ☐ Yes ☐ No ☐ N/A (if yes, describe):

_____

_____

_____

Additional comments/notes: _____

_____

_____

_____

SECTION 4 – RSO Evaluation and Investigation

Surveys performed: ☐ Yes ☐ No ☐ N/A

Survey records attached: ☐ Yes ☐ No ☐ N/A

Personnel dose evaluation required: ☐ Yes ☐ No ☐ N/A

Bioassay/medical evaluation considered or required: ☐ Yes ☐ No ☐ N/A

Material/source accounted for: ☐ Yes ☐ No ☐ N/A

Area released for normal use: ☐ Yes ☐ No ☐ N/A

Date/time released: _____

Apparent/root cause: _____

_____

_____

_____

Corrective actions required: _____

_____

_____

_____

Regulatory / Administrative Notification Evaluation

Regulatory notification required: ☐ Yes ☐ No ☐ Pending evaluation

If required:

Agency notified: _____

Date/time: _____

Person making notification: _____

Report/reference number, if applicable: _____

Other institutional notification required: ☐ Yes ☐ No

Details: _____

_____

_____

SECTION 5 – Corrective Actions and Closeout

Corrective actions completed: _____

_____

_____

_____

Additional training required: ☐ Yes ☐ No

Procedure/SOP revision required: ☐ Yes ☐ No

Permit/authorization modification required: ☐ Yes ☐ No

Additional follow-up required: ☐ Yes ☐ No

Regulatory notification determination finalized: ☐ Yes ☐ N/A

Comments / follow-up documentation: _____

_____

Incident closed: ☐ Yes

Closure date: _____

RSO name: _____

Signature: _____ Date: _____

RS-10 / Radioactive Material Package Receipt & Monitoring Record

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Radioactive-material packages shall be received, inspected, monitored, and opened in accordance with the NMT Radiation Safety Manual and applicable package-receipt procedures. Required receipt monitoring shall be completed as soon as practicable and within applicable regulatory time limits. If a package is damaged, wet, crushed, leaking, or otherwise shows evidence of compromised integrity, do not open the package; secure the area and immediately notify the Radiation Safety Officer.

SECTION 1 – Package Receipt Information

Date received: _____ Time received: _____

Received by: _____ Department: _____

Delivered to building / room: _____

Shipper / carrier: _____

Tracking / shipment no.: _____

DOT / UN no.: _____

a. Package label

☐ None / Excepted Package ☐ Radioactive Yellow-III

☐ Radioactive White-I ☐ Other: _____

☐ Radioactive Yellow-II

Transport Index (TI), if applicable: _____

b. Package Inspection

☐ Package intact and dry / No visible damage, leakage, or deterioration

☐ Shipping documents reviewed

If damaged, wet, crushed, or leaking: DO NOT OPEN. Secure the package and notify the RSO.

SECTION 2 – Required Receipt Monitoring

Survey meter model: _____ Serial #: _____ Calibration date: _____

a. Package Radiation Survey

Maximum surface dose rate: _____ mrem/hr

Dose rate at 1 meter: _____ mrem/hr

☐ Within applicable limits

☐ RSO notified

b. External Package Contamination Wipe

Wipe area: approximately 300 cm²

Background: _____ mR/hr **Net reading:** _____ mR/hr

Wipe reading: _____ mR/hr

☐ No detectable contamination above background

☐ Elevated reading detected — RSO evaluation required

SECTION 3 – Additional Monitoring / Package Opening, if applicable

Inner container/source wipe performed: ☐ Yes ☐ No ☐ N/A

Result: _____

Additional radiation measurements:

Location / item: _____

Surface: _____ mrem/hr

Distance: _____

Dose rate: _____ mrem/hr

Contents verified against shipping documentation: ☐ Yes

Discrepancy identified: ☐ No ☐ Yes – RSO notified

Packing material monitored: ☐ Yes ☐ N/A

☐ No contamination detected

☐ Contamination detected – managed as radioactive waste

SECTION 4 – Receipt Monitoring Record

☐ Package acceptable for opening/use

☐ Package/source transferred to authorized location/user

☐ Radioactive-material inventory updated, if applicable

☐ Discrepancy / abnormal condition referred to RSO

Survey performed by: _____

Signature: _____

Date/time monitoring completed: _____

RSO review required: ☐ Yes ☐ No

Comments: _____

_____

RSO signature: _____ Date: _____

Printed Name: _____

RS-11 / Radioactive Material Inventory

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Authorized User / Permit Information

Authorized User: _____ 900#: _____

Title / Position: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Radiation Use Permit No.: _____

Authorized location(s): _____

Inventory period: _____ Last updated: _____

SECTION 2 – Radioactive Material Inventory

Maintain a current record of radioactive material subject to NMT inventory requirements from receipt through final disposition. Include material in active use, storage, transfer, and radioactive waste until final pickup or disposition by Radiation Safety.

Radionuclide / Material	Source ID / Serial No.	Activity / Quantity	Receipt / Reference Date	Location	AU / Custodian	Status / Disposition

Radionuclide / Material	Source ID / Serial No.	Activity / Quantity	Receipt / Reference Date	Location	AU / Custodian	Status / Disposition

Inventory Column Guidance

Column	Enter
Radionuclide / Material	Nuclide and material/source description
Source ID / Serial No.	Source ID, manufacturer/serial number, if applicable
Activity / Quantity	Current activity or quantity
Receipt / Reference Date	Date applicable to the reported activity/quantity
Location	Building, room, and storage location
AU / Custodian	Responsible Authorized User or custodian
Status / Disposition	In use, stored, transferred, waste, disposed, as applicable; include date/reference when relevant

SECTION 3 – Inventory Status / Reconciliation

Applicable inventory reviewed against permit/license limits: ☐ Yes ☐ No ☐ N/A

Discrepancies identified**:** ☐ Yes ☐ No

RS-11A physical inventory verification completed**:** ☐ Yes ☐ No ☐ N/A

Inventory updated following receipt / transfer / disposal**:** ☐ Yes ☐ No ☐ N/A

RSO review required: ☐ Yes ☐ No

Comments / reconciliation: _____

_____

SECTION 4 – Record Review

Authorized User: _____ Date: _____

Printed Name: _____

RSO signature: _____ Date: _____

Printed Name: _____

RS-11A / Radioactive Material Inventory Verification & Self-Audit

Instructions: Complete all sections as appropriate and submit electronically to the Radiation Safety Officers at **RSO@nmt.edu**

Date: _____

SECTION 1 – Authorized User / Permit Information

Authorized User: _____ 900#: _____

Department: _____ Office Location: _____

Radiation Use Permit No.: _____

Authorized location(s): _____

Inventory verification date: _____

Inventory period, if applicable: _____

SECTION 2 – Physical Inventory Verification

Radionuclide / Source	Form / Serial No.	Recorded Activity / Quantity	Expected Location	Actual Location	Physically Verified?	Discrepancy
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	
					☐ Yes ☐ No	

SECTION 3 – Reconciliation

Discrepancies identified:

☐ None

☐ Yes — describe below: _____

Purchase / transfer / waste records reviewed: ☐ Yes ☐ No ☐ N/A

Corrective actions / reconciliation: _____

RS-11 inventory record updated, if necessary: ☐ Yes ☐ No ☐ N/A

SECTION 4 – AU Certification and RSO Review

I certify that I compared the listed inventory with material physically present in my authorized areas and reported discrepancies to Radiation Safety.

Authorized User Signature: _____ Date: _____

RSO Review

☐ Inventory verified / acceptable

☐ Discrepancies require follow-up

☐ Corrective actions completed

☐ Additional action required

Comments / required actions: _____

RSO signature: _____ Date: _____

Printed Name: _____

RS-12 / Radioactive Material Shipping Request Form

Request date: _____

Requested date of shipment (at least 5 business days after request date): _____

Instructions: Complete for outgoing radioactive-material shipments, as applicable. This record documents shipment preparation and does not replace required carrier or DOT shipping documentation. Retain applicable shipping papers and supporting documentation with this record.

PART A — TO BE COMPLETED BY REQUESTOR

SECTION 1 – Shipment Information

a. NMT Contact Information

Authorized User / Requestor: _____ 900#: _____

Email: _____ Phone: _____

Authorized User, if different: _____

Radiation Use Permit No.: _____

Originating lab building / room: _____

b. Recipient Information

Radiation Safety will verify recipient authorization to receive the material, as applicable. All other information in this section shall be the correct shipping address and any other identifying information required by the recipient organization.

Contact name: _____

Contact email: _____ Contact phone: _____

Company / organization name: _____

Shipping address: _____

_____

_____

_____

c. Requested Shipping Service

☐ FedEx First Overnight ☐ FedEx Ground

☐ FedEx Priority Overnight ☐ Other: _____

☐ FedEx Standard Overnight

Declared shipment value: $_____

If shipping internationally, attach the export control approval: ☐ N/A ☐ Attached

SECTION 2 – Material / Sample Information

a. Information

Is the material/sample laboratory-created or laboratory-modified? ☐ Yes ☐ No

Number of materials / samples: _____
Complete Section 2b for each material/sample.

Have contamination/radiation surveys already been performed on the material or its container(s)?

☐ Yes — attach results

☐ No

☐ N/A

Does the recipient require specific pre-shipment survey documentation?

☐ Yes — describe/attach requirements: _____

☐ No

☐ Unknown

b. Description of the Material / Sample

(If more than one sample, complete this page for each sample)

Sample number: _____

Name of material/sample: _____

Radionuclide(s): _____

Activity / quantity: _____

Physical / chemical form: _____

Description of chemical components/hazards: _____

Source / package ID, if applicable: _____

Total amount of material in this sample to be shipped including unit of measure: _____

Description of sample container material and dimensions of container: _____

_____

_____

_____

Will the material/sample(s) be returned to NMT? ☐ Yes ☐ No

If yes, will it be altered in any way before it is returned (e.g., irradiated/activated)?

Describe._____ _____

_____

_____

_____

PART B — TO BE COMPLETED BY RADIATION SAFETY / QUALIFIED SHIPPER

SECTION 3 – Shipping Classification and Package Preparation

a. DOT / Shipping Classification

UN / NA No.: _____

Proper Shipping Name: _____

Hazard Class: _____

Package Type / Classification:

☐ Excepted Package

☐ Type A

☐ Type B

☐ LSA / SCO

☐ Other: _____

b. Package Preparation / Marking / Labeling

☐ Package and inner containment appropriate for material and mode of transport

☐ Package integrity verified; closure completed in accordance with applicable instructions

☐ Required package markings applied, including UN number / proper shipping identification, as applicable

☐ Required radioactive-material labels applied, as applicable

☐ Orientation arrows / other handling marks applied, if applicable

☐ Old or conflicting labels / markings removed or covered

☐ Required carrier-specific requirements reviewed, if applicable

c. Package label / category

☐ None / Excepted ☐ Radioactive Yellow-III

☐ Radioactive White-I ☐ Other: _____

☐ Radioactive Yellow-II

Transport Index (TI), if applicable: _____

SECTION 4 – Package Radiation / Contamination Survey

a. Survey instrument

Model _____ Serial No. _____ Calibration date _____

Measurement	Result	Evaluation
Maximum package surface dose rate	_____ mrem/hr	☐ Acceptable ☐ RSO review
Dose rate at 1 meter	_____ mrem/hr	☐ Acceptable ☐ RSO review

b. Removable contamination survey, if required:

☐ Completed ☐ Not required

Method / instrument: _____ Wipe area: _____

Result: _____ ☐ Within applicable limit ☐ RSO evaluation required

SECTION 5 – Shipping Documentation Review

☐ DOT applicability / shipment classification reviewed

☐ Shipping paper completed, if required

☐ Radionuclide and activity/quantity correctly identified on applicable documentation

☐ Package category and Transport Index documented, if applicable

☐ Emergency response information provided, if required

☐ Carrier / mode-of-transport requirements reviewed

☐ Copies of required shipping documents retained with Radiation Safety records

SECTION 6 – Final Shipment Verification and Release

Final determination:

☐ Shipment ready for release ☐ Shipment held pending correction / additional review

Conditions / comments:_____

_____

Additional documents / references:

Prepared / packaged by: _____	Date / time: _____
RSO or authorized shipping reviewer: _____	Date / time: _____
Shipment released to carrier by: _____	Date / time: _____

RS-13 / Radioactive Material Purchase / Acquisition Request

Instructions: Complete this form and submit it to Radiation Safety at RSO@nmt.edu **before ordering, purchasing, accepting, or otherwise acquiring radioactive material**. Radioactive material shall not be ordered or acquired without prior Radiation Safety review and approval. The requested material must be authorized under an applicable NMT Radiation Use Permit and NMT radioactive-material license or other applicable authorization before acquisition.

Date: _____

Requisition number: _____

SECTION 1 – Requestor / Authorization Information

Authorized User: _____ 900#: _____

Department: _____ Office: _____

Phone: _____ Email: _____

Radiation Use Permit No.: _____

Intended use location (building / room): _____

SECTION 2 – Supplier / Source Information

Acquisition type:

☐ Purchase

☐ Transfer from another institution

☐ Donation

☐ Loan

☐ Other: _____

Supplier / institution: _____

Contact name: _____

Address 1: _____

Address 2: _____ City, state, ZIP: _____

Phone: _____ Email: _____

SECTION 3 – Material / Acquisition Information

Item	Qty.	Radionuclide	Activity per Unit (with units)	Total Activity (with units)	Chemical / Physical Form	Catalog / Source No.	Unit Cost ($)	Total
1								
2								
3								
4								
5								
6								
7								
8								
							Total:	

Comments: _____

_____

SECTION 4 – Radiation Safety Review

☐ Material and activity are authorized under applicable NMT license/authorization

☐ Authorized User / Radiation Use Permit verified

☐ Requested quantity is within applicable possession limits

☐ Proposed use and location are authorized

☐ Receipt / package-monitoring requirements identified, as applicable

☐ Special storage, security, or handling requirements identified, as applicable

☐ Inventory / receipt follow-up required (RS-10 / RS-11), as applicable

☐ Additional review required: _____

RSO Determination

☐ Approved for acquisition

☐ Approved subject to conditions: _____

☐ Additional information required

☐ Not approved

RSO signature: _____ Date: _____

Printed name: _____

SECTION 5 – Purchasing Division:

Entry date: _____ By: _____

Processed date: _____ By: _____

Purchase order no.: _____

RS-14A / Sealed Source Inventory Record

SECTION 1 – Requestor / Authorization Information

Authorized User / custodian: _____ 900#: _____

Email: _____ Phone: _____

Department: _____ Room no.: _____

Radiation Use Permit No.: _____

Verification date: _____ Performed by: _____

SECTION 2 – Sealed Source Inventory

Condition / Security Review

☐ Sources secured against unauthorized access/removal

☐ Labels / storage identification acceptable

☐ Shielding adequate

☐ No evidence of damage

☐ Source/device identification and serial number legible, as applicable

Radionuclide	Activity / ref. date	Manufacturer / model	Serial no.	Location	Regulatory status*	Leak-test status / due	Physical verification
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified
							☐ Verified

***Regulatory status examples:** specifically licensed, generally licensed, license-exempt, or other status as determined by Radiation Safety

SECTION 3 – Findings and Corrective Actions

Sources in storage / not in use	
Sources requiring leak test or other evaluation before use / transfer	
Damage, discrepancies, missing information, or other findings	
Corrective actions / disposition	

SECTION 4 – Verification

Verifier: _____ Date: _____

AU / custodian acknowledgment: _____ Date: _____

RSO review: _____ Date: _____

RS-14B / Sealed Source Leak-Test Record

SECTION 1 – Requestor / Authorization Information

Authorized User / custodian: _____ 900#: _____

Email: _____ Phone: _____

Department: _____ Room no.: _____

Radiation Use Permit No.: _____

Verification date: _____ Performed by: _____

SECTION 2 – Sealed Source Leak Test

Counting Instrument / System

Instrument type: _____

Manufacturer / model: _____ Serial no.: _____ Calibration date: _____

Detector efficiency used: _____ %

Source ID / Serial no.	Radionuclide	Wipe / Sample ID	Background (cpm)	Gross cpm	Net cpm	Efficiency	Result (dpm)	Pass / Fail

Net cpm = Gross cpm − Background cpm

dpm = Net cpm ÷ detector efficiency (expressed as a decimal; e.g., 35% = 0.35)

Leak-Test Acceptance Criterion

Applicable leak-test acceptance criterion: _____ dpm

Basis:

☐ License condition ☐ Manufacturer/source documentation

☐ Regulation ☐ Other: _____

SECTION 3 – Results and Corrective Actions

Elevated / Failed Leak-Test Result

☐ None

☐ Source removed from service

☐ Source secured / isolated

☐ RSO notified

☐ Contamination survey performed

☐ Regulatory notification evaluated, if applicable

☐ Other: _____

Comments / corrective actions: _____

SECTION 4 – Verification

Leak test performed/collected by: _____ Date: _____

Sample analyzed by: _____ Date: _____

RSO review: _____ Date: _____

RS-15 / Radiation Safety Inspection / Audit Form

SECTION 1 – Facility / Inspection Information

Department: _____ Room no.: _____

Authorized User: _____ 900#: _____

Phone: _____ Email: _____

AU representative: _____ 900#: _____

Phone: _____ Email: _____

Radiation Use Permit No., if applicable: _____

Inspection date: _____ Performed by: _____

Type of inspection: _____

S = Satisfactory | U = Unsatisfactory | C = Corrected During Inspection | N/A = Not Applicable

SECTION 2 – Required Documents and Posting

S	U	C	N/A	Door Posting:
				Radiation / radioactive material posting, as applicable
				No Food or Drink Notice, where applicable
				Authorized Personnel Only, where applicable
				Emergency contact information (AU/PI, RSO, Campus Police)

S	U	C	N/A	Lab Documents:
				Notice to Employees
				Applicable license / registration information available, as required
				Radiation Safety Manual
				Applicable SOPs / operating procedures
				Emergency procedures / plan, as applicable

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

_____

SECTION 3 – Authorization and Records

S	U	C	N/A	Records:
				Radiation Use Permit / authorization current, as applicable
				Radioactive material inventory current, as applicable
				Required acquisition / receipt / transfer / disposal records available
				Radiation safety training current
				Dosimetry requirements satisfied, if applicable
				Radioactive waste records current, if applicable
				Required radiation/contamination surveys documented
				Corrective actions from previous inspection completed

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

_____

SECTION 4 – Radioactive Material Controls

S	U	C	N/A	
				Storage / security
				Labeling / identification
				Containers / containment
				Inventory consistency
				Contamination controls
				Waste management
				Housekeeping
				Food / drink / personal-item restrictions
				Work practices / PPE, as applicable
				Material use limited to authorized locations/activities

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

_____

SECTION 5 – Sealed Sources

S	U	C	N/A	
				Inventory verified
				Identification / serial numbers
				Security
				Physical condition
				Leak-test status / current, if applicable

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

SECTION 6 – Radiation Machines

S	U	C	N/A	
				Registration/authorization
				Operating procedures
				Interlocks / safety features
				Warning devices
				Equipment condition / maintenance
				Surveys, as applicable
				Operator training

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

SECTION 7 – Radiation Surveys / Instrumentation

S	U	C	N/A	
				Required surveys performed
				Instruments appropriate
				Calibration current where required
				Survey records maintained

Observations / Findings / Corrective Actions: _____

_____

_____

_____

_____

_____

SECTION 8 – Inspection Summary and Follow-Up

Overall inspection status:

☐ Satisfactory – No corrective action required

☐ Satisfactory – Minor observations/corrections noted

☐ Corrective action required

☐ Immediate action/restriction implemented

☐ Follow-up inspection/review required

Outstanding corrective actions / follow-up: _____

_____

_____

_____

Follow-up due date, if applicable: _____

AU / representative acknowledgment: _____ Date: _____

Inspector: _____ Date: _____

RSO review: _____ Date: _____

Corrective actions verified/closed by: _____ Date: _____

RS-16 / Radiation / Contamination Survey Record

SECTION 1 – Survey Information

Department: _____ Room no.: _____

Authorized User / custodian: _____ 900#: _____

Email: _____ Phone: _____

Radiation Use Permit No., if applicable: _____

Date: _____ Time: _____

Survey performed by: _____

Reason for survey

☐ Routine survey

☐ After radioactive-material use/procedure

☐ Spill / contamination follow-up

☐ Area release / decommissioning

☐ Equipment / work-area survey

☐ Radiation machine survey

☐ Other: _____

SECTION 2 – Survey Instrumentation

Instrument type: _____ Calibration date: _____

Manufacturer / model: _____ Background: _____

Serial no.: _____ Units: _____

Probe / detector: _____

SECTION 3 – Survey Results

Location / Survey Point	Method	Result	Units	Acceptable / Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action
	☐ Direct ☐ Wipe			☐ Acceptable ☐ Action

SECTION 4 – Survey Area Diagram / Sampling Locations

Sketch the surveyed area and identify numbered survey points corresponding to Section 3. Show relevant equipment, radioactive-material use/storage locations, and other features as appropriate.

Building / room: _____ ☐ Diagram not to scale

Legend / notes: _____

_____

SECTION 5 – Survey Evaluation and Follow-Up

☐ No elevated radiation/contamination identified

☐ Elevated reading/contamination identified

☐ Area/equipment decontaminated

☐ Resurvey performed

☐ Area restricted pending corrective action

☐ RSO notified

☐ Additional action required

Applicable action level / acceptance criterion, if used: _____

Basis / reference: _____

Comments / corrective actions: _____

_____

_____

_____

Final survey acceptable: ☐ Yes ☐ No ☐ Pending

AU / representative acknowledgment: _____ Date: _____

Surveyor: _____ Date: _____

RSO review: _____ Date: _____