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5.	Training Requirements: As with any procedure revision, those employees affected by the procedure need to familiarize themselves with the changes. No additional training is required.

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Part 1 External Dosimetry

511 General Provisions

1. Personnel dosimetry shall be provided to and used by individuals as follows:
 - a. Radiological workers who are likely to receive from external sources an effective dose of 100 millirem or more in a year or a equivalent dose to the extremities, lens of the eye, or skin of 10 percent or more of the corresponding limits specified in Table 2-1 [835.402(a)(1)]
 - b. Declared pregnant workers who are likely to receive from external sources a equivalent dose of 50 millirem or more to the embryo/fetus during the gestation period [835.402(a)(2)]
 - c. Occupationally exposed minors likely to receive from external sources an effective dose in excess of 50 millirem in a year [835.402(a)(3)]
 - d. Members of the public who enter a controlled area and are likely to receive an effective dose in excess of 50 millirem in a year [835.402(a)(4)]
 - e. Individuals entering a high or very high radiation area [835.402(a)(5)].
2. Neutron dosimetry shall be provided when an individual is likely to exceed any of the criteria provided in Article 511.1 from neutrons [835.401(b)(2) and 835.402(a)].
3. To minimize the number of individuals in the dosimetry program, the SRS external dosimetry program discourages the issuance of dosimeters to individuals other than those entering areas where there is a likelihood of external exposure in excess of the monitoring thresholds established in Article 511.1.
4. Individuals should return dosimeters for processing as scheduled or upon request, and should be restricted by line management from continued radiological work until dosimeters are returned.
5. Individuals should wear their primary dosimeters on the chest area, on or between the waist and the neck.
6. Individuals should not wear dosimeters issued by SRS while being monitored by a dosimeter at another DOE or nuclear facility unless authorized by the Contractor radiological control manager or designee. Individuals should not expose their dosimeters to security X-ray devices, excessive heat, or medical sources of radiation.
7. Dosimeters should be issued only to individuals knowledgeable of their proper use and worn only by those to whom the dosimeters were issued.

8. An individual whose dosimeter is lost, damaged, or contaminated should place work in a safe condition, immediately exit the area, and report the occurrence to the radiological control organization. The individual should be restricted from entry into radiological areas until a review has been conducted to verify that dose limits have not been exceeded, and management has approved reentry.

512 Technical Provisions for External Dosimetry

1. External dosimetry programs shall be adequate to demonstrate compliance with the Table 2-1 limits [835.402(b)]. External dosimetry programs implemented to meet the requirements of Article 511.1 shall be accredited by the DOE Laboratory Accreditation Program for Personnel Dosimetry (DOELAP) [835.402(b)(1)].
2. A technical basis document (see WSRC-IM-92-101) should be developed and maintained for the external dosimetry program.
3. Multiple dosimeters should be issued to individuals to assess effective dose in non-uniform radiation fields. Non-uniform radiation fields exist when the dose to a portion of the whole body will exceed the dose to the primary dosimeter by more than 50 percent and the anticipated whole body dose is greater than 100 millirem.
4. A dose assessment should be performed for each instance of a lost, damaged, or contaminated personnel dosimeter.

513 Pocket and Electronic Dosimeters

Pocket and electronic dosimeters are supplemental dosimeters that provide real-time indication of exposure to radiation and assist in maintaining personnel doses less than administrative control levels.

1. Individuals entering a high radiation or very high radiation area shall be monitored by a supplemental dosimeter or other means (e.g., stay-time tracking) capable of providing an estimate of the individual's effective dose during the entry [835.502(a)(2) and (c)]. Supplemental dosimeters should also be issued when planned activities could cause an individual to exceed 50 millirem from external gamma radiation in 1 workday or when required by a radiological work permit.
2. Supplemental dosimeters should be worn simultaneously with the primary dosimeter and located in accordance with Article 511.5.

3. Supplemental dosimeters should be read periodically while in use and should not be allowed to exceed 75 percent of full scale.
4. Work permitted by written authorization should be stopped when supplemental dosimeter readings indicate total dose or rate of exposure substantially greater than planned.
5. The energy dependence and radiation sensitivity of supplemental dosimeters, particularly to low-energy beta and neutron radiation, should be considered in determining their applicability.

514 Area Monitoring Dosimeters

Establishment and maintenance of a comprehensive area monitoring program can minimize the number of areas requiring the issuance of personnel dosimeters and demonstrate that doses outside radiological areas are negligible.

1. Area monitoring dosimeters should be used to record and document radiation levels in routinely occupied areas adjacent to areas where radiation or operations with radiation exist (see Procedure Manual 5Q1.2, Procedure 217). This monitoring provision does not apply when the radiation arises solely from low-energy beta sources (e.g., carbon-14 or tritium).
2. Area monitoring dosimeter results should be used to support dosimetry investigations where individuals express concerns about their work environments and exposure to ionizing radiation.
3. Area monitoring dosimeters should be used in controlled areas to supplement existing monitoring programs and to provide data in the event of an emergency.
4. Area monitoring dosimeter results should be reviewed at least annually (see Procedure Manual 5Q1.2, Procedure 458).

515 Nuclear Accident Dosimeters

1. Facilities that possess fissile materials in sufficient quantities to create a critical mass such that the potential exists for excessive exposure of individuals in an accident shall provide nuclear accident dosimetry to affected individuals ^[835.1304(a)].

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2. The nuclear accident dosimetry system shall include the following:
 - a. A method to conduct initial screening of potentially exposed individuals to identify those who have received significant doses [835.1304(b)(1)]
 - b. Equipment and methods sufficient to analyze appropriate biological samples [835.1304(b)(2)] and dosimeters
 - c. A system of fixed nuclear accident dosimeter units [835.1304(b)(3)] capable of measuring the estimated neutron dose and approximate neutron spectrum
 - d. Personnel nuclear accident dosimeters [835.1304(b)(4)].
3. The fixed dosimeters discussed above should:
 - a. Be capable of determining the neutron dose from 10 rads to approximately 10,000 rads with an accuracy of $\pm 25\%$
 - b. Be capable of measuring fission gamma radiation from 10 rads to approximately 10,000 rads in the presence of neutron radiation with an accuracy of approximately $\pm 25\%$.
4. Personnel nuclear accident dosimeters should be capable of measuring an absorbed dose in or on a phantom from 10 rads to approximately 1,000 rads with an accuracy of $\pm 25\%$ (see WSRC-IM-96-145).
5. An analysis of the fixed dosimetry system needs should be documented and should consider such factors as the nature of operations, structural design of the facility, area accessibility, number of dosimeters and their location, and the effect of intervening shielding. The analysis should be reevaluated as necessary to ensure facility modifications do not impair the capabilities of the fixed dosimetry system.

Part 2 Internal Dosimetry

521 General Provisions

1. The following individuals shall participate in an internal dosimetry program:
 - a. Radiological workers who are likely to receive a committed effective dose of 100 millirem or more from all occupational radionuclide intakes in a year [835.402(c)(1)]
 - b. Declared pregnant workers likely to receive intakes resulting in an equivalent dose to the embryo/fetus in excess of 50 millirem during the gestation period [835.402(c)(2)]
 - c. Occupationally exposed minors likely to receive a committed effective dose in excess of 50 millirem from all radionuclide intakes in a year [835.402(c)(3)].

- d. Members of the public who enter a controlled area and are likely to receive an intake resulting in a committed effective dose exceeding 50 millirem in a year [835.402(c)(4)].
2. The estimation of internal dose shall be based on bioassay data rather than air concentration values unless one of the following conditions exists [835.209(b)]:
 - a. bioassay data are unavailable
 - b. bioassay data are inadequate
 - c. internal dose estimates based on representative air concentration values are demonstrated to be as or more accurate.
3. Individuals should participate in follow-up bioassay monitoring when their routine bioassay results indicate an intake in the current year with a committed effective dose of 100 millirem or more.
4. The bioassay program should establish appropriate participation and frequencies for the collection of bioassay samples, such as urine or fecal samples, and bioassay monitoring, such as whole body or chest counting. Individuals should participate at the frequency required by the bioassay program.
5. Individuals should be notified promptly of positive bioassay results and the results of dose assessments and subsequent refinements. Dose assessment results shall be provided in terms of rem or millirem.

522 Technical Provisions for Internal Dosimetry

1. All bioassay programs implemented to demonstrate compliance with Article 521.1 shall be:
 - a. Accredited by the DOE Laboratory Accreditation Program for Bioassay Programs (DOE-STD-1112-98) [835.402(d)(1)]; or
 - b. Excepted from accreditation by the DOELAP Program [835.402(d)(1)]; or
 - c. Otherwise approved by the Assistant Secretary for Environment, Safety and Health [835.402(d)(2)].
2. A technical basis document should be developed for the internal dosimetry program (see WSRC-IM-90139).

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3. Baseline bioassay monitoring of individuals who are likely to receive intakes resulting in a committed effective dose greater than 100 millirem in a year should be considered for personnel who are likely to have had prior internal exposure before they begin work that may expose them to internal radiation exposure.
4. Management should require termination bioassay monitoring when an individual who participated in the bioassay program terminates employment or concludes work involving the potential for internal exposure.
5. Bioassay analyses should also be performed when any of the following occurs:
 - a. Facial or nasal contamination is detected that indicates a potential for internal contamination exceeding any monitoring threshold established in Article 521
 - b. Airborne monitoring indicates the potential for intakes exceeding 100 millirem committed effective dose.
 - c. Upon direction of the Contractor area radiological control manager or the SRNS Radiological Protection Services Manager.
6. A preliminary assessment of any intakes detected should be conducted prior to permitting an employee to return to radiological work where it is likely that an additional intake could occur.
7. Bioassay programs implemented at the discretion of the contractor (i.e., for personnel monitoring that is not required by Article 521.1) must periodically reassess monitored individuals to determine that they do not fall under the monitoring requirements of 10 CFR 835.402 (that is, these individuals are not “likely” to receive 100 mrem in one year). Dose results for individuals monitored under the discretionary program must be recorded in accordance with 10 CFR 835.702.
8. When using personal air samplers (PAS), sometimes referred to as lapel air samplers, the associated DAC-hr exposures are tracked for the assigned workers. Exposures of greater than or equal to 8 DAC-hr in a day are assessed for the need of a special bioassay program. A cumulative annual exposure to a worker of greater than or equal to 40 DAC-hr at any time during the calendar year is assessed to determine the need for changes in that worker's routine bioassay program and for the need of a special bioassay program. All exposures that are consistent with available bioassay data are converted to dose and assigned to the individual.

Cumulative annual exposure for an individual of greater than or equal to 40 DAC-hr at any time during the calendar year is assessed by Internal Dosimetry to determine the need for changes in that worker's routine bioassay program. Any cumulative annual exposure in excess of 4 DAC-hr is assessed by Internal Dosimetry and assigned to the individual.

523 Technical Provisions for Dose Assessment

Interpretations of bioassay results and subsequent dose assessments should include the following:

1. Characteristics of the radionuclide, such as chemical and physical form
2. Bioassay results and the individual's previous exposure history
3. Exposure information, such as route of intake and time and duration of exposure
4. Biological models used for dosimetry of radionuclides
5. Models to estimate intake or deposition and to assess dose
6. Intra-departmental coordination between the Contractor radiological control organization, SRNS Radiological Protection Services and the medical organization for doses that may require medical intervention.

Part 3 Respiratory Protection Program

Respiratory protection equipment includes respirators with particulate or gas-filtering cartridges, supplied air respirators, self-contained breathing apparatus, and airline supplied-air suits and hoods.

531 General Provisions

1. Use of respiratory protection shall be reduced to the minimum practicable by implementing engineering controls and work practices to contain radioactivity at the source (see 29 CFR 1910.134).
2. Respirators shall be issued only to individuals who are trained, fitted, and medically qualified to wear the specific type of respirator. Training and qualification testing shall be performed annually (see 29 CFR 1910.134 and ANSI Z88.2).
3. Positive controls should be maintained for the issue, use, and return of respiratory protection equipment to ensure that only qualified individuals wear respiratory protective devices.
4. 29 CFR 1910.134 mandates that breathing air meet the specifications of ANSI/CGA G-7.1 Grade D breathing air. Compressed air supplied to respirators shall be tested quarterly. Compressors shall be of the breathing air type and shall not allow oil or other chemicals and fumes to enter the breathing air supply. Special attention shall be focused on the location of compressor air supply intakes and on cross-connections to other compressed gas systems to prevent contamination (see 29 CFR 1910.134).

532 Medical Assessment

Each prospective respirator wearer shall have a medical assessment prior to being fit-tested. The medical assessment shall determine if an employee's medical condition precludes the use of respirators and should follow the guidance in ANSI Z88.6 on frequency and content of the examination (see 29 CFR 1910.134 and ANSI Z88.2).

533 Use of Respiratory Protection

The use of respiratory protection devices can impair worker mobility and vision and cause worker discomfort and stress. For these reasons, the issue and use of respiratory protective devices must be controlled.

1. Individuals using respiratory protection shall:
 - a. Perform fit checks of close-fitting respirators to ensure a proper seal before entering areas requiring respirator use
 - b. Be clean shaven in the area of fit, if applicable
 - c. Use corrective lenses, if needed, that are approved for respirators
 - d. Be trained to leave the work area when experiencing respirator failure
 - e. Be trained to remove their respirators to avoid life-threatening situations when exiting an area after respirator failure (see 29 CFR 1910.134 and ANSI Z88.2).

534 Heat Stress

Heat stress may result from working in areas of high heat, humidity, and radiant heat; working in protective clothing; and using respirators, particularly where other protective equipment is required. Heat stress has occurred at ambient temperatures less than 70°F when multiple sets of anti-contamination clothing or plastic suits were in use or strenuous work was required.

1. The planning stages for work in hot environments should address heat stress controls.
2. Job managers should inform their personnel of heat stress precautions prior to work on job assignments in hot environments. Precautions that should be considered during work that includes a high probability of heat stress include:
 - a. Engineering controls to moderate the work area environment;
 - b. Appropriate work time limits;
 - c. Use of protective clothing made of materials that wick perspiration away from the body;
 - d. Use of body cooling devices;
 - e. Provision of beverages at or near the work site, using appropriate contamination controls;
 - f. Relaxation of protective clothing requirements.

Part 4 Handling Radiologically Contaminated Personnel

541 Skin Contamination

1. Skin decontamination and surveillance methods should be established for site-specific radionuclides (see Procedure Manual 5Q1.2, Procedure 203). Skin abrasion should be avoided during the decontamination process. Intrusive decontamination methods, such as tissue removal, require medical assistance.
2. Levels of skin contamination that trigger the need for dose assessments should be established for site-specific radionuclides. These trigger levels should not exceed 100 millirem (see Procedure Manual 5Q1.2, Procedure 203 and Procedure Manual 5Q2.1, Procedure 108).
3. Requirements for skin exposure assessments are provided in Appendix 2C and implemented by Procedure Manual 5Q2.1, Procedure 108. Promptly after completion, the results should be explained to the persons affected.

542 Contaminated Wounds

1. Emergency medical care should be administered immediately for injuries involving radioactive materials in accordance with National Council on Radiation Protection and Measurements Report Number 65. Medical treatment of injuries takes precedence over radiological control considerations.
2. The treatment of contaminated injuries should include the following:
 - a. Treatment of contaminated wounds by medically qualified personnel
 - b. Monitoring of wounds and associated bandages for contamination, including alpha emitters if applicable
 - c. Identification of the radionuclides involved
 - d. Medical determination of the need for therapeutic intervention such as blocking or chelating agents
 - e. Initiation of appropriate bioassay monitoring
 - f. Determination of need for work restrictions.
3. An injured individual should be counseled promptly on the medical and radiological implications resulting from contaminated wounds.

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543 Handling Individuals Exposed to Airborne Radioactivity

Potential intakes of radioactive material are indicated when individuals without respiratory protection are exposed to airborne radioactivity or when respiratory protection has been compromised. If inhalation of radioactive material is indicated which could result in an individual receiving a committed effective dose greater than 100 millirem (40 DAC hrs.), the following actions should be taken:

1. Identify individuals potentially exposed to airborne radioactivity
2. Obtain nasal and saliva smears for qualitative indication of intakes when appropriate
3. Analyze air samples to determine airborne concentrations where appropriate
4. Determine duration of potential exposure to airborne radioactivity
5. Perform special bioassay appropriate for the type and quantity of radionuclides involved
6. Evaluate dose prior to permitting the worker to return to radiological work.

Part 5 Radiological Monitoring

551 General Provisions

Workplace monitoring provides a basis for posting and labeling, development of RWPs and other work authorizations, implementation of ALARA measures, issuance of individual monitoring devices, and verification of the efficacy of design measures and engineering controls.

1. Radiological monitoring of radiation exposure levels, contamination, and airborne radioactivity shall be conducted to:
 - a. Characterize workplace conditions and detect changes in those conditions [835.401(a)(2) & (3)]
 - b. Verify the effectiveness of engineering and administrative controls [835.401(a)(5)]
 - c. Demonstrate regulatory compliance [835.401(a)(1)]
 - d. Detect the gradual buildup of radioactive material in the workplace [835.401(a)(4)]
 - e. Identify and control potential sources of personnel exposure [835.401(a)(6)]
 - f. Determine exposure rates during each entry to a high or very high radiation area [835.502(a)(1)].

2. Monitoring shall be performed only by individuals who have the appropriate education, training, and skills [835.103]. The instruments used shall be [835.401(b)]:
 - a. Periodically maintained and calibrated on an established frequency
 - b. Appropriate for the types, levels, and energies of radiation to be detected [ASME NQA-1(1.R12.200)]
 - c. Appropriate for existing environmental conditions
 - d. Routinely tested for operability.
3. Monitoring for radiation, contamination, and airborne radioactive materials should be performed as specified in technical work documents and radiological work permits. Individually owned radiation monitoring equipment is not authorized for use at SRS. Subcontractors providing radiation monitoring services at SRS are required to meet the provisions of this Manual pertaining to instrument selection, calibration and use.
4. The radiological control organization should perform and document a review of the adequacy of sampling and monitoring programs as part of any facility or operational changes affecting radiological control. In the absence of such changes, a review should be conducted annually (see Procedure Manual 5Q1.2, Procedure 458).
5. Instruments used to perform radiation monitoring (see Article 553 for area radiation monitor criteria) should be performance-checked daily or, if not checked within the past 24 hours, prior to operation. When performance checks are not within ± 20 percent of the expected value, the instrument should be taken out of service. When performance checks are not feasible, such as with instruments used to measure neutrons or tritium, compensatory actions should be established to ensure proper instrument performance (see Procedure Manual 5Q1.3, Procedure 144 and SRS-RPS-2004-01).
6. Monitoring of radiological conditions should include a sufficient number of survey points to characterize the radiation present and to verify boundaries.
7. Monitoring should be performed before, during, and at the completion of work that has the potential for causing changes in levels of radiation and radioactivity.
8. Monitoring frequencies should be established based on potential radiological conditions, probability of change in conditions, and area occupancy factors.
9. Monitoring results should be reviewed by the cognizant radiological control manager to ensure that all required surveys have been performed and that the documentation is accurate and complete.
10. Monitoring data in each building or area should be compiled and reviewed at least quarterly. Changes or trends should be noted and corrective actions assigned.

552 Radiation Exposure Monitoring

1. In addition to the requirements of Article 551, routine radiation monitoring programs should be established to ensure that surveys are performed at a frequency that is consistent with the existing and potential hazards and activities planned in the area. The following survey frequencies are suggested and should be modified as necessary to ensure area hazards are adequately characterized, based upon facility-specific experience:
 - a. Monthly, in routinely occupied radiological buffer areas, radiation areas and other areas surrounding radiological areas where the potential exists for external radiation exposure
 - b. Monthly, for operating HEPA-filtered ventilation units (SRS-RPD-2002-01)
 - c. Quarterly, or upon entry, if entries are less frequent than quarterly, for radioactive material areas.
2. Radiation monitoring should include dose rate measurements of the general area, dose rates at a distance of 30 centimeters from a source or surface of interest to evaluate potential whole body exposures, and dose rates on contact with potential sources of radiation where there is a potential for hands-on work or other direct contact.
3. Monitoring should be conducted whenever operations are being performed that might result in individuals being exposed to small intense beams of radiation, such as those generated by shielded X-ray devices or due to removal or alteration of shielding, modification of shielding penetrations, or relocation of significant radiation sources within shielded enclosures.
4. When radioactive material exceeding a Type A quantity (as defined in 10 CFR 71) [835.405(c)(2)] is received, radiation monitoring of the received packages shall be performed if:
 - a. The package is labeled in accordance with the applicable transportation requirements (e.g., Radioactive White I or Yellow II or III label) [835.405(b)(1)]; or
 - b. The package has been transported as low specific activity material on an exclusive use vehicle [835.405(b)(2)].

The external surfaces of all packages received from transportation should be monitored to determine the external radiation level, unless the packaged materials are not capable of creating an external radiation hazard (i.e., the packages contains only materials that emit radiation of low penetrating ability). These surveys are used to ensure compliance with Department of Transportation regulations and applicable DOE Orders and to identify appropriate postings and access control measures.

5. Monitoring shall also be performed when a received package containing greater than a Type A quantity of radioactive material shows evidence of degradation, such as packages that are crushed, wet, or damaged [835.405(b)(3)].
6. Monitoring of received packages of radioactive material shall be performed as soon as practicable following receipt, but not later than eight hours following the beginning of the working day following the receipt of the package [835.405(d)].
7. See Article 554 for additional provisions for radioactive material receipt.

553 Area Radiation Monitors

1. In addition to the workplace monitoring conducted by the radiological control organization described in Article 551, area radiation monitors (not to include area monitoring dosimeters discussed in Article 514) should be installed in frequently occupied locations with the potential for unexpected increases in dose rates and in remote locations where there is a need for local indication of dose rates prior to personnel entry. (SRS-RPS-2004-01)
2. Area radiation monitors should not be substituted for radiation exposure surveys in characterizing a workplace.
3. The need for and placement of area radiation monitors should be documented and assessed when changes to facilities, systems, or equipment occur (see Procedure Manual 5Q1.2, Procedure 458).
4. In addition to the requirements of Article 562, area radiation monitors should be operability tested at least quarterly or on a frequency determined by Procedure Manual 1Y, Procedure 5.04 methodology to source check, verify audible alarm system operability/ audibility under ambient working conditions, and operability of visual alarms when so equipped. (SRS-CBU-2003-01) and (SRS-RPS-2004-01)
5. If installed instrumentation is removed from service for maintenance or calibration, a radiation monitoring program providing similar detection capability should be maintained, consistent with the potential for unexpected increases in radiation dose rates. An operability test will be performed after any maintenance or repair that could affect the functionality of the monitor.
6. Where an area radiation monitor is incorporated into a safety interlock system, the circuitry should be such that a failure of the monitor either prevents entry into the area or prevents operation of the radiation producing device. If the circuitry is required to ensure compliance with the high radiation area access control requirements of 10 CFR 835.502, then the circuitry shall be fail-safe.

554 Contamination Monitoring

1. In addition to the requirements of Article 551, contamination monitoring programs should be established to ensure that surveys are performed at a frequency that is consistent with the existing and potential hazards and activities planned in the area. The following survey frequencies are suggested and should be modified as necessary to ensure area hazards are adequately characterized, based upon facility-specific experience:
 - a. Prior to transfer of equipment and material from contamination areas to radiological buffer areas
 - b. Daily, at contamination area step-off pads when in use, or per shift in high use situations
 - c. Weekly, in lunch rooms or eating areas near radiological buffer areas
 - d. Weekly, in accessible areas where operations are under way that is likely to produce hot particles (see Article 338)
 - e. Monthly, in routinely occupied radiological buffer areas (Quarterly 105-K) (SRS-NMM-2004-01)
 - f. Monthly; or upon entry if entries are less frequent, in contamination areas or where contamination area boundaries or postings are located (Quarterly 105-K) (SRS-NMM-2004-01)
 - g. Monthly, in radioactive material areas (frequency may be extended to quarterly for radioactive material areas exclusively used to store sealed sources) (Quarterly 105-K) (SRS-NMM-2004-01) (SRS-RPD-2002-01)
 - h. Annually, in and around areas of fixed contamination.
 - i. During initial entry into a known or suspected contamination area, periodically during work, at completion of job, or as specified in a radiological work permit
 - j. After a leak or spill of radioactive materials.
2. Articles 421 and 422 provide requirements and guidance for material release surveys.
3. When radioactive material is received (other than gaseous or special form materials), contamination monitoring of the received packages shall performed if: [835.405(c)(1)]
 - a. The package is labeled in accordance with the applicable transportation requirements (e.g., Radioactive White I or Yellow II or III label) [835.405(b)(1)]; or
 - b. The package has been transported as low specific activity material on an exclusive use vehicle [835.405(b)(2)].

The external surfaces of all packages received from transportation should be monitored to determine the external contamination level, unless the packaged materials are not capable of creating a contamination hazard (i.e., the packages contain only gaseous or special form materials). These surveys are used to ensure compliance with Department of Transportation regulations and applicable DOE Orders and to identify appropriate postings and access control measures.

4. Monitoring shall also be performed when a received package of radioactive material shows evidence of degradation [835.405(b)(3)], unless the packages contain only special form or gaseous radioactive material.
5. Monitoring of received packages of radioactive material shall be performed as soon as practicable following receipt, but not later than eight hours following the beginning of the working day following the receipt of the package [835.405(d)].
6. Contamination surveys should incorporate techniques to detect both removable and fixed contamination, as applicable (see Table 2-2, Note 4). For routine radiological habitability surveys, removable surveys are generally sufficient to provide effective contamination control. (SRS-ESH&QA-1997-03)
7. Swipe surveys for removable contamination should be recorded in units of disintegrations per minute per 100 cm² (dpm/100 cm²). For swipe surveys of small items covering less than 100 cm², the results should be recorded in units of dpm per area swiped. If contamination levels exceed the range of the available contamination survey meters, the swipes should be analyzed by holding an appropriate exposure rate meter within one half inch and the results should be recorded in units of millirad or rad per hour.
9. Large area wipes should be used to supplement standard swipe techniques in areas generally assumed not to be contaminated, such as entrances to radiological areas. If an evaluation indicates that an area wiped is contaminated, a thorough contamination swipe survey should be performed.
10. Areas identified as either contaminated with, or having the potential for being contaminated with, highly radioactive particles ("hot particles") should be surveyed using special swipe techniques to collect hot particles, such as tape and large area wipes (see Article 348).

555 Airborne Radioactivity Monitoring

1. In addition to the requirements of Article 551, air monitoring programs should be established to ensure that airborne radioactivity monitoring is performed at a frequency that is consistent with the existing and potential hazards and activities planned in the area. Air monitoring equipment includes portable and fixed air sampling equipment and continuous air monitors.
2. Air sampling equipment shall be used where an individual is likely to receive an exposure of 40 or more Derived Air Concentration (DAC) hours in a year [835.403(a)(1)]. This intake generally represents a committed effective dose to an individual of approximately 100 millirem. Samples shall also be taken as necessary to characterize the hazard in areas where respiratory protection devices or engineered controls have been prescribed for protection against airborne radionuclides [835.403(a)(2)]. Air samples should be adequate to evaluate the concentrations of airborne radioactive materials at the individual's work locations.

3. Real-time (or continuous) air monitors are used to provide early warning to individuals of events that could lead to substantial unplanned exposures to airborne radioactivity. Real-time air monitoring, with alarm capability, shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate exposure to airborne radioactive material [835.403(b)].
4. Air sampling equipment should be positioned to measure air concentrations to which individuals are exposed.
5. Air monitoring equipment shall be routinely calibrated and maintained on an established frequency [835.401(b)]. Continuous air monitors should be capable of measuring 1 DAC when averaged over 8 hours (8 DAC-hours) under laboratory conditions. [ASME NQA-1 (P1.R12.200)]
6. A technical basis document should be developed for the airborne radioactivity monitoring program. The technical basis document should provide the basis for air monitor selection, placement, and operation.
7. The proper operation of continuous air monitoring equipment should be verified daily, during occupied periods, by performing an operational check. (SRS-NMMD-2002-01) Operational checks should include positive airflow indication, non-zero response to background activity, and internal check sources or 60 Hz electronic checks when available. Real-time air monitoring equipment operation should be verified periodically by checking for instrument response with a check source or with ambient levels of radon and thoron daughters. (SRS-RPS-2002-01)
8. Preliminary assessments of air samples utilizing field survey techniques should be performed promptly upon removal. In situations where background levels of radon (Rn-222) and thoron (Rn-220) daughters interfere with evaluation of alpha air samples, prompt field assessments may not be possible.

Part 6 Instrumentation and Calibration

561 Standardization

SRNS Health Physics Services will approve all radiation monitoring equipment prior to its implementation at SRS.

562 Inspection, Calibration, and Performance Tests

1. Radiological instruments shall be used only to measure the radiation for which their calibrations are valid [835.401(b)(2)]. ANSI N323A and N323D provide appropriate comprehensive guidance for establishing and operating a radiological instrumentation calibration program. Calibrations should use National Institute of Standards and Technology (NIST) traceable sources. [ASME NQA-1 (P1.R12.300.301.b)] and (SRS-RPS-2004-01)
2. Procedures should be developed for each radiological instrument type and should include frequency of calibration, pre-calibration requirements, primary calibration requirements, periodic performance test requirements, [835.401(b)(4)] calibration record requirements, and maintenance requirements.
3. All radiological monitoring instruments, including pocket and electronic dosimeters and area radiation monitors, shall be maintained and calibrated on an established frequency [835.401(b)(1)]. Calibration frequencies should be determined in accordance with National Conference of Standards Laboratories Recommended Practices RP-1, Establishment and Adjustment of Calibration Intervals.
4. The effects of environmental conditions, including interfering radiation, on an instrument shall be known prior to use [835.401(b)(3)].
5. In unusual and limited situations it may be necessary to use an instrument in an application other than that envisioned by the manufacturer. Special calibrations should be performed for use of instrumentation outside manufacturer's specifications. The instrument should be adjusted, calibrated, and labeled to identify the special conditions and used only under the special conditions for which it was calibrated.
6. Measures should be implemented to ensure that individuals using an instrument can verify its calibration status.
7. Instruments whose "as found" readings indicate that the instrument may have been used while out of calibration should be reported to the radiological control organization. The radiological control organization should review surveys performed with the instrument while it was out of calibration and consider the need for additional surveys.

563 Maintenance

1. A program for preventive and corrective maintenance of radiological instrumentation should be established and documented.
2. Preventive and corrective maintenance should be performed using components and procedural recommendations at least as stringent as those specified by the manufacturer of the instrument.

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3. Radiological instruments should undergo calibration prior to use following any preventive or corrective maintenance or any adjustment that voids the previous calibration. A battery change is not normally considered maintenance.

564 Calibration Facilities

1. Radiological monitoring instrument inspections, calibrations, performance tests, calibration equipment selection, and quality assurance shall be performed in accordance with the recommendations of ANSI N323A. Responsible individuals should:
 - a. Locate activities in a manner to control radiation exposure to operating personnel and to personnel in adjacent areas
 - b. Minimize sources of interference, such as backscatter and non-ionizing radiation, during the calibration of instrumentation and correct for interferences as necessary
 - c. Operate in accordance with the referenced standards
 - d. Generate records in accordance with the referenced standards.
2. For organizations that do not possess or use their own calibration facilities, contracted calibration services should be performed in accordance with the referenced standards.