

7.0 RADIATION SAFETY

7.1 Purpose of Review

The purpose of this review is to determine that the applicant commits to implementing a radiation protection program that is adequate to protect against intakes of soluble uranium, to protect the radiological health and safety of the occupational workers, and to comply with the regulatory requirements imposed by the Commission in 10 CFR Parts 19, 20, and 76.

7.2 Responsibility for Review

Primary: Health Physicist

Secondary: Certification Project Manager

Supporting: Region III Inspector

7.3 Areas of Review

The radiation protection program is reviewed to provide assurance that the applicant has and will maintain an adequate radiation protection program that will meet the requirements of 10 CFR Parts 19, 20, and 76. The reviewed program areas contain as low as reasonably achievable (ALARA) policy, organizational relationships and personnel qualifications, radiation safety procedures and radiation work permits (RWPs), training, ventilation systems, air sampling, contamination control, external and internal exposure, summing internal and external exposure, respiratory protection, and instrumentation.

7.4 Review Procedures

7.4.1 Acceptance Review

The staff review should start with the primary reviewer's determination that sufficient information has been provided in the contents of the application to satisfy the requirements in 10 CFR 76.35, "Contents of Application," and 10 CFR 76.36, "Renewals," with respect to the radiation protection programs for gaseous diffusion plants—see Standard Review Plan (SRP) Section 7.5.1.1, "Regulatory Requirements"—and that the topics discussed in SRP Section 7.3, "Areas of Review," have been addressed.

If significant deficiencies are identified in the application, the applicant should be requested to submit additional material before the staff resumes the application review.

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7.4.2 Evaluation

On the basis of its review, the staff may request that the applicant provide additional information or modify the submittal to meet the acceptance criteria in SRP Section 7.5.

The final step in the review is the primary staff reviewer's writing of a Compliance Evaluation Report (CER) that summarizes the conduct of the review, identifies what material in the application forms the basis for a finding of reasonable assurance with respect to the acceptance criteria, and presents the bases for certificate conditions that may be necessary to conclude that reasonable assurance is achieved.

7.4.2.1 ALARA

The reviewer will determine that the applicant describes the following details of the program policy and procedures used to maintain occupational radiological exposures ALARA: (1) the organization structure and how units interact to maintain ALARA; (2) how internal audits and assessments are structured and performed; and (3) how trend analysis is conducted to examine the historical patterns of exposures, activity concentrations, contamination levels, instrumentation performance, respiratory protection equipment performance, effluent filter performance, and worker performance.

7.4.2.2 Organizational Relationships and Personnel Qualifications

The reviewer will determine that the applicant describes: (1) the administrative organization of the radiation protection program, including the authority and responsibility of each position identified; (2) that the General Manager, or equivalent, has overall responsibility and authority for safety; (3) the organizational relationships that exist between the individual position responsible for the radiation protection program and other line managers; (4) the authority of the Radiation Safety Manager, Radiation Safety Officer or equivalent, to ensure that they are able to carry out their assigned responsibilities as defined in the radiation protection program (i.e., direct access to the General Manager); (5) that the radiation safety specialist(s) is responsible for specific uranium exposure prevention and radiation safety activities; (6) that the radiation safety technicians implement these functions; and (7) the education and experience criteria for the key radiation protection personnel.

7.4.2.3 Radiation Safety Procedures and RWP

The reviewer will determine that the applicant commits to using written, approved radiation safety procedures or RWPs to carry out activities related to the radiation safety program and that the procedures and RWPs are reviewed, revised, and updated periodically. The reviewer will also verify that the procedures are described in the application along with how the need for the procedures is identified and how the procedures are created, approved, controlled, revised, and made available to the worker.

7.4.2.4 Training

The reviewer will determine that the applicant contains a training program for all personnel and visitors who have access to a restricted area that is commensurate with the potential soluble uranium and radiological health protection problems in the restricted area. The reviewer will verify that the application describes a training program in which personnel and visitors entering restricted areas receive training in uranium exposure prevention and radiation safety or are escorted by a trained individual and that the refresher training content and schedule is described. The effectiveness of the training program is evaluated by written tests or other methods and the frequency of refresher training should not exceed 2 years. Further aspects of training are covered in Chapter 2.0, Section 2.3, of this SRP.

7.4.2.5 Ventilation Systems

The reviewer will determine that the applicant commits to operating the ventilation systems in a manner that protects operating personnel and the public from airborne soluble uranium and other radioactive material. Criteria for the ventilation systems includes minimum flow velocity at the hood openings, the types of filters and the maximum differential pressure across filters, and the frequency and types of tests required to measure ventilation system performance.

7.4.2.6 Air Sampling

The reviewer will determine that the applicant describes the air sampling objectives and procedures and includes: (1) the frequency and methods of analysis of airborne concentrations of soluble uranium and other radionuclide airborne concentrations and total radioactivity levels for each area, (2) the counting techniques, (3) the lower limits of detection for soluble uranium and other specific radionuclides, (4) the specific calculations for concentrations and levels, (5) the action levels and investigation levels, (6) the sampling methods and frequency, and (7) the location of continuous air monitors (CAMs), if used, and annunciators and alarms associated with CAMs.

7.4.2.7 Contamination Control

The reviewer will determine that the applicant commits to establishing a contamination survey program that includes the types and frequencies of surveys, limits for contamination levels, and methods and instruments used in the surveys. In addition, the applicant describes the design features of the facility that control contamination and access and should specify: (1) the types and availability of contamination monitoring equipment, (2) the specific limits established for personnel contamination, (3) the minimum provisions for personnel decontamination, (4) the minimum types of protective clothing necessary for individuals to enter restricted areas, (5) the technical criteria and levels for defining contamination areas, and (6) the frequency of a periodic review of all aspects of contamination control.

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7.4.2.8 External Exposure

The reviewer will determine that the applicant commits to a personnel monitoring program for external radiation that provides a means to measure, assess, and record personnel exposure to radiation. The type, range, sensitivity, accuracy, and frequency for reading personnel dosimeters and recording the radiation dose is stated. The applicant tests its dosimeters by participating in the National Voluntary Laboratory Accreditation Program.

7.4.2.9 Internal Exposure

The reviewer will determine that the applicant commits to a program for monitoring worker internal exposures in which the following are specified to adequately demonstrate compliance with the 10-milligram-per-week soluble uranium intake limit and the radiological dose limits: (1) the frequency of analysis, (2) the sensitivity and minimum detection levels, (3) the criteria for participation, and (4) the action levels and actions to be taken on the results. In addition, the applicant specifies: (1) the criteria for determining when it is necessary to monitor an individual's internal exposure during work hours, and (2) the methods for determining the worker intake from (a) the concentrations of radioactive materials in the work area air, (b) the quantities of radionuclides in the body, (c) the quantities of radionuclides excreted from the body, or (d) any combination of the above methods, as may be necessary for determining the intake.

7.4.2.10 Summing Internal and External Radiological Exposure

The reviewer will determine that the applicant commits to a program for summing internal and external radiological exposures to demonstrate compliance with radiological dose limits. The applicant commits to a policy for combining internal and external radiological exposures in accordance with Regulatory Guide (RG) 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," Rev. 1; RG 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses"; and RG 8.36, "Radiation Dose to the Embryo/Fetus."

7.4.2.11 Respiratory Protection

The reviewer will determine that the applicant commits to establishing a respiratory protection program that meets the requirements of 10 CFR Part 20 and states the equipment to be used, the conditions under which respiratory protection will be required for routine and nonroutine operations, the protection factors that will be applied when respirators are being used, and the locations of respiratory equipment within the plant.

7.4.2.12 Instrumentation

The reviewer will determine that the applicant commits to a policy for the maintenance and use of operating instrumentation in sufficient number and types to meet the requirements specified in 10 CFR Part 20. The applicant provides a listing of the types of instruments that are available, including ranges, counting mode, sensitivity, alarm setpoints, planned use, and

frequency of calibration. The applicant commits to calibrating instruments at least annually, preferably semiannually, and recalibrating instruments after adjustments or repairs.

7.5 Acceptance Criteria

The regulatory requirements, regulatory guidance, and regulatory review criteria applicable to this SRP are listed in the following sections.

7.5.1 ALARA Policy

7.5.1.1 Regulatory Requirements

The following regulations are applicable to the ALARA program:

1. 10 CFR 19.12 Instructions to Workers
2. 10 CFR 20.1101 Radiation Protection Programs
3. 10 CFR 20.2102 Records of Radiation Protection Programs
4. 10 CFR 20.2110 Form of Records
5. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.1.2 Regulatory Guidance

NRC RGs and American National Standards Institute (ANSI) standards applicable to the ALARA program that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 19.12, 20.1101, and 20.2102 are:

1. RG 8.2 Guide for Administrative Practice in Radiation Monitoring
2. RG 8.10, Rev. 1-R Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable
3. RG 8.13, Rev. 2 Instructions Concerning Prenatal Radiation Exposure
4. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
5. RG 8.29 Instructions Concerning Risks from Occupational Radiation Exposure
6. ANSI N13.2–1969 Guide for Administrative Practices in Radiation Monitoring

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7.5.1.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer shall determine that the applicant commits to an ALARA program. An acceptable program is evidenced and documented by an organizational structure in which radiation protection personnel interact, in a timely manner, with production personnel to ensure that methods and techniques for reducing occupational radiation exposure are incorporated in facility operation.
2. An ALARA committee, or other similar safety committee, is composed of radiation protection, environmental, safety, and production managers. The committee's membership is documented and its scope is to review the radiation safety program at least annually. The scope of the ALARA committee review includes the results of audits and self-assessments made by the radiation protection organization and reports of radiation levels, contamination levels, employee exposures, waste management, and effluent releases. The review determines:
 - a. If there are any upward trends toward increased personnel exposure developing in identified categories of workers, types of operations, or effluent releases.
 - b. If exposures and releases are being lowered or maintained in accordance with the ALARA concept.
 - c. If equipment for effluent and exposure controls is being properly used, maintained, and inspected.
3. Trend analysis is performed in areas such as the following:
 - a. Radiation exposures of plant workers and members of the public.
 - b. Concentrations of airborne radioactivity in plant areas and effluents.
 - c. Radioactive contamination in plant areas and on equipment.
 - d. Operation of radiation measurement instrumentation.
 - e. Operation of respiratory protection equipment.
 - f. Operation of effluent filtration systems.

7.5.2 Organizational Relationships and Personnel Qualifications

7.5.2.1 Regulatory Requirements

The following regulations are applicable to the radiation protection program organization:

1. 10 CFR 20.1101 "Radiation Protection Programs," require that the applicant use, to the extent practicable, procedure and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are ALARA.
2. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.2.2 Regulatory Guidance

The U.S. Nuclear Regulatory Commission (NRC) RGs and ANSI standards applicable to organizational relationships and personnel qualifications generally describe a basis acceptable to the staff for implementing the radiation protection program requirements of 10 CFR Part 76 are:

1. RG 8.2 Guide for Administrative Practices in Radiation Monitoring
2. RG 8.10, Rev. 1-R Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable
3. ANSI N13.2–1969 Guide for Administrative Practices in Radiation Monitoring

7.5.2.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria, or information demonstrating acceptable alternatives, in its review of the application. Acceptability should be based on the following:

The reviewer shall determine that the applicant commits to a structure that identifies the administrative organization of the radiation safety program and includes the authority and responsibility of each position. In addition, the applicant describes the organizational relationships that exist between the individual positions responsible for the radiation safety program and other line managers. The General Manager, or equivalent, shall have overall responsibility and authority for safety. The Radiation Safety Manager, or equivalent, may be delegated direct responsibility for establishing and implementing the radiation protection program and shall have direct access to the General Manager. Radiation safety specialist(s) shall be responsible for specific activities assigned to the radiation and soluble uranium safety function, with radiation safety technicians implementing these functions. Certain radiation safety technical support and/or audit activities may be supplied by qualified offsite corporate or consultant organizations.

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7.5.3 Radiation Safety Procedures and Radiation Work Permits

7.5.3.1 Regulatory Requirements

The following regulations are applicable to approved operating procedures and RWPs:

1. 10 CFR 20.2110 Form of Records
2. 10 CFR 76.36 Renewals
3. 10 CFR 76.60 Regulatory Requirements which Apply

7.5.3.2 Regulatory Guidance

The NRC RG applicable to radiation safety procedures that generally describe a basis acceptable to the staff for implementing the radiation protection program requirements of 10 CFR 2.2110 is RG 8.10, Rev. 1-R, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable."

7.5.3.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to using written, approved radiation safety procedures and RWPs to carry out activities related to the radiation safety program and that the procedures and RWPs are reviewed, revised, and updated periodically. A mechanism for providing a current copy of the procedures to personnel is established, and procedures are reviewed and approved by the Radiation Safety Manager. No longer than every 2 years, the Radiation Safety Manager, or an individual who has the qualifications of the Radiation Safety Manager, revises and updates the procedures as necessary.
2. The applicant commitment to use special reviews and approvals before conducting an activity involving radioactive materials that is not covered by a written radiation safety procedure. The applicant specifies how the determination is made to use an RWP, the positions within the organization authorized to approve and issue an RWP, the types of information to include in an RWP, the provisions for updating and terminating an RWP, and the records to be kept for the RWPs. The applicant specifies the levels of approval necessary for an RWP before it can become effective and specifies that the RWP be approved and signed by a supervisor or specialist in radiation protection. Approvals are required from other involved groups to ensure that the provisions of the RWP cover all potential hazards and that the operations will be conducted according to proper standards.
3. The applicant commits to using RWPs for specific purposes only. RWPs will be reissued when significant changes in the task or changes that affect worker safety are made. The applicant states that the RWP will include a list of the safety requirements for work

conducted under the authorization and will include the following, as applicable: (a) the type and frequency of monitoring to be conducted, (b) the total time allotted for the authorization, (c) special shielding or ventilation to be used, (d) personal protective equipment, (e) work limitations, (f) radiological and soluble uranium conditions, and (g) special instructions.

4. The applicant commits to a system that ensures that RWPs are not used past their termination dates. The system includes the types of records to be kept, the retention times for these records, and the final disposition of the RWP. The record system is sufficient to allow independent auditors to reconstruct the circumstances necessitating the RWP, the factors included, and the results.

7.5.4 Training

7.5.4.1 Regulatory Requirements

The following regulations are applicable to the radiological training program:

1. 10 CFR 19.12 Instructions to Workers
2. 10 CFR 20.2110 Form of Records
3. 10 CFR 76.95 Training

7.5.4.2 Regulatory Guidance

The following NRC RGs, ANSI, and American Society for Testing and Materials (ASTM) standards provide information, recommendations, and guidance and generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 19.12, 20.2110, and 76.95.

1. RG 8.10, Rev. 1-R Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable
2. RG 8.13, Rev. 2 Instructions Concerning Prenatal Radiation Exposure
3. RG 8.29 Instructions Concerning Risks from Occupational Radiation Exposure
4. ANSI NQA-1-1986 Quality Assurance Program Requirements for Nuclear Facilities
5. ASTM C986-89 Developing Training Programs in the Nuclear Fuel Cycle
6. ASTM E1168-87 Radiological Protection Training for Nuclear Facility Workers

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7.5.4.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to a training program such that all personnel and visitors entering restricted areas either receive training in soluble uranium and radiation protection or be escorted by an individual who has received such training. The technical content of the training program is commensurate with the potential soluble uranium and radiological health protection problems in the restricted area and meets the requirements of 10 CFR Parts 19 and 20. Training covers the following areas, as appropriate, in sufficient depth for the specific types of functions: (a) access and egress controls and escort procedures; (b) soluble uranium and radiation safety principles, policies, and procedures; (c) internal and external exposures of uranium and other radionuclides; (d) personnel dosimeters; (e) monitoring instruments and protective devices; (f) contamination control, including protective clothing and equipment; (g) radiation area and airborne radioactive area; (h) use, storage, and transfer of radioactive materials; (i) posting and labeling requirements; (j) ALARA and exposure limits; (k) soluble uranium and radiation hazards and health risks; and (l) emergency response requirements for individuals.
2. Refresher training is completed not later than 2 years following the most recent training and consists of a condensed version of the initial training, with emphasis on changes in policies, procedures, requirements, and facilities. The effectiveness of the training program is evaluated by written tests or other methodologies and includes an evaluation of the curriculum and the instructor's qualifications.

7.5.5 Ventilation Systems

7.5.5.1 Regulatory Requirements

The following regulations are applicable to the regulatory requirements for the ventilation system:

1. 10 CFR 20.1701 Use of Process or Other Engineering Controls
2. 10 CFR 20.2110 Form of Records
3. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.5.2 Regulatory Guidance

NRC RGs, ANSI standards, and a National Council on Radiation Protection and Measurements (NCRP) report applicable to the regulatory requirements related to the ventilation system generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1701 and 20.2110 are:

1. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
2. RG 3.12 General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants
3. ANSI N510–1980 Testing of Nuclear Air Cleaning Systems
4. ANSI NQA–1–1986 Quality Assurance Program Requirements for Nuclear Facilities
5. NCRP Report No. 59 Operational Radiation Safety Program

7.5.5.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to a policy for designing and operating the ventilation systems in the facility in a manner that protects operating personnel and the public from airborne soluble uranium and other radioactive materials and assures that the limits of 10 CFR Part 20 are not exceeded during normal operations. The applicant specifies criteria for the ventilation systems, including minimum flow velocity at openings of hoods, maximum differential pressure across filters, and types of filters to be used, where applicable. In addition, the applicant specifies the frequency and types of tests required to measure ventilation system performance, the acceptance criteria, and the actions to be taken when acceptance criteria are not satisfied. The applicant describes the maintenance, quality assurance, fire safety, and chemical safety activities associated with these ventilation systems, structures, systems, and components that are important to safety.
2. Airflow patterns generally are from areas of lesser contamination potential to areas of greater contamination potential. Engineering controls are used to limit the intake of soluble uranium and other radioactive materials, including portable filtration systems used to control airborne contaminants and containment structures to protect personnel working in adjacent areas, when feasible.

7.5.6 Air Sampling

7.5.6.1 Regulatory Requirements

The following regulations are applicable to the air sampling/monitoring program:

1. 10 CFR 20.1204 Determination of Internal Exposure
2. 10 CFR 20.1703 Use of Individual Respiratory Protection Equipment

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3. 10 CFR 20.2103 Records of Surveys
4. 10 CFR 20.2110 Form of Records
5. 10 CFR 20.2203 (a)(3)(i) Reports of Exposures, Radiation Levels and Concentrations
(ii), (b), and (d) of Radioactive Material Exceeding the Limits

7.5.6.2 Regulatory Guidance

NRC RGs, an NRC NUREG document, and ANSI standards applicable to the air sampling/monitoring program that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1204, 20.1703, 20.2103, 20.2110, and 20.2203 are:

1. RG 8.2 Guide for Administrative Practice in Radiation Monitoring
2. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
3. RG 8.25, Rev. 1 Air Sampling in the Workplace
4. NUREG-1400 Air Sampling in the Workplace
5. ANSI N13.1-1969 Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities
6. ANSI N13.2-1969 Guide for Administrative Practices in Radiation Monitoring

7.5.6.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to providing representative air sampling for areas in which a potential exists for airborne radioactive materials. Air sampling data is provided that demonstrate that soluble uranium and other radionuclide exposures do not exceed established limits and that radiation exposures are maintained ALARA.
2. The applicant provides for each work area a determination that the frequency for analyzing the airborne level of soluble uranium and other radionuclides, the counting techniques, and the method for determining the airborne concentration are adequate. The calibration methods and frequencies that ensure proper operation of the instrumentation and the calculations of airborne concentrations, in various areas, to obtain the airborne levels also is described. The application contains a description of action levels, alarm setpoints, frequency of measurements, and action to be taken when airborne levels are exceeded. In

those facilities where CAMs are used, the location of the CAMs and the readouts, annunciators, and alarms are described.

3. The applicant demonstrates that the action levels, investigation levels, and derived air concentrations (DACs) used, including soluble uranium's toxicological DAC, are based on appropriate technical criteria to evaluate air sampling and monitoring results and determine necessary control procedures. The minimum detectable activities for the specific radionuclides of interest are provided. Detection levels provide optimum worker protection and are appropriate for established action levels, investigation levels, and DACs.

7.5.7 Contamination Control

7.5.7.1 Regulatory Requirements

The following regulations are applicable to the contamination control program:

1. 10 CFR 20.1501(a)(2)(ii) Surveys and Monitoring-General
2. 10 CFR 20.1703(a)(3)(ii) Use of Individual Respiratory Protection Equipment
3. 10 CFR 20.1901 Caution Signs
4. 10 CFR 20.1902(e) Posting Requirements
5. 10 CFR 20.1904 Labeling Containers
6. 10 CFR 20.1906 Procedures for Receiving and Opening Packages
7. 10 CFR 20.2103 Records of Surveys
8. 10 CFR 20.2110 Form of Records
9. 10 CFR 20.2203(a)(3)(i) Reports of Exposures, Radiation Levels, and Concentrations
(ii), (b), and (d) of Radioactive Material Exceeding the Limits
10. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.7.2 Regulatory Guidance

NRC RGs, NRC Branch Technical Positions, and ANSI standards applicable to the contamination control program that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1501, 20.1703, 20.1901, 20.1904, 20.1906, 20.2103, and 20.2110 are:

1. RG 8.1 Radiation Symbol
2. RG 8.2 Guide for Administrative Practice in Radiation Monitoring

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3. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
4. ANSI N2.1–1989 Radiation Symbol
5. ANSI N13.2–1969 Guide for Administrative Practices in Radiation Monitoring
6. ANSI N512–1974 Protective Coatings (Paints) for the Nuclear Industry
7. ANSI N542–1977 Sealed Radioactive Sources Classification
8. NRC Branch License Condition for Leak Testing Sealed Byproduct
Technical Position Material Sources, April 1993
9. NRC Branch License Condition for Leak Testing Sealed Plutonium
Technical Position Sources, April 1993
10. NRC Branch License Condition for Plutonium Alpha Sources, April 1993
Technical Position
11. NRC Branch License Condition for Leak Testing Sealed Source which
Technical Position Contains Alpha and/or Beta-Gamma Emitters, April 1993
12. NRC Branch License Condition for Leak Testing Sealed Uranium
Technical Position Sources, April 1993
13. NRC Branch Guidelines for Decontamination of Facilities and Equipment
Technical Position Prior to Release for Unrestricted Use or Termination of Licenses
for Byproduct, Source, or Special Nuclear Material, April 1993

7.5.7.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to establishing a contamination survey program, based on the specifications in RG 8.24, that includes the types and frequencies of surveys, limits for contamination levels, and methods and instruments used in the surveys. Contamination surveys are conducted routinely for the areas of the plant site where contamination is likely, and the methods and types of instruments used in the surveys are adequate to allow accurate assessment of working conditions. Information is given about survey frequency for each area, types of radiation, criteria for contamination levels for both removable and fixed contamination, and action levels and actions (including the time frame for action initiation and completion) to be taken if levels are exceeded. Instruments with sufficient sensitivity to measure contamination at or below the action level are provided.

2. The applicant describes the facility features that help control contamination, including step-off pads, personnel monitoring equipment at exits, and change rooms. The applicant describes the following: (a) the types and availability of contamination monitoring equipment, (b) the specific limits established for personnel contamination, (c) the minimum provisions for personnel decontamination, (d) the minimum types of protective clothing necessary for individuals to enter restricted areas, and (e) the technical criteria and levels for defining contamination areas.
3. Sealed sources are leak tested on a regular basis in accordance with these NRC Branch Technical Positions: (a) "License Condition for Leak Testing Sealed Byproduct Material Sources," April 1993; (b) "License Condition for Leak Testing Sealed Plutonium Sources," April 1993; (c) "License Condition for Plutonium Alpha Sources," April 1993; (d) "License Condition for Leak Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters," April 1993; and (e) "License Condition for Leak Testing Sealed Uranium Sources," April 1993. The applicant establishes acceptable contamination levels, test frequencies, and actions to be followed if limits are exceeded.
4. The applicant commits to a periodic review of all aspects of access control to determine that: (a) signs, labels, and other access controls are properly posted and operative; (b) restricted areas established to prevent the spread of contamination are identified with appropriate signs; and (c) step-off pads, change facilities, protective clothing facilities, and personnel monitoring instruments are adequate. The reviews are documented, along with any deficiencies, and the corrective actions taken.
5. Allowable limits (fixed and removable) and action levels for immediate cleanup or delayed cleanup are specified for clean areas, intermediate areas (change rooms), and contaminated areas.
6. The radiological contamination levels of items (e.g., tools, equipment, material, premises, or scrap) given clearance for release for unrestricted use are in accordance with the NRC 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," dated April 1993.
7. A system is established to ensure that equipment and materials removed from contaminated areas are not contaminated above specified release levels. Maximum permissible personnel contamination levels (skin and clothing) also are established. Detected contamination in excess of these levels are investigated and documented as to source, probable cause, and other pertinent information. Records of these investigations are maintained and reviewed by radiation protection management for trends and corrective action taken, as necessary.
8. The policy on the use of personnel monitoring equipment is stated. Personnel perform a whole-body survey each time they leave known contaminated areas, or a minimum of a hand and shoe survey each time they leave restricted areas that are potentially contaminated.

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7.5.8 External Exposure

7.5.8.1 Regulatory Requirements

The following regulations are applicable to measuring, documenting, and maintaining the external exposure of personnel below the applicable external exposure limits:

1. 10 CFR 19.13 Notifications and Reports to Individuals
2. 10 CFR 20.1201(a)(2) Occupational Dose Limits for Adults
 and(c)
3. 10 CFR 20.1501(a)(2)(i) Surveys and Monitoring–General
 and(c)
4. 10 CFR 20.1502(a) Conditions Requiring Individual Monitoring of External and Internal
 Occupational Dose
5. 10 CFR 20.1601 Control of Access to High Radiation Areas
6. 10 CFR 20.1901 Caution Signs
7. 10 CFR 20.1902(a) Posting Requirements
8. 10 CFR 20.1906 Procedures for Receiving and Opening Packages
9. 10 CFR 20.2101 Records–General Provisions
10. 10 CFR 20.2103 Records of Surveys
11. 10 CFR 20.2106 Records of Individual Monitoring Results
12. 10 CFR 20.2110 Form of Records
13. 10 CFR 20.2202(a), Notification of Incidents
 (b), (c), and (d)
14. 10 CFR 20.2203(a)(2), Reports of Exposures, Radiation Levels, and
 (a)(3)(i) and (ii), (b), Concentrations of Radioactive Material Exceeding the
 and (d) Limits
15. 10 CFR 20.2206 Reports of Individual Monitoring
16. 10 CFR Part 76 Domestic Licensing of Special Nuclear Material
17. 10 CFR Part 20 Radiation Dose Limits for Individual Members of the Public

7.5.8.2 Regulatory Guidance

NRC RGs and ANSI standards applicable to measuring, documenting, and maintaining the external exposure of personnel below the applicable external exposure limits that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1201, 20.1501, 20.1502, 20.1901, 20.1906, 20.2103, 20.2106, 20.2110, and 20.2206 are:

1. RG 8.1 Radiation Symbol
2. RG 8.2 Guide for Administrative Practice in Radiation Monitoring
3. RG 8.3 Film Badge Performance Criteria
4. RG 8.4 Direct-Reading and Indirect-Reading Pocket Dosimeters
5. RG 8.7, Rev. 1 Instructions for Recording and Reporting Occupational Radiation Exposure Data
6. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
7. RG 8.34 Monitoring Criteria and Methods to Calculate Occupational Radiation Doses
8. ANSI N2.1–1989 Radiation Symbol
9. ANSI N13.2–1969 Guide for Administrative Practices in Radiation Monitoring
10. ANSI N13.5–1972 Performance Specification for Direct Reading and Indirect Reading Pocket Dosimeters for X- and Gamma-Radiation
11. ANSI N13.6–1966
 (R1972) Practice for Occupational Radiation Exposure Records Systems
12. ANSI N13.7–1983 Radiation Protection–Photographic Film Dosimeters–Criteria for Performance
13. ANSI N13.11–1983 Dosimetry–Personnel Dosimetry Performance–Criteria for Testing
14. ANSI N13.15–1985 Radiation Detectors–Personnel Thermoluminescence Dosimetry Systems–Performance
15. ANSI N13.27–1981 Performance Requirements for Pocket-Sized Alarm Dosimeters and Alarm Ratemeters
16. ANSI N322–1977 Inspection and Test Specifications for Direct and Indirect Reading Quartz Fiber Pocket Dosimeters

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7.5.8.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria, or information demonstrating acceptable alternatives, in its review of the application. Acceptability should be based on the following:

The reviewer determines that the applicant commits to a personnel monitoring program for external radiation that provides a means to measure, assess, and record personnel exposure to radiation and commits to an ALARA philosophy. The types of monitoring equipment that will be used and the types of radiation that will be measured are described. Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses," provides guidance for determining who is required to wear personnel monitoring dosimeters. The type, range, sensitivity, accuracy, and frequency for reading personnel dosimeters and recording the radiation dose of the dosimeter reading are stated. In addition, the use of dosimetry results as a guide to operational planning and the specific exposure levels below the regulatory requirements at which action will be taken to reduce exposures are specified. The applicant participates in the National Voluntary Laboratory Accreditation Program to test its dosimeters.

7.5.9 Internal Exposure

7.5.9.1 Regulatory Requirements

The following regulations are applicable to the measuring, documenting, and maintaining the internal exposure of personnel below the applicable internal exposure limits:

1. 10 CFR 20.1201(d) and (e) Occupational Dose Limits for Adults
2. 10 CFR 20.1204 Determination of Internal Exposure
3. 10 CFR 20.1502(b) Conditions Requiring Individual Monitoring of External and Internal Occupational Dose
4. 10 CFR 20.1703(a)(3)(ii) and (b) Use of Individual Respiratory Protection Equipment
5. 10 CFR 20.1901 Caution Signs
6. 10 CFR 20.1902(d) Posting Requirements
7. 10 CFR 20.2101 Records—General Provisions
8. 10 CFR 20.2103 Records of Surveys
9. 10 CFR 20.2106 Records of Individual Monitoring Results
10. 10 CFR 20.2110 Form of Records

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| 11. | 10 CFR 20.2202(a), (b), (c), and (d) | Notification of Incidents |
| 12. | 10 CFR 20.2203(a)(2), (b), and (d) | Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits |
| 13. | 10 CFR 20.2206 | Reports of Individual Monitoring |
| 14. | 10 CFR Part 76 | Certification of Gaseous Diffusion Plants |
| 15. | 10 CFR Part 20, Subpart D | Radiation Dose Limits for Individual Members of the Public |

7.5.9.2 Regulatory Guidance

NRC RGs, ANSI standards, and an NRC NUREG document applicable to measuring, documenting, and maintaining the external exposure of personnel below the applicable internal exposure limits that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1201, 20.1204, 20.1502, 20.1703, 20.1901, 20.1902, 20.2103, 20.2106, 20.2110, and 20.2206 are:

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| 1. | RG 8.1 | Radiation Symbol |
| 2. | RG 8.2 | Guide for Administrative Practices in Radiation Monitoring |
| 3. | RG 8.7, Rev. 1 | Instructions for Recording and Reporting Occupational Radiation Exposure Data |
| 4. | RG 8.9, Rev. 1 | Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program |
| 5. | RG 8.24, Rev. 1 | Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication |
| 6. | RG 8.25 | Air Sampling in the Workplace |
| 7. | RG 8.34 | Monitoring Criteria and Methods to Calculate Occupational Radiation Doses |
| 8. | ANSI N2.1–1989 | Radiation Symbol |
| 9. | ANSI N13.2–1969 | Guide for Administrative Practices in Radiation Monitoring” |
| 10. | ANSI N13.6–1966 (R1972) | Practice for Occupational Radiation Exposure Records Systems |
| 11. | NUREG/CR–4884 | Interpretation of Bioassay Measurements |

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7.5.9.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The applicant's program for internal exposure must meet the requirements of 10 CFR 20.1201, 20.1204, and 20.1502(b). RG 8.25, "Air Sampling in the Workplace"; RG 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses"; RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," Rev. 1; and NUREG/CR-4884, "Interpretation of Bioassay Measurement," provide information, recommendations, guidance, and a basis acceptable to the staff for implementing the internal exposure program.
2. The reviewer determines that the applicant has established a program for monitoring worker internal exposures. The program specifies the methods to be used, the frequency of analysis, the sensitivity and minimum detection levels, the frequency of measurements, the criteria for participation, and the action levels and actions to be taken on the results. In addition, the program specifies:
 - a. The methods for determining if monitoring of worker internal exposure is needed,
 - b. The criteria for determining when it is necessary to monitor an individual's internal exposure during work hours, and
 - c. The methods for determining the worker intake from (1) the concentrations of soluble uranium and other radioactive materials in the work area air, (2) the quantities of soluble uranium and other radionuclides in the body, (3) the quantities of radionuclides excreted from the body, or (4) any combination of the above methods as may be necessary for determining the intake. Action levels for internal exposure levels are established based on the clearance time of the radioactive material from the lung.
3. When air sampling measurement results are used for determining worker intake, the applicant specifies the frequency of sampling and data analysis, the minimum detection levels, and the action levels and actions to be taken on the results.
4. When bioassay results are used for determining worker intake, the applicant specifies the types of bioassay to be used, the frequency of data collection for each type of measurement, the minimum detection levels, and the action levels and actions to be taken on the results.

7.5.10 Summing Internal and External Radiological Exposure

7.5.10.1 Regulatory Requirements

The following regulations are applicable to summing internal and external exposures:

1. 10 CFR 20.1201(a)(1) and (f) Occupational Dose Limits for Adults
2. 10 CFR 20.1202 Compliance with Requirements for Summation of External and Internal Doses
3. 10 CFR 20.1207 Occupational Dose Limits for Minors
4. 10 CFR 20.1208 Dose to an Embryo/Fetus
5. 10 CFR 20.2101 Records–General Provisions
6. 10 CFR 20.2103 Records of Surveys
7. 10 CFR 20.2104 Determination of Prior Occupational Dose
8. 10 CFR 20.2106 Records of Individual Monitoring Results
9. 10 CFR 20.2110 Form of Records
10. 10 CFR 20.2202(a), (b), (c), and (d) Notification of Incidents
11. 10 CFR 20.2203(a)(2), (b), and (d) Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits
12. 10 CFR 20.2206 Reports of Individual Monitoring
13. 10 CFR Part 76 Certification of Gaseous Diffusion Plants
14. 10 CFR Part 20, Subpart D Radiation Dose Limits for Individual Members of the Public

7.5.10.2 Regulatory Guidance

NRC RGs and an ANSI standard applicable to the summing of internal and external exposures that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1201, 20.1202, 20.1207, 20.1208, 20.2101, 20.2106, 20.2110, 20.2203, and 20.2206 are:

1. RG 8.2 Guide for Administrative Practice in Radiation Monitoring
2. RG 8.7, Rev. 1 Instructions for Recording and Reporting Occupational Radiation Exposure Data
3. RG 8.34 Monitoring Criteria and Methods to Calculate Occupational Radiation Doses

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4. RG 8.36 Radiation Dose to the Embryo/Fetus
5. ANSI N13.6–1966 Practice for Occupational Radiation Exposure Records Systems (R1972)

7.5.10.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

The radiological reviewer determines that the applicant commits to a policy for combining internal and external radiological exposures in accordance with RG 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," Rev. 1; RG 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses"; and RG 8.36, "Radiation Dose to the Embryo/Fetus."

7.5.11 Respiratory Protection

7.5.11.1 Regulatory Requirements

The following regulations are applicable to respiratory protection:

1. 10 CFR 20.1701 Use of Process or Other Engineering Controls
2. 10 CFR 20.1702 Use of Other Controls
3. 10 CFR 20.1703(a), (c), and (d) Use of Individual Respiratory Protection Equipment
4. 10 CFR 20.2110 Form of Records
5. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.11.2 Regulatory Guidance

The NRC RG and ANSI standard applicable to the respiratory protection program that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1702 and 20.1703 are:

1. RG 8.15 Acceptable Programs for Respiratory Protection
2. ANSI Z88.2–1992 Practices for Respiratory Protection

7.5.11.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to establishing a respiratory protection program that meets the requirements of 10 CFR Part 20. The program identifies the equipment to be used, the conditions under which respiratory protection will be required for routine and nonroutine operations, the protection factors that will be applied when respirators are being used, and the locations of respiratory equipment within the plant. ANSI Z88.2–1992, which defines responsibilities and requirements in the areas of (a) training, (b) control and use of respiratory equipment, (c) mask-fit testing, and (d) breathing-air purity, is used as appropriate.
2. The applicant describes: (a) the types of engineering and administrative controls that have been implemented to reduce the risk of internal exposure without the need for respiratory protection, and (b) the methods for determining exposure while an individual is using respiratory protection to ensure that a proper estimate of exposure and internal dose is made. Factors that are critical in this calculation include the time of exposure to airborne soluble uranium and other radioactive materials, the protection factor for the respirator, the proper fitting of the equipment before use, and the measurement of the concentrations of soluble uranium and other radioactive material during the exposure.

7.5.12 Instrumentation

7.5.12.1 Regulatory Requirements

The following regulations are applicable to the instrumentation program:

1. 10 CFR 20.1501(b) Surveys and Monitoring–General
2. 10 CFR 20.2103 Records of Survey
3. 10 CFR Part 76 Certification of Gaseous Diffusion Plants

7.5.12.2 Regulatory Guidance

The NRC RG and ANSI standards applicable to the instrumentation program that generally describe a basis acceptable to the staff for implementing the requirements of 10 CFR 20.1501 and 20.2103 are:

1. RG 8.24, Rev. 1 Health Physics Surveys during Enriched Uranium-235 Processing and Fuel Fabrication
2. ANSI N13.4–1971 Specification of Portable X- or Gamma-Radiation Survey Instruments

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3. ANSI N42.12–1980 Calibration and Usage of Sodium Iodide Detector Systems
4. ANSI N42.15–1980 Performance Verification of Liquid-Scintillation Counting Systems
5. ANSI N42.17A–1989 Performance Specifications for Health Physics Instrumentation–Portable Instrumentation for Use in Normal Environmental Conditions
6. ANSI N42.17B–1989 Performance Specifications for Health Physics Instrumentation–Occupational Airborne Radioactivity Monitoring Instrumentation
7. ANSI N323–1978 Radiation Protection Instrumentation Test and Calibration
8. ANSI N542–1977 Sealed Radioactive Sources, Classification

7.5.12.3 Regulatory Review Criteria

The staff should use the following regulatory review criteria or information demonstrating acceptable alternatives in its review of the application. Acceptability should be based on the following:

1. The reviewer determines that the applicant commits to a policy for the maintenance and use of operating instruments in sufficient number and types to meet the requirements specified in 10 CFR Part 20. The applicant provides a listing of the types of instruments that are available, including ranges, counting mode, sensitivity, alarm setpoints, planned use, and frequency of calibration. The applicant commits to calibrate instruments at least annually, preferably semiannually, and recalibrate instruments if the equipment is adjusted or repaired.
2. The applicant justifies the criteria for selecting radiation measurement instruments for:
 - (a) performing direct radiation and surface and volumetric contamination surveys,
 - (b) sampling airborne soluble uranium and other radioactivity, (c) monitoring area radiation,
 - (d) monitoring personnel, and (e) performing radioactive analyses.
4. The applicant describes the instruments and related equipment and the quantities of such equipment provided for plant operations. The applicant also describes the following:
 - (a) instrument storage, calibration, and maintenance facilities; (b) the health physics (radiation safety) facilities; and (c) the laboratory facilities for radiological analyses. Instrumentation and instrumentation calibration is consistent with ANSI N42.17A–1989 and ANSI N323–1978, as appropriate. Instrument calibrations are traceable to a recognized standard such as that issued by the National Institute of Standards and Technology.

7.6 Evaluation Findings

The staff's review should verify that sufficient information has been provided in the application to satisfy the intent of requirements in 10 CFR 76.35, "Contents of Application," and 10 CFR 76.36, "Renewals," with respect to radiation safety and that the information provided is consistent with the guidance in this SRP. On the basis of this information, the staff should be able to conclude that this evaluation is complete.

The staff could document the evaluation of the application as follows:

The staff has reviewed the technical safety requirements for [name of facility] according to SRP Sections 7.3, 7.4, and 7.5. In addition, the applicant has [The reviewer will describe the bases for this conclusion, addressing the regulations, the areas that were reviewed, and discussing how the acceptance criteria have been met.]

The applicant has committed to a radiation safety program that includes: (1) an ALARA program to ensure that occupational radiological exposures are ALARA, (2) an organization with qualification requirements for the radiation safety personnel, (3) approved written radiation safety procedures or RWPs for soluble uranium and radiation safety activities, (4) soluble uranium and radiation safety training for all personnel who have access to restricted areas, (5) requirements for the ventilation systems, (6) requirements for soluble uranium and other radiological air sampling, (7) requirements for control of soluble uranium and other radiological contamination within the facility, (8) programs for monitoring personnel external and internal exposure, (9) a respiratory protection program, and (10) requirements for soluble uranium and other radiological measurement instrumentation.

On the basis of its review, the NRC staff has concluded that the radiation safety program is acceptable and that the applicant has the necessary technical staff to administer an effective radiation safety program to support recertification.

7.7 References

Code of Federal Regulations, *Title 10, Energy*, Part 76, "Certification of Gaseous Diffusion Plants."

Nuclear Regulatory Commission (U.S.) (NRC). 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." NRC: Washington, D.C. April 1993.

_____. Branch Technical Position, "License Condition for Leak Testing Sealed Plutonium Sources." NRC: Washington, D.C. April 1993.

_____. Branch Technical Position, "License Condition for Leak Testing Sealed Source Which Contains Alpha and/or Beta-Gamma Emitters." NRC: Washington, D.C. April 1993.

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_____. Branch Technical Position, "License Condition for Leak Testing Sealed Uranium Sources." NRC: Washington, D.C. April 1993.

_____. Branch Technical Position, "License Condition for Plutonium Alpha Sources." NRC: Washington, D.C. April 1993.

_____. Information Notice No. 93-03, "Recent Revisions to 10 CFR Part 20 and Change of Implementation Date to January 1, 1994." NRC: Washington, D.C. January 1993

_____. Information Notice No. 92-34, "New Exposure Limits for Airborne Uranium and Thorium." NRC: Washington, D.C. May 1992

_____. Regulatory Guide 8.1, "Radiation Symbol." NRC: Washington, D.C. May 1983

_____. Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus." NRC: Washington, D.C. July 1992

_____. Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities." NRC: Washington, D.C. July 1993