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4. RADIATION PROTECTION

4.1 RADIATION PROTECTION PROGRAM

The purpose of this chapter is to define the GE-Hitachi Global Laser Enrichment LLC (GLE) Radiation Protection (RP) Program. The RP Program protects the radiological health and safety of workers and the public and complies with the following:

- 10 CFR 19, Notices, Instructions, and Reports to Workers: Inspection and Investigations (Ref. 4-1),
- 10 CFR 20, Standards for Protection Against Radiation (Ref. 4-2),
- 10 CFR 70, Domestic Licensing of Special Nuclear Material (Ref. 4-3), and
- Regulatory Guide 8.2, Guide for Administrative Practices in Radiation Monitoring (Ref. 4-4).

The RP Program also provides protection to workers in the event of an accident as defined in the Integrated Safety Analysis (ISA).

4.1.1 Requirements of 10 CFR 20, Subpart B

In accordance with 10 CFR 20.1101, *Radiation Protection Programs* (Ref. 4-5), the RP Program uses approved written procedures and engineering controls based on sound RP principles to achieve occupational and public doses below the U.S. Nuclear Regulatory Commission (NRC) established limits. The RP Program is focused on implementing RP principles necessary to achieve compliance with the requirements of 10 CFR 20.1201, *Occupational Dose Limits for Adults* (Ref. 4-6), and to maintain exposure to radiation As Low As Reasonably Achievable (ALARA). The content and implementation of the RP Program is reviewed annually, at a minimum. In addition, constraints on atmospheric releases are established such that no member of the public is expected to receive a total effective dose equivalent (TEDE) in excess of 0.1 millisievert per year (mSv/yr) (10 millirem per year [mrem/yr]) from these releases. Occupational radiation exposures are maintained ALARA through the following:

- Exposure monitoring is consistent with the guidance in 10 CFR 20.1501, General (Ref. 4-7), and 10 CFR 20.1502, Conditions Requiring Individual Monitoring of External and Internal Occupational Dose (Ref. 4-8),
- Frequent interactions between the Radiation Safety Committee (RSC) and Operations personnel, and
- Annual RP Program assessments with senior management.

Administrative personnel exposure limits are set below the limits specified in 10 CFR 20.1201.

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4.1.2 Responsibilities of Key Program Personnel

The technical qualifications of GLE staff, to include training and experience, are provided in the GLE License Application (LA) in accordance with 10 CFR 70.22, *Contents of Applications* (Ref. 4-9). Staffing is consistent with guidance provided in Regulatory Guide 8.2 and Regulatory Guide 8.10, *Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable* (Ref. 4-10). Further discussion regarding the qualifications of GLE management and the delineation of safety responsibilities is provided in GLE LA Chapter 2, *Organization and Administration*.

4.1.2.1 Global Laser Enrichment Facility Manager

The GLE Facility Manager has the overall responsibility for safety and activities conducted at the GLE Commercial Facility. The duties of the GLE Facility Manager are performed in accordance with approved written policies and procedures. The GLE Facility Manager provides for safe and controlled operations and protection of the environment by delegating and assigning responsibility to qualified line management and area managers. Line management and area manager qualifications are detailed in GLE LA Chapter 2.

4.1.2.2 Global Laser Enrichment Environmental, Health, and Safety Manager

The GLE Environmental, Health, and Safety (EHS) Manager reports to the GLE Facility Manager and has responsibility for directing activities to ensure that the GLE Commercial Facility complies with appropriate rules, regulations, and codes. The GLE EHS Manager directs the following functions: Nuclear Criticality Safety (NCS), RP, Material Control and Accounting (MC&A), Security and Emergency Preparedness, Licensing, Industrial Safety, and Environmental Protection. The GLE EHS Organization provides independent oversight of Operations. The qualifications for this position are described in GLE LA Chapter 2.

4.1.2.3 Radiation Protection Manager

The RP Manager reports to the GLE EHS Manager and is responsible for the overall implementation of the RP Program. In matters involving RP, the RP Manager has direct access to the GLE Facility Manager. The RP Manager shall have, at a minimum, a bachelor's degree in an engineering or scientific field, three years experience in assignments that include responsibility for RP, and experience in the understanding, application, and direction of RP Programs. The RP staff, including engineers, technicians, administrative support personnel, and contractors specifically assigned to the RP Program, report to the RP Manager.

4.1.2.4 Global Laser Enrichment Facility Personnel

GLE personnel working with or near radioactive materials are required to take basic RP training, as well as any other specialized training deemed appropriate by assigned management. The GLE Training Program is further described in Section 4.5, *Radiation Protection Training*.

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4.1.3 Radiation Protection Program Staffing

The RP Manager ensures that the GLE Commercial Facility is staffed with suitably trained RP personnel to implement an effective program. RP staff qualifications and training are consistent with the guidance in American National Standards Institute (ANSI)/American Nuclear Society (ANS)-3.1-1993, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants* (Ref. 4-11). It is the responsibility of the RP Manager and his/her staff to:

- Establish and maintain the RP Program;
- Generate and maintain RP procedures;
- Assure ALARA is practiced by GLE personnel;
- Review and audit the effectiveness of the RP Program in regards to compliance with NRC, applicable regulatory guides, and other governmental regulations;
- Modify the program based on experience and facility history;
- Adequately staff the RP Organization to successfully implement the RP Program;
- Establish and maintain a Respiratory Protection Program;
- Monitor worker doses (both internal and external);
- Control sealed sources;
- Implement contamination minimization activities;
- Comply with the radioactive materials possession limits for the facility;
- Handle radioactive wastes when disposal is needed;
- Calibrate and maintain radiological instrumentation, including verification of required lower limits of detection or alarm levels;
- Establish and maintain RP training for personnel working in Radiological Controlled Areas (RCAs);
- Perform audits of the RP Program on an annual basis;
- Establish and maintain the Radiological Environmental Monitoring Program; and
- Post the RCAs, and within the RCAs post: Radiation, Airborne Radioactivity, High Radiation, and Contaminated Areas, as appropriate.

RP Technicians report to the RP Manager and are responsible for implementing the RP Program. Further description of the RP Technician duties and training is provided Section 4.3, *Organization and Personnel Qualifications*.

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4.1.4 Independence of the Radiation Protection Program

The RP Program is independent of GLE Operations. The management of the RP Program is conducted through the GLE EHS Manager and the RP Manager, both of whom function independent of Operations. This independence ensures the RP Program maintains objectivity to ensure safety takes priority over production.

4.1.5 Annual Review of the Radiation Protection Program

In accordance with 10 CFR 20.1101(c), the RP Program is reviewed annually by the Facility Safety Review Committee (FSRC), an independent advisory committee to the GLE Facility Manager. The review considers facility changes, new technologies, or other process enhancements that could improve overall program effectiveness. Further detail regarding the FSRC's review is provided in Section 4.2.6, *Review of ALARA Program*.

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4.2 AS LOW AS REASONABLY ACHIEVABLE (ALARA) PROGRAM

This section describes GLE's commitment to an ALARA Program. The ALARA Program functions as a subset of the RP Program. Approved written policies and procedures document and govern the implementation of the ALARA goals.

4.2.1 ALARA Program

The design and implementation of the ALARA Program is consistent with the guidance contained in Regulatory Guide 8.2, Regulatory Guide 8.13, *Instruction Concerning Prenatal Radiation Exposure (Ref. 4-12)*, Regulatory Guide 8.29, *Instruction Concerning Risks from Occupational Radiation Exposure (Ref. 4-13)*, and Regulatory Guide 8.37, *ALARA Levels for Effluents from Materials Facilities (Ref. 4-14)*.

Documented RP Program policies are implemented to ensure the ALARA goal is met. Procedures incorporate the ALARA philosophy into routine GLE Commercial Facility operations and ensure exposures are maintained below 10 CFR 20.1101(d) limits. As discussed in Section 4.7.15, *Access Control*, RCAs are established within the GLE Commercial Facility. RCAs contain radioactive material or have radiation-generating devices, and are identified through signs, ropes, gates, fences, or other visible means. Each RCA has specific entry, survey, and dosimetry requirements. The establishment of RCAs supports the ALARA commitment to minimize the spread of contamination and reduce unnecessary exposure of personnel to radiation.

4.2.2 ALARA Policies and Procedures

To ensure occupational doses are maintained ALARA, work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the applicable 10 CFR 20.1201 limit. The establishment of RCAs contributes to keeping exposures ALARA by minimizing the spread of contamination and reducing unnecessary exposure to radiation.

Doses to declared pregnant workers are maintained below the regulatory limit specified in 10 CFR 20.1208, *Dose Equivalent to an Embryo/Fetus (Ref. 4-15)*, and are maintained ALARA. Female employees are advised of the RP policy for declared pregnant workers during the basic RP training. The policy for occupational exposures to pregnant workers is consistent with the guidance in Regulatory Guide 8.13.

Constraints on atmospheric releases are established for the GLE Commercial Facility such that no member of the public is expected to receive a TEDE in excess of 0.1 mSv/yr (10 mrem/yr) from these releases. Approved written procedures dictate atmospheric releases to be monitored and measured. Doses to the public are calculated to ensure compliance with the requirements of 10 CFR 20.1101(d). Numerous controls exist to ensure public exposure resulting from the GLE Commercial Facility operations remains below the 10 CFR 20.1301, *Radiation Dose Limits for Individual Members of the Public (Ref. 4-16)* limits, to include stack and fence line monitoring. See GLE LA Chapter 9, *Environmental Protection*, for further information regarding implemented measures to keep public doses ALARA.

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4.2.3 ALARA Goals

In accordance with 10 CFR 20.1101, the RP Program is designed to achieve occupational and public doses that are ALARA. The RP Manager is responsible for implementation of the ALARA Program. The RSC provides oversight of the RP Program as described in Section 4.2.4, *Radiation Safety Committee*. In order to keep exposures ALARA, the following principles guide the RP Program:

- Radiation exposures and the release of radioactive effluents shall be monitored.
- Individual exposures shall be controlled to be less than applicable regulatory limits.

Specific goals of the ALARA Program include maintaining occupational exposures, as well as environmental releases, as far below regulatory limits as is reasonably achievable. The ALARA concept is also incorporated into the design and operation of the GLE Commercial Facility. The size and number of areas with higher dose rates are minimal. Per approved written procedures, the time spent in these areas is controlled and projects are evaluated to ensure workers receive the minimum exposure. Areas where personnel spend significant amounts of time are designed to maintain the lowest dose rates reasonably achievable.

4.2.4 Radiation Safety Committee

The RSC provides oversight of the RP Program and functions as the ALARA Committee. The objectives of the RSC include, but are not limited to, the following:

- Promote continued improvement in limiting employee radiological exposures;
- Identify potential radiological and safety hazards;
- Advise the GLE Facility Manager on RP concerns;
- Monitor trends in radiation levels, contamination levels, effluent releases, occupational exposure, and selected RP issues;
- Review proposed activities with regard to contamination control and ALARA; and
- Review results of audits performed by RP.

The membership of the RSC consists of a Chairperson (the RP Manager or designee) and representatives from RP, Environmental Protection, Industrial Safety, Operations Management, Operations, Engineering, and Maintenance. The committee meets on a monthly basis to review nuclear safety trends and to establish and monitor projects. This review includes a determination as to whether or not there are any upward trends in personnel exposure (for identified categories of workers and types of operations), effluent releases, or contamination levels.

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The Chairperson compiles and maintains nuclear safety trend information and project status summaries for committee review. The Chairperson distributes monthly meeting summaries to the GLE Facility Manager and appropriate line managers and area managers and maintains records of the committee proceedings for a minimum of three years. The maximum interval between meetings is not to exceed 60 days. Recommendations of the RSC are documented and tracked to completion.

4.2.5 Interaction Between Radiation Protection and Operations Personnel

The ALARA Program is one of several ways RP personnel interact with Operations personnel. RP and Operations personnel serve on the RSC. RP personnel are also involved in preparation of Radiation Work Permits (RWPs), which are further discussed in Section 4.4.3, *Radiation Work Permit Procedures*. To prepare an RWP, RP personnel must interact with Operations personnel to fully understand the activity and facility conditions in order to assess the associated radiological hazards. RP personnel also interact with Operations personnel when participating in safety audits. Lastly, RP personnel perform routine surveys of operational areas in order to ensure occupational doses are ALARA.

4.2.6 Review of ALARA Program

The FSRC is an independent advisory committee that reports to the GLE Facility Manager. The FSRC is responsible for the following:

- An annual ALARA review that considers:
 - Programs and projects undertaken by the RP Manager and the RSC;
 - RP training including, but not limited to, the effectiveness and adequacy of the curriculum and instructors;
 - Performance including, but not limited to, trends in airborne concentrations of radioactivity, personnel exposures, and environmental monitoring results;
 - Programs for improving the effectiveness of equipment and procedures used for effluent and exposure control;
- Review of major changes in authorized activities affecting nuclear or non-nuclear safety practices;
- Evaluation of contamination minimization and/or removal activities;
- Professional advice and counsel on Environmental Protection, NCS, RP, and Industrial Safety issues affecting nuclear activities; and
- Evaluation of new approaches, technologies, procedures, or facility changes that could potentially reduce radiation exposures.

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The proceedings, findings, and recommendations of the FSRC are reported in writing to the GLE Facility Manager and appropriate line managers and area managers. Such reports are retained for a minimum of three years. Based upon expected improvement, updated performance data, economics, and consideration of other site priorities, decisions are made as to which of the FSRC recommendations are pursued. If a specific recommendation is pursued, a task owner is assigned and the action is tracked to completion. The committee holds a minimum of three meetings each calendar year with a maximum interval of 180 days between any two consecutive meetings.

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4.3 ORGANIZATION AND PERSONNEL QUALIFICATIONS

This section provides information pertaining to the structure of the RP Organization and the staff qualifications.

4.3.1 Radiation Protection Personnel

The technical qualifications are provided in the GLE LA, to include training and experience of GLE staff, in accordance with 10 CFR 70.22(a)(6). Further discussion regarding the qualifications of GLE management and the delineation of the safety authority and responsibilities is provided in GLE LA Chapter 2. The organization of the RP staff is consistent with the guidance in Regulatory Guides 8.2 and 8.10.

RP personnel technical qualifications are provided in this section as well as in Section 4.1.2, *Responsibilities of Key Program Personnel*. RP personnel include the RP Manager and his/her staff. Typically, the RP Manager's staff consists of at least one Radiation Safety Engineer and several RP Technicians.

4.3.2 Organizational Relationships

The organizational relationships were previously described in Section 4.1.2. The RP Program is independent from the Operations and Technical Services Organizations and the RP Manager reports to the GLE EHS Manager.

4.3.3 Radiation Protection Manager

The position of RP Manager was previously described in Section 4.1.2.3, *Radiation Protection Manager*. The RP Manager has direct access to the GLE Facility Manager, which ensures independence from the Operations and Technical Services Organizations. In addition to being responsible for establishing and implementing the RP Program, the RP Manager is skilled in interpretation of data and regulations pertinent to RP, is familiar with the operation of the GLE Commercial Facility and RP concerns of the GLE Site, and is used as a resource in management decisions regarding RP.

4.3.4 Radiation Protection Staff Responsibilities

RP Technicians, Engineers, and Managers perform the functions of assisting and guiding workers in radiological aspects of the job. These individuals have the responsibility and authority to stop radiological work or mitigate the effect of an activity if it is suspected that the initiation or continued performance of a job, evaluation, or test will result in the violation of approved RP requirements.

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4.3.5 Minimum Training of Radiation Protection Staff

The RP Training Program is designed and implemented consistent with the guidance in ANSI/ANS-3.1-1993 and American Society for Testing and Materials (ASTM) E1168-95, *Standard Guide for Radiological Protection Training for Nuclear Facility Workers (Ref. 4-17)*. The RP staff is trained in accordance with the requirements for their specific job function. The level of RP training is commensurate with the RP responsibility held by the individual. At a minimum, the RP staff completes basic RP training. In addition, Radiation Safety Engineers are required to have a technical degree. RP Technicians shall have a minimum of two years experience in their specialty.

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4.4 COMMITMENT TO APPROVED PROCEDURES

This section describes the GLE commitment to prepare and maintain approved written RP procedures.

4.4.1 Radiation Protection Procedures

Operations at the GLE Commercial Facility involving licensed materials are conducted through the use of approved written procedures as required by 10 CFR 70.22(a)(8). RP procedures are prepared, reviewed, and approved to carry out activities related to the RP Program. Approved written procedures are used to control RP activities in order to ensure activities are carried out in a safe, effective, and consistent manner. RP procedures are reviewed and revised, as necessary, to incorporate any facility or operational changes or changes to the ISA.

4.4.2 Preparation, Authorization, Approval, and Distribution of Radiation Protection Procedures

The RP staff, or an area manager, prepares draft procedures that are reviewed by affected personnel to ensure the procedures are appropriate and reasonable to implement. The RP Manager reviews and approves final RP procedures, as well as proposed revisions to RP procedures. GLE LA Section 11.4, *Procedures*, provides additional information on GLE procedures.

RP procedures are distributed to appropriate Managers. RP procedures are available to GLE employees electronically. For certain activities, paper copies are available at the activity location. Certain RP procedures are required to be reviewed on a periodic basis by employees, depending on their job function. The assigning and documenting of the employee's review of the procedure(s) is tracked. Requirements for procedure control and approval authority are documented.

4.4.3 Radiation Work Permit Procedures

Routine work performed in RCAs is administered by the use of approved written procedures described in GLE LA Chapter 11, *Management Measures*. Non-routine activities, particularly those performed by non-GLE employees generally not covered by approved written procedures, are administered by the RWP System. An example of a non-routine activity would be unanticipated maintenance on, or repair of, a piece of equipment. The RWP System is described in approved written procedures. An RWP requires RP Manager, or designee, approval prior to issuance. The RWP specifies the necessary radiation safety controls, as appropriate, to include personnel monitoring devices, attendance of RP staff, protective clothing, respiratory protective equipment, special air sampling, and additional precautionary measures to be taken. The RWP also contains a description of the radiological conditions in the immediate work area covered by the RWP.

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Prior to commencing work that requires an RWP, employees performing the job must review the RWP and document their review. Work is monitored, as required, by an RP Technician. RWPs are available to workers for re-review at any time and include expiration dates. An RP Technician or the RP Manager (or designee) reviews the status of issued RWPs on a periodic basis. RWPs are closed out when the applicable work activity for which it is written is complete and terminated. A copy of RWPs and any associated records are kept for the life of the facility.

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4.5 RADIATION PROTECTION TRAINING

4.5.1 Design and Implementation of Radiation Protection Training Program

The RP Training Program is designed and implemented to be consistent with the guidance in ASTM E1168-95. As described in Section 4.5.3, *Level of Training*, the RP Training Program is compliant with regulations in 10 CFR 19.12, *Instruction to Workers (Ref. 4-18)*, and 10 CFR 20.2110, *Form of Records (Ref. 4-19)*.

4.5.2 Training of Personnel and Visitors

Training programs are established for various job functions (such as, Operations, RP Technicians, contractor personnel) commensurate with NCS and RP responsibilities. Visitors to RCAs are either trained in the formal RP Training Program or are given a general training session regarding radioactive materials in the workplace and are escorted by trained personnel.

4.5.3 Level of Training

The required level of RP Training is based on the potential radiological health risks associated with an employee's work responsibilities. In accordance with 10 CFR 19.12(a), any individual working at the facility likely to receive, in one year, an occupational dose in excess of 1 mSv (100 mrem) is:

- Informed of the storage, transfer, or use of radioactive material;
- Instructed in health protection issues associated with exposure to radiation and radioactive material, precautions or procedures to minimize exposure, and the purpose and function of protective devices employed;
- Required to observe, to the extent within the worker's control, the applicable provisions of the NRC regulations and licenses for protection of personnel from exposure to radiation and radioactive material;
- Instructed of their responsibility to promptly report to management any condition that may lead to or cause a violation of NRC regulations and licenses, or result in unnecessary exposure to radiation and radioactive material;
- Instructed on the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and radioactive material; and
- Advised of the various notifications and reports that a worker may request pursuant to 10 CFR 19.13, *Notifications and Reports to Individuals (Ref 4-20)*.

In accordance with 10 CFR 19.12(b), when determining if a worker is likely to receive 1 mSv (100 mrem), management considers the worker's assigned activities during normal and abnormal situations. The instructions provided to the worker, as described above, are commensurate with potential radiological conditions present in the workplace.

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4.5.4 Incorporation of 10 CFR 19 Training Requirements

The RP Training Program complies with 10 CFR 19.12 and 10 CFR 20.2110 requirements and takes into consideration a worker's normally assigned work activities. The following topics are covered during basic RP training:

- Radiation safety principles, policies, and procedures,
- Radiation hazards and health risks,
- Correct handling of radioactive materials,
- Location of and adherence to RP procedures,
- Minimization of exposures to radiation and radioactive materials,
- Contamination control,
- Access and egress controls,
- Monitoring for internal and external exposures,
- ALARA and exposure limits,
- Exposure monitoring methods and instrumentation,
- Personal and area dosimetry,
- Donning and doffing of personal protective equipment (PPE), and
- Emergency response.

Abnormal situations involving exposure to radiation and radioactive material, which can reasonably be expected to occur during the life of the facility, are evaluated and additional training is assigned as appropriate.

4.5.5 Review of Radiation Protection Training Program

The contents of the RP Training Program are reviewed bi-annually by the RP and NCS Managers. The review addresses changes in policies, procedures, requirements, and changes to the ISA.

The periodicity of RP refresher training required by a worker is dependent on the worker's responsibilities; however, the basic RP refresher training occurs annually (not to exceed 15 months) and includes an exam. Training requirements are documented and tracked for employees. Training records are managed and stored in accordance with 10 CFR 20.2110.

4.5.6 Evaluation of the Radiation Protection Training Program

Training records are kept in a database managed by the RP Manager or designee. RP training is typically computer-based but may be performed by authorized instructors. The contents of the RP Training Program are reviewed bi-annually by the RP and NCS Managers, and are periodically audited by Operations personnel to evaluate the effectiveness and adequacy of the program.

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4.6 VENTILATION AND RESPIRATORY PROTECTION PROGRAMS

In accordance with the regulations in 10 CFR 20, Subpart H, *Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas (Ref. 4-21)*, control of the release of radiation or radioactive materials is a fundamental requirement for facility and equipment design for areas in which uranium and other sources of radiation are handled, processed, or used in processes. The following sections describe the containment, ventilation, and respiratory protection equipment utilized to keep exposure to airborne radiation below regulatory limits.

4.6.1 Ventilation and Containment

In accordance with 10 CFR 20.1701, *Use of Process or Other Engineering Controls (Ref. 4-22)*, the containment of uranium hexafluoride (UF₆), and therefore the concentration of radioactive material in air, is accomplished through several engineered controls. These engineered controls include containment and ventilation systems.

The containment of UF₆ within process equipment is the primary control. UF₆ is transported and stored primarily in ANSI N14.1 compliant 30- and 48-inch cylinders. Enrichment process systems are designed for the containment of UF₆. UF₆ process systems are operated so that leaks are into the system and not into work areas. Process system components that are equipped with removable covers or hatch openings are equipped with seals and mechanical closure devices to ensure containment of UF₆. UF₆ is processed in the UF₆ Feed and Vaporization, Product Withdrawal, Tails Withdrawal, and Cascade and Gas Handling Areas. Ventilation systems serving these areas include design features that provide for confinement of radiological contamination. The ventilation systems for the enrichment process areas are described below.

4.6.1.1 Ventilation System Description

Ventilation systems for potentially contaminated areas exhaust to the environment through the Operations Building Stack. All air released from potentially contaminated areas is filtered to remove radioactive particulates before it is released. Ventilation equipment is designed to provide airflow from areas of lesser potential contamination to areas of higher potential contamination. Direction of airflow between areas is checked bi-weekly or after significant modifications to the ventilation system. If insufficient airflow results in airborne concentrations greater than the established procedural action limits, the affected processes are shut down. Specific facilities and capabilities of ventilation systems are detailed in Table 4-1, *Specific Facilities and Capabilities of Ventilation Systems*.

Potentially contaminated air is exhausted through high-efficiency filter media that are at least 99.97 percent efficient for removal of 0.3 micron particles. High-efficiency particulate air (HEPA) filters in the exhaust system are equipped with a device for measuring differential pressure. In accordance with approved written procedures, filters are not operated at a differential pressure exceeding the manufacturer's ratings for the filter. Prefilters, or other appropriate devices, are provided where necessary to treat effluents before filtration to ensure filter effectiveness is maintained. Air exits the Operations Building through HEPA and high-efficiency gas absorption (HEGA) filters. Additional information on the ventilation systems is provided in the ISA Summary.

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Hoods and other localized ventilation designs are utilized to minimize personnel exposure to airborne uranium. Activities and process equipment which generate airborne uranium are designed with filtered enclosures, hoods, dust capturing exhaust ports, or other devices that maintain air concentrations of radioactivity in work areas such that personnel exposures are below administrative and regulatory limits under normal operating conditions. Air flows through hood openings and localized vents are maintained in accordance with the values in Table 4-1, *Specific Facilities and Capabilities of Ventilation Systems*. Additionally, differential pressure indicators are installed across exhaust system filters to monitor system performance. The flows and differential pressures are checked monthly or after significant changes to the ventilation system. If insufficient airflow results in airborne concentrations greater than 10 times the derived air concentration (DAC) as defined in 10 CFR 20.1003, *Definitions (Ref. 4-23)*, the affected processes are shut down in accordance with approved written procedures.

4.6.1.2 Management Measures for Ventilation and Containment Systems

The Items Relied on for Safety (IROFS) are monitored on a regular basis as a routine part of the operating process. Operations and maintenance are performed using approved written procedures as described in GLE LA Section 11.4. The various programs that pertain to preventive and corrective maintenance are described in GLE LA Section 11.2, *Maintenance*. See GLE LA Chapter 11 for a description of the management measures applied to IROFS.

4.6.1.3 Design Criteria for Ventilation and Containment Systems

Redundancy and engineered controls are integrated into the design of ventilation systems. Degradations or failures in normally operating systems or components result in the automatic operation of standby equipment. Room isolation or the safe shutdown of operations and equipment is implemented if a release exceeds the system’s ability to maintain protection of the workers and public.

The ventilation system design requirements provide a safety margin between normal and accident conditions so that no single failure could result in the release of significant hazardous material. Standby power sources allow continuous operation of the ventilation systems upon a loss of power. Instrumentation is provided to detect abnormal process conditions so that the process can be returned to normal by operator actions.

The ventilation systems are sized to maintain ambient temperatures in the facility for the comfort and safety of the workers. The size of the ventilation system in the Operations Building is adequate to ensure potential airborne concentrations of radioactivity do not exceed the DAC values specified by International Commission on Radiological Protection (ICRP)-68, *Dose Coefficients for Intakes of Radionuclides by Workers (Ref. 4-24)*, during normal operations.

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4.6.1.4 Testing of the Ventilation and Containment Systems

Several measures are in place to ensure effective operation of the ventilation systems. Differential pressure across HEPA filters, in potentially contaminated ventilation exhaust systems, is monitored at least monthly or automatically monitored and alarmed. Approved written operating procedures specify limits and setpoints on the differential pressure consistent with manufacturers' recommendations. Filters are changed if they fail to function properly, or if the differential pressure exceeds the manufacturers' ratings. Filter inspection, testing, maintenance, and change-out criteria are specified in approved written procedures. Change-out frequency is based on considerations of filter loading, operating experience, differential pressure data, and any UF₆ releases indicated by hydrogen fluoride alarms.

4.6.2 Respiratory Protection Program

The Respiratory Protection Program is a subset of the RP Program and is conducted in accordance with 10 CFR 20, Subpart H. In accordance with 10 CFR 20.1703(c)(1-2), *Use of Individual Respiratory Protection Equipment (Ref. 4-25)*, the Respiratory Protection Program includes air sampling to identify potential hazards, permit proper equipment selection, and estimate occupational doses. Surveys and bioassays are also performed, as necessary, to evaluate actual intakes. The Respiratory Protection Program is consistent with the guidance in Regulatory Guide 8.15, *Acceptable Programs for Respiratory Protection (Ref. 4-26)*.

4.6.2.1 Respiratory Protection Requirements of 10 CFR 20, Subpart H

In accordance with 10 CFR 20.1701, the GLE Commercial Facility is designed and operated to use, to the maximum extent practical, process and engineering controls to minimize the concentration of radioactive material in air. In accordance with 10 CFR 20.1702(a), *Use of Other Controls (Ref. 4-27)*, when it is not practical to apply process or other engineering controls, ALARA principles to include access control to the affected area, limitations on exposure times, and use of respiratory protection equipment are applied. In accordance with 10 CFR 20.1703(a), respiratory protection equipment specifically tested and certified by the National Institute for Occupational Safety and Health (NIOSH) is used.

4.6.2.2 Procedures for Using Respiratory Protection Equipment

In accordance with 10 CFR 20.1703(c)(4), approved written procedures are used to control the following activities:

- Monitoring, including air sampling and bioassays,
- Supervision and training of respirator users,
- Fit testing of respirators,
- Respirator selection,
- Breathing air quality,
- Inventory and control of respirators,

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- Cleaning of respirators,
- Storage, issuance maintenance, repair, and testing of respiratory protection equipment,
- Recordkeeping, and
- Limitations on respirator use and relief from respirator use.

4.6.2.2.1 Selection of Respiratory Protection Equipment

In accordance with 10 CFR 20.1702(b), when performing ALARA analysis to determine if respiratory equipment should be used, other safety factors are considered including the impact of respiratory protection equipment use on industrial safety and health.

In accordance with 10 CFR 20.1703(e), consideration is given to the limitations appropriate to the type and mode of respiratory device use. Provisions are made for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or RP equipment. Per approved written procedure(s), RP personnel select the appropriate type of respiratory device to be used for activities involving potential exposure to airborne radioactivity.

4.6.2.2.2 Fitting of Respiratory Protection Equipment

Approved written procedures describe the proper techniques for performing fit tests. An adequate fit is determined for face-sealing respirators using either a quantitative fit test method or a qualitative method. In accordance with 10 CFR 20.1703(c)(6), qualitative fit testing is acceptable if: (1) it is capable of verifying a fit factor of 10 times the assigned protection factor (APF) for face pieces operated in a negative pressure mode; or (2) it is capable of verifying a fit factor of at least 500 for face pieces operated in a positive pressure mode. Mask fits are re-evaluated at least annually. Also in accordance with 10 CFR 20.1703(h), no objects, materials, substances (such as facial hair), or any conditions that may interfere with the facepiece seal or valve function and that are under the control of the respirator wearer, shall be present between the skin of the wearer’s face and the sealing surface of a tight-fitting respirator facepiece.

4.6.2.2.3 Issuance of Respiratory Protection Equipment

Approved written procedures prescribe the actions to be taken when issuing respiratory protection equipment. In accordance with 10 CFR 20.1703(c)(5), individuals designated to use respiratory protection equipment are evaluated by the Medical function to determine if the individual is medically fit to use respiratory protection devices. Individuals are evaluated periodically thereafter, at a frequency specified by the Medical function.

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4.6.2.2.4 Maintenance of Respiratory Protection Equipment

Respiratory protection equipment is cleaned, serviced, tested, and inspected in accordance with the instructions specified by the manufacturer per NIOSH for each respiratory protection device. The GLE Commercial Facility is equipped with a suitable location for cleaning and storage of respirators and other reusable PPE. Contaminated items remain inside the RCA where the items are cleaned until they are successfully decontaminated. Cleaned PPE, such as face shields and respirators that come into contact with the wearer's face, must be inspected after cleaning before reuse. Approved written procedures prescribe the actions to be taken for maintenance of respiratory protection equipment. The liquid waste resulting from cleaning respirators and other reusable PPE is sent to the Radioactive Liquid Effluent Treatment System (RLETS).

4.6.2.2.5 Testing of Respiratory Protection Equipment

In accordance with 10 CFR 20.1703(c)(3), respirators are tested for operability (user seal check for face-sealing devices and functional check for others) immediately prior to each use, per the instructions in approved written procedures.

4.6.2.2.6 Training on Use of Respiratory Protection Equipment

If there are no medical restrictions precluding respirator use, the individual is provided respiratory training and fitting by a qualified instructor. Additional training on the use and limitations of self-contained breathing devices is provided to designated individuals, per approved written procedures.

In accordance with 10 CFR 20.1703(d), each respirator user is advised that he/she may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other condition that may require such relief.

4.6.2.2.7 Monitoring Areas Requiring Respiratory Protection

In accordance with approved written procedures, an area requiring respiratory protection is monitored by the RP staff for airborne radioactivity in order to estimate the dose to the individual wearing respiratory protection. This monitoring could include air sampling, bioassay, and/or other method(s) deemed appropriate by RP personnel.

4.6.2.2.8 Recordkeeping for the Use of Respiratory Protection Equipment

Records regarding the use of respiratory protection equipment are maintained in accordance with approved written procedures and comply with 10 CFR 20, Subpart L, *Records* (Ref. 4-28). The GLE Records Management Program is described in GLE LA Section 11.7, *Records Management*.

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4.6.2.3 Revision of Respiratory Protection Procedures

Respiratory protection procedures are developed and revised, as needed, in accordance with the procedure development process described in GLE LA Section 11.4.2, *Procedure Development Process*.

4.6.2.4 Respiratory Protection Program Records

Records of the Respiratory Protection Program (including training for respirator use and maintenance) are maintained in accordance with the Records Management Program as described in GLE LA Section 11.7.

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4.7 RADIATION SURVEYS AND MONITORING PROGRAMS

Routine radiological surveys and monitoring are conducted at a regular frequency to ensure occupational exposures are ALARA. This includes airborne and surface contamination surveys and personnel dosimetry. The survey and monitoring programs are consistent with the guidance in Regulatory Guide 8.2, Regulatory Guide 8.7, *Instructions for Recording and Reporting Occupational Radiation Dose Data (Ref. 4-29)*, and Regulatory Guide 8.9, *Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program (Ref. 4-30)*.

4.7.1 Radiation Surveys and Monitoring Programs Meeting Requirements of 10 CFR 20, Subpart F

In accordance with 10 CFR 20.1501(a) and (b), GLE conducts surveys that are necessary to comply with the applicable regulations, and are reasonable to evaluate the magnitude and extent of radiation levels, concentrations, or quantities of radioactive material and the potential radiological hazards. Section 4.7.6, *Air Sampling Program*, discusses air sampling, and Section 4.7.8, *Minimization of Contamination*, discusses the Contamination Survey Program.

In accordance with 10 CFR 20.1501(b), instruments and equipment are calibrated periodically. Section 4.7.12, *Equipment and Instrumentation Sensitivity*, discusses equipment calibrations.

In accordance with 10 CFR 20.1501(c), personnel dosimeters are processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor. Section 4.7.3, *External Occupational Radiation Exposures*, discusses external dose and personnel dosimetry.

In accordance with 10 CFR 20.1502, GLE monitors exposure to radiation and radioactive material to demonstrate compliance with occupational dose limits. Sections 4.7.3 and 4.7.4 discuss monitoring for external and internal dose, respectively.

4.7.2 Approved Procedures for Radiation Surveys and Monitoring Programs

The approved written procedures include an outline of survey and monitoring objectives, sampling procedures and data analysis methods, types of equipment and instrumentation to be used, frequency of measurements, recordkeeping and reporting requirements, and actions to be taken in the event measurements exceed administrative or regulatory limits.

4.7.3 External Occupational Radiation Exposures

External occupational dose is measured in accordance with 10 CFR 20.1501(a). Deep-dose equivalent and shallow-dose equivalent from external sources of radiation are determined by individually assigned dosimeters. Thermo luminescent dosimeters (TLDs) are issued to persons entering RCAs. TLDs are sensitive to beta, gamma, and neutron radiation. Per approved written procedures, personnel dosimeters are distributed to individuals based on their job functions, commensurate with the amount of time an individual spends working with or near radioactive materials. Personnel dosimeters are processed by a NVLAP accredited vendor. The capability exists to process dosimeters expeditiously if there is an indication of an exposure in excess of established action guides. Action guides for external exposures are established in

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approved written procedures. Work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the applicable 10 CFR 20.1201 limit.

Any time an administrative limit is exceeded, the RP Manager is notified. The RP Manager then determines the need for investigation and/or corrective action. When the results of individual monitoring are unavailable or are invalidated by unusual exposure conditions, external exposures may be calculated by the RP staff on the basis of data obtained by investigation.

4.7.4 Internal Occupational Radiation Exposures

The Personnel Monitoring Program is designed and implemented for internal occupational radiation exposures based on the requirements of 10 CFR 20.1201, 10 CFR 20.1204, *Determination of Internal Exposure (Ref. 4-31)*, 10 CFR 20.1502(b), and 10 CFR 20.1704(i), *Further Restrictions on the Use of Respiratory Protection Equipment (Ref. 4-32)*. Intakes are assigned to individuals based upon one or more types of measurements as follows: air sampling (described in Section 4.7.6), urinalysis, and/or in vivo lung counting. The type and frequency of measurement(s) for an individual are determined by their job function. The measurements are commensurate with the amount of time an individual spends working with or near radioactive material. Intakes are converted to committed dose equivalent (CDE) and committed effective dose equivalent (CEDE) for the purposes of limiting and recording occupational doses. Action levels are established in approved written procedures to prevent an individual from exceeding the occupational exposure limits specified in 10 CFR 20.1201. Work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the 10 CFR 20.1201 limit. Control actions include temporarily restricting the individual from working in an area containing airborne radioactivity, and actions are taken as necessary to prevent recurrence.

4.7.4.1 Urinalysis Program

The Urinalysis Program is conducted primarily to evaluate the intake of soluble uranium to assure the 10 CFR 20.1201(e) intake limit of 10 milligram (mg) per week is not exceeded. Personnel assigned to work in areas where soluble airborne uranium compounds are present in concentrations likely to result in intakes in excess of 10 percent of the applicable limits in 10 CFR 20.1201 are monitored by urinalysis. The minimum sampling frequency for these individuals is specified in approved written procedures. Urinalysis may also be used to monitor individuals involved in non-routine operations, perturbations, or incidents.

Urine sampling frequencies and action levels are established in approved written procedures based on the appropriate biokinetic models for the present uranium compounds. Results above the applicable action level are investigated. Work activity restrictions are imposed when an individual's exposure (TEDE) exceeds 80 percent of the occupational dose limit in 10 CFR 20.1201(a). Exceeding action levels will result in a temporary work restriction for the individual to prevent additional exposure and allow a more accurate assessment of the intake.

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4.7.4.2 In Vivo Lung Counting Program

Routine in vivo lung counting frequencies are established for personnel who regularly work in areas where insoluble uranium compounds are processed. Baseline and termination counts are typically performed. Lung counting frequencies are based upon individual airborne exposure assignments and previous counting results. The minimum count frequency for individuals with an assigned intake greater than 10 percent of the Annual Limit on Intake (ALI), as defined in 10 CFR 20.1003, is annual.

Appropriate actions are taken based upon in vivo lung counting results to ensure the ALI is not exceeded. If an individual's lung burden indicates an intake greater than the applicable action level, the individual is temporarily restricted from working in areas containing airborne uranium. Work activity restrictions are imposed when an individual's exposure exceeds 80 percent of the occupational dose limit in 10 CFR 20.1201(d).

4.7.5 Summation of External and Internal Occupational Radiation Exposures

Per approved written procedures, the summation of external and internal occupational radiation exposure is reported as a TEDE and is calculated in accordance with 10 CFR 20.1202(a)-(d), *Compliance with Requirements for Summation of External and Internal Doses (Ref. 4-33)*. The calculation is consistent with the guidance in Regulatory Guide 8.34, *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses (Ref. 4-34)*.

4.7.6 Air Sampling Program

An Air Sampling Program is designed and implemented in areas of the GLE Commercial Facility that are potential Airborne Radioactivity Areas. This program includes procedures to conduct air surveys, and to calibrate and maintain RP airborne sampling equipment in accordance with the manufacturers' recommendations.

4.7.7 Control of Airborne Radioactive Material

Air samples are continuously taken from each main process area where airborne concentrations are likely to exceed 0.1 DAC when averaged over 40 hours to assess the concentrations of uranium in the air. Per approved written procedures, the air samples are collected in such a way that the concentrations of uranium measured are representative of the air which workers breathe. Air sampling results and individual personnel exposure assignments are monitored by the RP function to evaluate the effectiveness of personnel exposure controls.

Evaluations of air sampling effectiveness are performed in accordance with the methods and acceptance criteria in Regulatory Guide 8.25, *Air Sampling in the Workplace (Ref. 4-35)*. Filters from air samplers are changed each shift during normal operating periods, or at more frequent intervals following the detection of an event that may have released airborne uranium, based upon knowledge of the particular circumstances. Filters are not changed as frequently during periods when no work is in progress. The filters are processed to determine the uranium concentration in the air for each area.

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Each air sampler is equipped with a rotameter to indicate flow rate of air sampled. These rotameters are calibrated or replaced every 18 months, at a minimum. Air sampling results in excess of 2.5 DAC (eight hour sample) and not resulting from a specific known cause are investigated to determine the probable cause. Operations or equipment will be shut down and immediate corrective action will be taken at locations where an air samples exceeds 10 DAC without a specific known cause.

In addition to the activities described above, exposure to airborne radioactive material is controlled through limiting access to areas, limiting exposure time, and the use of respiratory equipment.

4.7.8 Minimization of Contamination

The GLE Commercial Facility is designed and operated in accordance with 10 CFR 20.1406, *Minimization of Contamination (Ref. 4-36)*, to minimize contamination, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. Removing radioactive material from equipment, to the extent reasonably possible prior to servicing, reduces exposures to personnel who work around and service contaminated equipment. Surface contamination is removed to minimize its spread to other areas of the facility. Surfaces such as floors and walls are designed to be smooth, nonporous, and free of cracks so that they can be more easily decontaminated. In addition, minimization of contamination is accomplished through compliance with labeling and packaging requirements in 10 CFR 20.1904, *Labeling Containers (Ref. 4-37)*, 10 CFR 20.1905, *Exemptions to Labeling Requirements (Ref. 4-38)*, 10 CFR 20.1906, *Procedures for Receiving and Opening Packages (Ref. 4-39)*, 10 CFR 20, Subpart K, *Waste Disposal (Ref. 4-40)*. The following are examples of GLE methods for minimizing contamination:

- Containment of radioactive material throughout the facility,
- Monitoring for equipment leaks,
- Providing overflow vessels to capture potential spills,
- Minimizing the use of nonradioactive process equipment in locations subject to potential contamination,
- Providing local air filtration in areas with potential airborne contamination to preclude its spread,
- Use of protective clothing (training on donning and doffing),
- Use of respiratory protection,
- Training on proper techniques for handling radioactive material, and
- Airflow from areas of low radioactivity to higher radioactivity.

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4.7.9 Contamination Survey Program

Routine surveys are performed in areas that are most likely to be contaminated, as well as in all other operational areas. The RP staff determines survey frequencies, compares the survey results to action guide values as specified in approved written procedures, and ensures the appropriate responses are taken. If the results exceed the action guide values, the RP Manager (or designee) is informed, and he/she determines if an investigation and/or corrective actions are necessary.

4.7.10 Corrective Action Program for Personnel Contamination

Protective clothing is provided to persons who are required to enter the RCAs, where the potential for personnel contamination exists as determined by the RP staff. The amount and type of protective clothing required for a specific area or operation is determined by operational experience and the potential for contamination. Available clothing includes caps, hoods, laboratory coats, coveralls, safety glasses, boots, overshoes, shoe covers, rubber and cloth gloves, and safety shoes. The minimum clothing requirements for RCA entry are defined in Table 4-2, *Personnel Protective Clothing*. The protective clothing is removed in the change rooms upon exit. In the Laboratory Area, where uranium is handled, the minimum protective clothing requirement for entry is a laboratory coat and safety glasses. PPE and anti-contamination clothing is segregated and disposed of in accordance with the following:

- Labeled radioactive material bags are provided for placement of disposable PPE; and
- Used, disposable PPE, respirator cartridges, and other disposable items are containerized and taken to the Radiological Waste Area.

RP Technicians perform routine contamination surveys in the change rooms and the Laboratory Area.

Personnel contamination surveys are required for external contamination on clothing and the body by personnel exiting the change rooms. If contamination is found in excess of background levels, the individual attempts self-decontamination (except for facial contamination) at the facilities provided in the change rooms. If decontamination attempts are not successful, or if facial contamination is detected, decontamination assistance is provided by the RP function (typically an RP Technician). If skin or personal clothing is still contaminated above background levels, the individual is not permitted to leave the area without the prior approval (per approved written procedure) of the RP function.

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4.7.11 Corrective Action Program for Airborne Occupational Exposure

Corrective actions are implemented and documented based on the frequency and magnitude of events causing releases of airborne uranium that exceed administrative limits. Routine air sampling is supplemented by portable air sample surveys as required to evaluate non-routine activities or breaches in containment. RP and Operations staff investigate the cause of the release and implement recommended actions to prevent future releases.

4.7.12 Equipment and Instrumentation Sensitivity

Appropriate radiation detection instruments are available in sufficient number to ensure adequate radiation surveillance can be accomplished. Selection criteria for portable and laboratory counting equipment are based on the types of radiation detected, maintenance requirements, ruggedness, interchangeability, and upper and lower limits of detection capabilities. The RP staff reviews the appropriateness of the types of instruments being used for each monitoring function annually. Table 4-3, *Types and Uses of Available Instrumentation (Typical)*, lists examples of the types and uses of available instrumentation and includes the type of equipment, the sensitivity (typical range), and the routine use.

Portable instrumentation is calibrated in accordance with manufacturing recommendations before initial use, after major maintenance, and on a routine basis following the last calibration. Calibration consists of a performance check on each range scale of the instrument with a radioactive source of known activity traceable to a recognized standard such as the National Institute of Standards and Technology (NIST). Prior to each use, operability checks are performed on monitoring and laboratory counting instruments. The background and efficiency of laboratory counting instruments are determined on a daily basis when in use.

4.7.13 Policies for Removal of Equipment and Materials from Radiological Controlled Areas

When removing equipment and materials from RCAs, the guidance contained in Branch Technical Position, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material (Ref. 4-41)* is followed. Per approved written procedures, the RP staff has to approve release of equipment and/or materials from RCAs.

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4.7.14 Sealed Sources

When not in use, sources shall be stored in a closed container adequately designed and constructed to contain radioactive material that may otherwise be released during storage. Sealed sources are controlled and periodically inventoried. The sources shall be leak-tested in accordance with ISO 2919, *Radiation Protection – Sealed Radioactive Sources – General Requirements and Classifications* (Ref. 4-42).

4.7.15 Access Control

Access control is accomplished through compliance with the requirements in 10 CFR 20.1601(a)-(c), *Control of Access to High Radiation Areas* (Ref. 4-43), and 10 CFR 20.1602, *Control of Access to Very High Radiation Areas* (Ref. 4-44). For most RCAs, routine access points are established through change rooms. Each change room includes a step-off area provided between the contamination controlled and non-controlled areas. Instructions controlling entry and exit from RCAs are posted at the entry points. Survey meters are provided in the step-off area of each change room for use by personnel leaving the RCA. Posted instructions address the use of the survey meters, donning and doffing protective clothing, and appropriate decontamination methods. Alternate access points to RCAs are established for specific activities not accommodated by the change rooms. Such access is governed by approved written procedures or RWPs, which establish controls to prevent the spread of contamination to non-controlled areas.

RCAs that may pose a risk to employees are identified and posted in compliance with the requirements in 10 CFR 20.1901, *Caution Signs* (Ref. 4-45), 10 CFR 20.1902, *Posting Requirements* (Ref. 4-46), and 10 CFR 20.1903, *Exceptions to Posting Requirements* (Ref. 4-47). Access to these areas is controlled so that only appropriately trained individuals are allowed entry. Signs are regularly inspected for conformance. In accordance with definitions provided in 10 CFR 20.1003, the following areas are identified and posted:

- Radiation Area,
- High Radiation Area,
- Airborne Radioactivity Area, and
- Radioactive Material Area.

In addition, contamination areas are posted in accordance with approved written procedures. Signs are posted at the entry points of areas requiring protective clothing. RP training and approved written procedures instruct employees on requirements for entering and working in posted areas.

4.7.16 Radiation Reporting Program

A Radiation Reporting Program is established to maintain records of the RP Program, radiation survey results, results of Corrective Action Program referrals, RWPs, and planned special exposures. The Radiation Reporting Program is consistent with the guidance in Regulatory Guide 8.7.

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The Radiation Reporting Program commits to report to the NRC, any event resulting in an occupational exposure to radiation exceeding the dose limits in 10 CFR 20.1201, within the time specified in 10 CFR 20.2202, *Notification of Incidents (Ref. 4-48)*, 10 CFR 30.50, *Reporting Requirements (Ref. 4-49)*, 10 CFR 40.60, *Reporting Requirements (Ref. 4-50)*, and 10 CFR 70.74, *Additional Reporting Requirements (Ref. 4-51)*. The Radiation Reporting Program also commits to prepare and submit, to the NRC, an annual report of individual monitoring results, as required by 10 CFR 20.2206(b), *Reports of Individual Monitoring (Ref. 4-52)*.

Radiation exposure data for an individual, and the results of any measurements, analyses and calculations of radioactive material deposited or retained in the body of an individual, shall be reported to the individual as specified in 10 CFR 19.13. Individuals are advised of their right to request radiation exposure data in basic RP training. In accordance with 10 CFR 19.11, *Posting of Notices to Workers (Ref. 4-53)*, GLE posts current copies of the following documents:

- The regulations in 10 CFR 19 and 10 CFR 20;
- The license, license conditions, or documents incorporated into the license by reference, and amendments thereto; and
- The operating procedures applicable to licensing activities.

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4.8 ADDITIONAL PROGRAM COMMITMENTS

The following sections provide commitments to achieve compliance with the regulations in 10 CFR 20, Subpart L, 10 CFR 20, Subpart M, *Reports (Ref. 4-54)*, and 10 CFR 70.74.

4.8.1 Records

In accordance with 10 CFR 20, Subpart L, GLE maintains records of the GLE RP Program (including program provisions, audits, and reviews of the program context and implementation), radiation survey results (air sampling, bioassays, external exposure data from monitoring individuals, internal intakes of radioactive material), and results of corrective action program referrals, RWPs, and planned special exposures. GLE recordkeeping is further described in GLE LA Section 11.7.

4.8.2 Event Reporting

Approved written procedures dictate that GLE will report, to the NRC, within the time specified by 10 CFR 20, Subpart M, and 10 CFR 70.74, any event resulting in an occupational exposure to radiation exceeding the dose limits in 10 CFR 20. Approved written procedures contain instructions for when and how to report events to the NRC and other regulatory agencies.

4.8.3 Annual Dose Monitoring Report

GLE prepares and submits, to the NRC, an annual report of the results of individual monitoring, as required by 10 CFR 20.2206(b).

4.8.4 Corrective Action Reporting

Any radiation incident resulting in an occupational exposure that exceeds the dose limits in 10 CFR 20.1201, or is required to be reported per 10 CFR 20, Subpart M, 10 CFR 30.50, 10 CFR 40.60, and 10 CFR 70.74 will be evaluated within the Corrective Action Program. The corrective actions taken (or planned) to protect against a recurrence and the proposed schedule to achieve compliance are reported to the NRC.

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4.9 REFERENCES

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Table 4-1. Specific Facilities and Capabilities of Ventilation Systems.

Facility	Alarms, Interlocks and Safety Features	Purpose
Hoods	Airflow during operation > 80 linear feet per minute	Prevents spread of radioactive materials
	Effluent air filtered with HEPA filters and/or other appropriate filtration mechanisms	Prevents release of radioactive materials to environs
High Velocity Local Ventilation	Airflow designated to maintain an average of 200 linear feet per minute	Prevents spread of radioactive materials from work area to immediate room area
Recirculating Air Systems and Exhaust Air Systems	Air filtered in potentially contaminated zones with HEGA and HEPA filters	Removes essentially all contaminants from room and exhaust to environs
	Pressure drop indicator set to alarm at a setpoint differential pressure across final filter	Maintains adequate circulation for removal of dust and contaminants from the room air
	Low flow and no flow alarms	Detects clogged filters
	Final effluent air double-filtered with HEPA and HEGA filters prior to release through the stack	Prevents release of radioactive materials in environs

Table 4-2. Personnel Protective Clothing.

Area Workers	Inspectors and Visitors Only Observing Operations
Shoe covers or work area shoes	Shoe covers
Coveralls	Laboratory coats
Rubber gloves	Rubber gloves (as needed)
Safety glasses	Safety glasses

Table 4-3. Types and Uses of Available Instrumentation (Typical).

Type	Typical Range	Routine Use
Dose Rate Meters		
GM Low Range	0.01 mR – 2000 mR	Area Dose Rate Survey, Shipment Survey
GM High Range	0.1 mR - 1000 R	Emergency Monitoring
Ion Chamber - Low Range	0.1 mR - 10 R	Area Dose Rate Survey Shipment Survey
Ion Chamber - High Range	1 mR - 1000 R	Emergency Monitoring
Alpha Survey Meters	50 cpm - 2 x 10 ⁶ cpm	Direct Personnel and Equipment Surveys
Neutron Meters	0.5 mR - 5 R	Special Dose Rate Surveys
Laboratory Instrumentation		
Automatic air sample counter	N/A	Lab Analysis
Fixed geometry Geiger-Mueller counter	N/A	Lab Analysis
Scintillation Counter	N/A	Lab Analysis
In Vivo Lung Counter	N/A	Lung Deposition Measurements