

OCCUPATIONAL RADIATION EXPOSURE AT PERMANENTLY SHUTDOWN REACTORS

Effective Date: 01/01/2021

PROGRAM APPLICABILITY: IMC 2561 Appendix A

83750-01 INSPECTION OBJECTIVES

To independently gather sufficient information to determine whether licensee performance meets the following objectives:

01.01 To ensure adequate protection of worker health and safety from exposure to radiation or radioactive material at permanently shutdown reactors.

01.02 To evaluate whether the licensee adequately identifies problems and implements appropriate and timely corrective actions related to occupational radiation safety.

83750-02 INSPECTION REQUIREMENTS

02.01 Organization, Changes, and Training

- a. Review major changes since the last inspection in organization, personnel, facilities, radiation instrumentation, equipment, programs, and procedures that may affect occupational radiation protection.
- b. Review the applicable education, experience, qualifications and training of selected members of the licensee's (and its contractor's) radiation protection organization(s).

02.02 Radiological Work Planning and Observation

- a. As available, select (2 - 4) work activities, and conduct observations to verify the licensee is identifying the magnitude and extent of radiological hazards and is adequately assessing the radiological hazards and adequate worker radiation protection technician implementation of radiological controls.
- b. For the selected activities above, verify that the licensee's planning was commensurate with the risk of the work and identified appropriate dose reduction techniques, defined reasonable dose goals, and identified appropriate radiation protection hold or verification points.
- c. Perform tours of the radiological control area (RCA) to verify appropriate radiological postings, high radiation area and very high radiation area controls, and evaluate material conditions.

- d. Review any planned special exposures to determine whether they meet the regulatory requirements in addition to the above.

02.03 Dosimetry. Inspectors need not review all of the below during each inspection. The inspector shall risk-inform their selected activities and perform at least one of the three inspection areas below. The inspectors shall conduct a review of previous inspection reports to provide a variety of inspection areas.

a. External Exposure Dosimetry

1. National Voluntary Laboratory Accreditation Program (NVLAP). Obtain the NVLAP certification documentation. Verify that the licensee's personnel dosimeters—that require processing—are processed by a NVLAP accredited processor and that the approved radiation test categories for each type of personnel dosimeter are consistent with the types and energies of radiation present and method of dosimeter use.
2. Passive Dosimeters (e.g. thermoluminescent dosimeter (TLD), Optically Stimulated Luminescent (OSL)). Evaluate the onsite storage of dosimeters before their issuance, during use, and before processing/reading.
3. Active Dosimeters (Electronic Alarming Dosimeters). Determine if and how bias has been determined to correct the response of the electronic alarming dosimeter (EAD) as compared to TLD/OSL and verify that the correction factor is based on sound technical principles. Evaluate placement of dosimeters and determine whether the licensee has appropriately considered dose-rate gradients in their surveys to inform their determinations, as appropriate.

b. Internal Exposure Dosimetry

1. Routine Bioassay (in vivo). Evaluate the licensee's program and capability to monitor workers for unplanned intakes, including dose assessments based on methods such as derived air concentration (DAC)-hour tracking monitoring and air sampling for related work.
2. Special Bioassay (in vitro). Verify that the licensee has the capability to do assessments by verifying that the licensee has the appropriate collection kits on-hand, appropriate guidance for when and how to collect a sample, a contracted laboratory, and appropriate staff or contractors to interpret the results, as appropriate. Select 1-2 internal dose assessments, as available, and evaluate the process and results.

c. Special Dosimetric Situations. For the special dosimetric situations reviewed in this section, evaluate how the licensee assigns dose of record for total effective dose equivalent, Shallow Dose Equivalent (SDE), and lens dose equivalent.

1. Declared Pregnant Workers. If available, review 1-2 workers who have declared their pregnancy since the last inspection, review the exposure results and the monitoring controls employed by the licensee and verify the monitoring program to assess the dose to the embryo/fetus.

2. Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures (EDEX). Evaluate the licensee's methodology and verify adequate criteria for monitoring external dose in situations in which non-uniform fields are expected or large dose gradients will exist. For 1-2 dose assessments performed using multi-badging verify that the assessment was performed consistently with licensee procedures and dosimetric standards, as available.
3. Shallow Dose Equivalent. As available, for 1-2 SDE dose assessments evaluate the licensee's method for calculating SDE from distributed skin contamination or discrete radioactive particles and verify that clear criteria were established for releasing personnel with imbedded radioactive particles.
4. Neutron Dose Assessment. Evaluate the licensee's neutron dosimetry program and as available, select 1-2 neutron exposure situations and evaluate the instrumentation chosen for appropriate sensitivity, calibration, and usage. Evaluate neutron timekeeping and associated technical basis document and correction factor use, as appropriate.

02.04 Airborne and Contamination Controls

- a. Review the licensee's use of controls as described in Title 10 of the *Code of Federal Regulations* (10 CFR) 20.1701 and determine if the use of other controls, including any respirator use, as described in 10 CFR 20.1702 is appropriate. Review (1-3) work activities, observe the work activity, as available, and assess the adequacy of the licensee's respiratory protection program, practices, and dose assessments based on air sampling and DAC-hour monitoring.
- b. Observe locations where the licensee monitors potentially contaminated material leaving the RCA. Observe workers exiting the RCA and performing contamination monitoring to verify the appropriate methods used for control, survey, and release from these areas are sufficient to prevent the unintended release of radioactive materials from the site, including adequate knowledge on how to respond to an alarm.
- c. Verify that the licensee is ensuring the accuracy and operability of radiation monitoring instruments that are used to monitor areas, materials, and workers to ensure a radiologically safe environment by spot checking (2-4) instruments in the field, observing at least one daily check of an instrument, and reviewing at least one calibration of an instrument, as available.
- d. Walk down (2-4) area radiation monitors (ARMs) to determine whether they are appropriately positioned relative to the radiation source(s) or area(s) they are intended to monitor and compare response with actual area conditions for consistency.
- e. Walk down (2-4) continuous air monitors or grab air samplers, specifically considering temporary monitors to determine whether they are appropriately positioned relative to the radiation source(s) or area(s) they are intended to monitor and compare response with actual area conditions for consistency. Evaluate the licensee's use of air sampling for workers who are wearing respirators.

- f. Walk down (1-3) temporary ventilation systems, as available to verify that they are correctly configured to mitigate the potential for airborne radioactivity.

02.05 Source Term Characterization. Verify the licensee has characterized the radiation types and energies being monitored and is appropriately implementing surveys and work practices.

02.06 SAFSTOR Inspections. For a SAFSTOR site that is not co-located, the inspector shall complete this section and the rest of the procedure with limited depth, as appropriate. For a SAFSTOR site that is co-located, perform this section and section 02.07.

- a. Evaluate to determine whether the licensee has appropriate personnel and chain of command for radiological protection.
- b. Inspectors shall perform a tour of the RCA and other appropriate areas to verify that the licensee is performing adequate surveys, tours of the facility, and is maintaining appropriate radiological postings and controls and adequate material condition of the facility.
- c. Verify the status of and any changes to the facility since the last inspection and determine whether regulatory commitments are being met.

02.07 Problem Identification and Resolution. Verify that the licensee is identifying problems related to radioactive waste storage, processing, and transportation activities at an appropriate threshold and entering them into the corrective action program. If applicable, for a sample of problems documented in the corrective action program, verify that the licensee has identified and implemented appropriate corrective actions.

83750-03 INSPECTION GUIDANCE

General Guidance

The inspector is not required to complete all of the inspection requirements listed in this Inspection Procedure, nor is the inspector limited to those inspection requirements listed if additional safety concerns are identified. However, the objectives of this Inspection Procedure shall be met. Due to variance in decommissioning strategies and timelines, inspection effort is expected to vary based on site activities and phase of decommissioning. Inspections should be scheduled to coincide with major decommissioning activities, as available. The inspector should review major changes since the last inspection in organization, personnel, facilities, radiation instrumentation, equipment, programs, and procedures that may affect occupational radiation protection noting the three main areas of radiation protection: radiation, contamination and airborne considerations.

The inspector should note the differences in inspection effort and focus based on the licensee's current state. For sites in a SAFSTOR condition, the inspector should focus on reviewing changes to organization and radiation protection programs, adherence to regulatory commitments, walkdowns of the plant to include infrequently accessed areas, controls for entering and appropriate surveys in infrequently accessed areas, and appropriate identification and resolution of any changes in plant conditions. While there is a specific inspection

requirement for SAFSTOR sites, the inspector may inspect any other additional areas as necessary. For sites in active decommissioning or post-operational transition, the inspector should focus on ongoing decommissioning activities with specific attention given to airborne monitoring, contamination control, and internal dosimetry. The inspector should be cognizant of changing plant conditions, including changes to radionuclide mix and reviewing the changes in radiological controls such as postings, dosimetry requirements and placement, adequate and appropriate surveys to include gradient surveys as necessary.

Inspectors should select inspection items using a performance-based, risk-informed approach, while also considering variety. Inspectors should review a sampling of past inspection reports to inform their selection. Walkdowns and work activity observations required by the procedure should be performed together, to the extent practical.

Specific Guidance

03.01 Organization, Changes, and Training

- a. By observation and discussion with cognizant supervisory and management personnel, determine whether the changes have affected the licensee's program for control of radiation exposures. Determine what regulatory process was used to make the change. Review the licensee's procedures for conducting change in accordance with the applicable regulatory requirement or license condition. Review a selection of changes and the associated basis provided to demonstrate compliance. Be sensitive to changes that result in a decrease of the radiation protection manager (RPM) to have direct recourse to the on-site plant/station manager in order to resolve questions related to the conduct of the radiation protection program. Additionally, be sensitive to any organizational change in the RPM position relative to its reporting chain and level in the organization.
- b. For an initial decommissioning inspection or when a site shifts to active decommissioning from SAFSTOR, review the licensee's training programs and review qualifications of several radiation protection technicians and other related personnel, as applicable. For subsequent inspections, inspectors could consider performing a spot check and reviewing any changes to the program, but not performing a full review of this area unless there is a performance-based reason for doing so.

03.02 Radiological Work Planning and Observation.

- a. Discuss decommissioning activities with licensee representatives. Inspectors should consider selecting activities of the highest exposure significance or that involve work in high dose rate areas. Further guidance on activity selection can be found in the paragraph below:

The inspector should emphasize work with the potential for high individual and/or collective exposures, such as work typically performed during major dismantlement and decontamination activities that require greater exposure or unusual work practices. Risk-significant work activities typically take place in highly contaminated, high radiation, locked high radiation or very high radiation areas and should be inspected whenever possible. Also, work activities that involve hard-to-detect radionuclides, alpha contamination and/or respirable radiation hazards should be evaluated. Examples of other areas that may be examined are special training; adequacy of licensee controls

and monitoring of contractor work standards, equipment, and practices; review of special (non-routine, seldom used, or new) procedures and infrequent evolutions that have the potential for creating radiological hazards; and use of engineering controls, such as auxiliary ventilation systems to minimize the need to use respiratory protection equipment.

Observe pre-job briefings and determine if the planned controls are discussed with workers. Observe activities to verify necessary planning and preparations and management support for radiation protection planning. Determine whether planning and preparation for radiation work are adequate. The review of plans should focus on the means of controlling airborne and surface contamination, the need for special equipment if required, and the control of high radiation areas. Observe the selected work activities to verify the licensee has effectively integrated the planned administrative, operational, and engineering controls into the actual field work to maintain occupational exposure as low as reasonable achievable (ALARA). Consider if radiological controls are implemented commensurate with the radiological hazards, including and special dosimetry necessary for dose gradient conditions.

While on-site observations of work activities is preferred and should be done, inspectors are not limited only to those activities taking place while on-site. Inspectors should consider in-office review of radiologically significant activities as they feel appropriate.

- b. Radiological administrative, engineering and operational controls include, but are not limited to procedures, RWPs, ALARA Plans, TEDE ALARA Evaluations, work orders, etc. Engineering controls include temporary and permanent (e.g., lead, tungsten, and water) shielding, system flushing, permanent and portable ventilation systems, glove bags, tents, etc. Operational controls include work sequencing and scheduling. The inspector should review the applicable documents for each work activity and determine if the licensee has appropriately planned the work for the expected hazards, including changing conditions. The inspector should note that these expected hazards can change over time as scaling factors change and an increase in alpha and beta hazards affect necessary controls. The inspector should review whether the licensee appropriately incorporates internal lessons learned and any industry operational experience as applicable.

10 CFR 20.1101(b) requires licensees use, to the extent practical, procedures and engineering controls based on sound radiation protection principles to achieve occupational doses that are ALARA. Performance in this area is judged on whether the licensee has taken appropriate measures to track, and if necessary, to reduce exposures and not on whether each individual exposure and dose represent an absolute minimum, or whether the licensee has used all possible methods to reduce exposures.

- c. The inspector should consider asking for a list of infrequently entered (HRA, LHRA, VHRA) areas and selecting several to enter. The selection of these areas should be risk-informed by a review of issue reports, systems, and previous inspection reports while adhering to ALARA considerations. The inspector should strive for a variety of areas; however, consideration should be given to any changing plant conditions to verify the appropriate radiological controls, including postings and control points.

The inspectors should evaluate if ambient radiological conditions are consistent with radiological postings. The inspector should review the licensee's controls for accessing infrequently entered areas to include high radiation areas, locked high radiation areas, and very high radiation areas. The inspector should consider if the licensee informs workers of changes in conditions that could significantly impact radiological hazards. The inspector should consider whether the licensee has implemented a sampling and monitoring program sufficient to detect leakage of site SSCs that hold radioactive material.

- d. As defined in 10 CFR 20.1003, a PSE "means an infrequent exposure to radiation, separate from and in addition to the annual dose limits." The relevant requirements for PSEs are in sections 20.1201(b), 20.1206, 20.2104(b), 20.2104(e)(2), 20.2105, 20.2106, 20.2202(e), and 20.2204. Regulatory Guide 8.35, "Planned Special Exposure," provides guidance on the conditions and prerequisites for permitting PSEs. NUREG/CR-6204, "Questions and Answers Based on Revised 10 CFR Part 20," (ML12166A179) provides further guidance on PSEs in Q&A #8, #24, #63, #112, #135, #136, and #137. For additional information, see the discussion of PSEs in the statement of considerations for the Part 20 (56 FR 23371-23372).

03.03 Dosimetry

a. External Exposure Dosimetry

1. National Voluntary Laboratory Accreditation Program (NVLAP). Verify that the approved irradiation test categories for each type of personnel dosimeter used are consistent with the types and energies of the radiation present, and the way that the dosimeter is being used. Relevant test categories may include Categories I (accident photons), Category II (Photon mixture), Category III (betas), and Category IV (photon/beta mixtures), Category V.C (moderated Cf-252 neutrons and photons), and possibly Category V.A (neutron/photon mixtures) and possibly Category V.B (unmoderated Cf-252 neutrons and photons).
2. Passive Dosimeters (e.g. TLD, OSL). Storage of dosimeters prior to issuance and after the monitoring period (prior to processing) should be in a low dose rate area. Dosimeters in use that are stored in racks on-site during non-wear periods should be in a low dose rate area with control dosimeters. For issued dosimeters not stored on-site during the wear period, guidance should be provided to workers on acceptable storage conditions (e.g., to avoid hanging from rear view mirrors, excessive heat (cars/trucks), and storage on granite countertops).
3. Active Dosimeters (Electronic Alarming Dosimeters). The regulation in 10 CFR 20.2206(c) requires that, on or before April 30 of each year, licensees submit to the NRC an annual report containing the results of individual monitoring (when required by 10 CFR 20.1502) carried out by the licensee for the previous year's collective exposure. The inspector should review the annual report and determine if the doses received appear commensurate with the activities conducted on a macro scale. On a micro scale, the inspector should review the licensee's dose estimates for individual jobs as described in section 03.02 of this guidance.

A bias is normally established for EADs to adjust readings to account for a geometric bias and a conservative factor. These two correction factors are normally a geometry correction and a conservative factor (conservative with respect to TLD/OSL measurements). The geometry correction factor is typically a 5-10% positive bias to account for the fact that the EAD physical size and geometry is larger than the passive dosimeter. The EAD batteries and electronics provides some self-shielding, since the instrument response is directionally dependent (i.e., when the exposure angle is not perpendicular to the face of the EAD). The second factor is a conservative factor (~5%) commonly used to ensure the real-time dose tracking used for worker exposure control is conservative (i.e., the EAD measurements will be higher than the TLD/OSL dose measurements normally used for dose of legal record). These two factors of a conservative bias and a geometry bias may be better understood if field comparisons of RO-2 surveys, electronic dosimeter and TLD/OSL evaluations are performed. Note that if used for underwater diving, EADs may be subject to different (lower) energy levels due to scattering in the water medium. This may also impact dosimetry of record (e.g., TLDs).

The inspector should review whether correlations between EADs and passive dosimeter measurements are being performed, and if substantial discrepancies are investigated.

- b. Internal Exposure Dosimetry. Inspectors should review this area in depth when active decommissioning activities are being conducted, particularly when cutting and grinding work is being conducted.

Routine Bioassay (in vivo). The inspector should review the licensee's method for evaluating for unplanned exposures. Should the licensee select several workers during higher risk jobs and send for a confirmatory body count, review the results and method. If the licensee uses a method other than whole body counting for screening intakes, verify the minimum detectable activity (MDA) is adequate to determine the potential for internally deposited radionuclides sufficient to prompt additional investigation.

The inspector should review several whole body counts (WBC) or results from an alternative methodology and evaluate the licensee's method for screening intakes to determine whether personnel were properly monitored, considering frequency, hard-to-detects (HTDs), adequate MDA, biological half-lives, and appropriate counting times, as appropriate. Methods of assessing internal dose are provided in Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses." Also see guidance in Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," and ANSI N13.30-1996, "Performance Criteria for Radiobioassay."

A common method for determining the location of personnel contamination is identifying the contaminated area via a hand-held frisker and identifying the zone where beta contamination monitor alarms. Prompt WBCs, as well as follow-up WBCs can be used to determine if the residual contamination level follows the retention functions in NUREG/CR-4484 inhalation or ingestion models, and contamination removal from skin via showering and dead skin layer sluffing off.

WBC systems and gamma spectroscopy systems commonly have different radionuclide libraries for different exposure conditions and / or analytical needs. Selectively review the radionuclide libraries to verify that the licensee has analytical capabilities for fission products, natural occurring radioactive materials, and failed fuel conditions. The inspector should review that the system used in each had sufficient counting time/low background to ensure appropriate sensitivity for the potential radionuclides of interest; that the appropriate nuclide library was used; that HTD radionuclides are accounted for in the dose assessment, and that any anomalous count peaks/nuclides indicated in each output spectra received appropriate disposition. Inspectors should review the methods and sources used to perform WBC functional checks before use of the instrument to determine whether the check source(s) are appropriate for the site isotopic mix. Review whether alpha and beta producing radionuclides were appropriately considered in the selection of WBC and that other methods were used if necessary.

Special Bioassay (in vitro). For licensees with a routine in vitro bioassay program, select 1-2 internal dose assessments, as available, and verify procedures used to assess dose from internally deposited radionuclides address collection and storage of samples; whether the contamination was ingested or inhaled; and the adequate assignment and assessment of dose. Labs should participate in an analysis cross-check program and out-of-tolerance results should be evaluated and resolved appropriately.

The licensee's sample collection procedures should ensure the following:

- Collection and preservation of samples in a manner such that the loss of activity on the walls of the container is minimal and sample contamination is prevented,
- A sample of adequate size for each type of analysis requested, including adequate amounts to allow verification or additional analysis if needed,
- Containers that are free of external and internal contamination,
- Precautions to ensure the integrity of the container and prevent leakage from the container and/or cross-contamination of samples during the shipment and storage of samples, and
- Accurate and unambiguous identification of samples. In addition, the licensee should specify the required LLDs and the reporting requirements, including standard error or confidence interval estimates, and alert the service laboratory of potentially "highly contaminated" samples, samples that may contain additives and/or preservatives, or samples that may contain extremely insoluble material.

In addition to the references cited above in section 03.03.a, Regulatory Guide 8.26, "Applications of Bioassay for Fission and Activation Products," and Regulatory Guide 8.32, "Criteria for Establishing a Tritium Bioassay Program," provide relevant guidance for in vitro monitoring programs.

- c. Special Dosimetric Situations. See guidance in Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data" and ANSI N13.6-2010, "Practice for Occupational Radiation Exposure Records Systems."

1. Declared Pregnant Workers. Additional guidance can be found in Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus," Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure," and Regulatory Guide 8.34, "Monitoring Criteria and Methods to Calculate Occupational Radiation Doses. Declared Pregnant Workers. The inspector should review whether the licensee inform workers, as appropriate, of the risks of radiation exposure to the embryo/fetus, the regulatory aspects of declaring a pregnancy, and the specific process to be used for (voluntarily) declaring a pregnancy.
2. Dosimeter Placement and Assessment of Effective Dose Equivalent for External Exposures (EDEX). Consider evaluating the licensee's methodology for monitoring external dose in situations in which non-uniform fields are expected or large dose gradients will exist. Consider if the licensee has established criteria for determining when alternate monitoring techniques are to be implemented. When available, review annual dose records of workers that used EDEX monitoring and routine monitoring during the annual period, and verify accurate dose values were assigned per NRC Form 5 requirements.

See the guidance on several NRC-approved methods for assessing EDEX contained in Regulatory Issue Summary (RIS) 2003-04, "Use of the Effective Dose Equivalent in Place of the Deep Dose Equivalent in Dose Assessments," dated February 13, 2003; RIS 2004-01, "Method for Estimating Effective Dose Equivalent from External Radiation Sources Using Two Dosimeters," dated February 17, 2004; RIS 2009-09, "Use of Multiple Dosimetry and Compartment Factors in Determining Effective Dose Equivalent From External Radiation Exposures," dated July 13, 2009; and Regulatory Guide 8.40, "Methods for Measuring Effective Dose Equivalent from External Exposure," dated July 2010.

3. Shallow Dose Equivalent (SDE). SDE is the dose averaged over the 10 square centimeters of skin receiving the highest exposure. This should combine contributions from distributed skin contamination, gamma contributions from clothing contamination (if significant), as well as Discrete Radioactive Particles (DRPs), into one dosimetric quantity. If licensees are keeping track of DRP dose separately from SDE, then they are not meeting the intent of the 2002 rule change to SDE evaluation. See the Federal Register notice dated April 5, 2002 (67 FR 16304), for a more detailed discussion. Consider if the licensee has established procedures for wound monitoring, and dose assessment from imbedded sources. Clear criteria should be established for releasing from the site personnel with imbedded radioactive particles.
4. Neutron Dose Assessment. See guidance on neutron dosimeters in ANSI N13.52-1999 (Reaffirmed August 2010), "Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV)." Review whether dosimetry and/or instrumentation is appropriate for the expected neutron spectra, there is sufficient sensitivity for low dose and/or dose rate measurement, neutron dosimetry is properly calibrated, interference by gamma radiation has been accounted for in

the calibration, and time and motion evaluations are representative of actual neutron exposure events, as applicable.

03.04 Airborne and Contamination Controls

- a. The inspectors should review the use of process or other engineering controls to determine if the licensee has reasonably implemented controls before implementing use of other controls as described in 10 CFR 20.1702. A TEDE ALARA evaluation may be used to document the planning for dose reduction based on use (or non-use) of respiratory protection equipment. Review the licensee's determination on whether a respirator should be used and the appropriateness of any chosen. The inspector should spot check respiratory protection qualifications and the qualification process to ensure workers are appropriately being trained.

Verify that flow rates and/or collection times for fixed head air samplers or lapel breathing zone air samplers are adequate to ensure that appropriate lower limits of detection (LLDs) are obtained. Review the adequacy of procedural guidance used to assess dose when, if using respiratory protection, the licensee applies protection factors appropriately. If available, for 1-2 dose assessments performed using air sampling and DAC-hour monitoring, verify that the licensee's DAC calculations are representative of the actual airborne radionuclide mixture, including HTD radionuclides, as appropriate. Inspectors should note that beta and alpha considerations can be much higher during decommissioning and should be evaluated by the licensee on a job by job basis. The inspector should review the licensee's evaluation of changing conditions in the plant as the source term decreases and changes.

- b. Inspectors should observe health physics personnel surveying and releasing material for unrestricted use to ensure that the work is performed in accordance with plant procedures as available and the procedures are sufficient to control the spread of contamination and prevent the unintended release of radioactive materials from the site. Review the licensee's criteria for the survey and release of personal items using small-article monitors (SAMs). Workers should be provided guidance on how to use the SAMs and they should be knowledgeable on how to respond to an alarm that indicates the presence of licensed radioactive material. If workers are permitted to self-frisk personal items, selectively consider observing one or two controls points to ensure that workers are complying with applicable guidance and training. The inspector should review whether the periodic source checks of the PCMs and SAMs are performed in accordance with the manufacturer's recommendations and licensee procedures.

Consider background dose rates; they should not excessively interfere with the sensitivity of contamination monitoring equipment (e.g., friskers, personnel contamination monitors). Contamination monitoring equipment for free release of equipment and materials should be in a low background area. The licensee should not have established a de facto "release limit" by raising the instrument's detection sensitivity through such methods as raising the energy discriminator level or locating the instrument in a high-radiation background area.

Further guidance can be found in IE Circular 81-07, "Control of Radioactively Contaminated Material," IN 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities," December 2, 1985, HPPOS #221 (NUREG/CR-5569, Rev. 1, "Health Physics Positions Data Base," May 1, 1992), and HPPOS #250.

- c. Inspectors should review portable survey instruments in use or available for issuance check calibration and source check stickers are up-to-date and assess instrument material condition and function. Inspectors should observe licensee staff perform source checks of at least one type of portable survey instrument considering whether high-range instruments are source checked on all appropriate scales. Review calibration documentation for at least one instrument. For portable survey instruments and ARMs, review detector measurement geometry and calibration methods, plus have the licensee demonstrate use of its instrument calibrator (if applicable). Inspectors should consider whether the licensee has the appropriate instruments and equipment on-site to ensure reasonable assurance of adequate radiological protection.
- d. No further guidance.
- e. The inspector should focus on portable instrumentation used for monitoring transient high-risk radiological conditions; air monitors associated with work generating airborne radioactivity; and radwaste resin transfers; and for determining worker external and internal contamination. Determine if the licensee has appropriately evaluated and implemented the right equipment at appropriate set points for the work being done and for the area being monitored. Determine if the licensee has appropriately considered the use, operation, and placement of samplers.
- f. Walk down temporarily installed ventilation systems and consider if the use of these systems, including features and components (e.g., flow paths, air flow capacity, alarms and set points), is consistent with licensee procedures. Determine whether the ventilation pathway correctly flows from lesser contaminated areas to more contaminated areas to lessen the spread of contamination. Determine if the licensee has appropriately evaluated and implemented the controls and systems necessary for the work being done in that location and any impacts on adjacent locations.

03.05 Source Term Characterization

Licensees are required under 10 CFR 20.1501(a)(2) to conduct surveys that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels; evaluate quantities of radioactivity; and evaluate potential radiological hazards. During tours of the facility and during discussion with workers, evaluate aspects of surveys and monitoring. The licensee should have knowledge of the gamma (photon) spectrum, the beta spectrum and average beta energy of the beta spectrum, the HTD component of beta/gamma activity, and the alpha transuranic component of the source term.

Knowledge of the types and energies of radiation being monitored are critical to the correct selection and use (calibration and/or dose assessment) of dosimeters. Additionally, the source term may have changed over the years as plants are in various stages of decommissioning. A review of the licensee's characterization of the current source term (radionuclide mixture) throughout the plant should include a plan that establishes specific survey points on components and for general areas to allow determination of the decrease or increase in levels of alpha, beta, and gamma emitting radionuclides. The inspector should be particularly cognizant of potential changes in the licensee's isotopic mix based on decommissioning activities and isotope half-lives and determine if the licensee is appropriately taking these into consideration.

Information Notice 2014-05, "Verifying Appropriate Dosimetry Evaluation," (ADAMS Accession No. ML14028A513) reminds licensees of their responsibility for ensuring that all applicable factors that may affect the accuracy of a dosimetry evaluation have been considered, including the proper characterization of the radiation fields that are to be monitored.

The inspector should review the types of surveys being done regularly and during specific jobs to determine if the licensee is appropriately evaluating the hazards. Review the licensee's assumptions on fixed versus removable contamination particularly during work involving grinding and cutting.

03.06 SAFSTOR Inspections

- a. Inspectors should consider whether the licensee has an appropriate number of qualified radiation protection technicians and appropriate management, including any required on-shift staffing. At a co-located site, review whether the SAFSTOR unit is getting the appropriate attention and that issues are being addressed under the CAP program.
- b. While performing a tour of the RCA, the inspector should consider industrial safety hazards, (adequate lighting and ventilation), housekeeping standards, appropriate surveys, including check point surveys, and periodic reviews of infrequently accessed areas. The inspector should consider selecting several infrequently accessed areas to tour while balancing these activities with ALARA principles. The inspector should be cognizant of any water or dampness as this could indicate many issues, including groundwater and mold issues. The inspector should review the licensee's high radiation area and other more stringent controls.
- c. Review a selection of changes and the associated basis provided to demonstrate compliance. The inspector should review the reported doses since the last inspections and evaluate whether the doses appear to be commensurate with the work completed. The inspector should review any leaks, spills, or contamination events and evaluate the response of radiation protection. The inspector should consider attending meetings such as ALARA meetings, turn overs, and pre-job briefs to assess whether radiation workers are cognizant of the radiological hazards and whether the radiation protection department has the appropriate focus on radiation safety.

03.07 Problem Identification and Resolution. Additional guidance can be found in IP 71152, "Problem Identification and resolution" and IP 40801, "Problem Identification and Resolution at Permanently Shutdown Reactors."

83750-04 RESOURCE ESTIMATE

Note that for all decommissioning inspection activities, the frequency of performance, level of effort needed, and specific inspection requirements to be evaluated and verified vary based on the stage of decommissioning at the facility, the scope of licensee activities, and the overall decommissioning strategy chosen for the plant (i.e., SAFSTOR or DECON). IMC 2561 contains a discussion of the expected inspection frequency and resource estimates during each phase of decommissioning and should be used when planning resources to conduct this inspection.

83750-05 COMPLETION STATUS

Inspection findings, open items, follow-up items, and conclusions shall be documented in accordance with Inspection Manual Chapter 0610 and other relevant regional or headquarter instructions. Inspections resulting from allegations will be documented and dispositioned in accordance with Management Directive 8.8.

83750-06 REFERENCES

10 CFR Part 20, "Standards for Protection Against Radiation."

American National Standards Institute (ANSI)/American Nuclear Society (ANS) 3.1-1993, "Selection, Qualification and Training of Personnel for Nuclear Power Plants."

ANSI N13.1-1969 (R 1982), "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities."

ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration."

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END

ATTACHMENT 1

Revision History for IP 83750

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Numbers (Pre-Decisional, Non-Public Information)
N/A	9/30/1988 CN 88-014	Initial issuance for use in the Systematic Assessment of Licensee Performance (SALP) inspection program.	None Required	None
N/A	12/18/1989 CN 89-016	Revised to add guidance relating to licensee actions to control and recover areas that have become unusable as a result of an operational occurrence.	None Required	None
N/A	10/4/1990 CN 90-011	Revised to remove requirements and guidance relating to transportation to new IP 86750. Extensive changes were made to the requirements and guidance relating to ALARA and the guidance relating to training and qualifications. Inspection resource hours were reduced from 68 hours to 60 hours per year for a single unit site to reflect the reduced scope of the procedure.	None Required	None
N/A	3/15/1994 CN 94-006	Revised to reflect the requirements of the new 10 CFR Part 20 and to add a new section addressing the effectiveness of licensee controls.	None Required	None

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Numbers (Pre-Decisional, Non-Public Information)
N/A	6/6/2002 CN 02-023	Deleted IP 83750 from IMC 2800, "Materials Inspection Program." The requirements of this procedure for that program have been incorporated into the IP 87100-series of procedures.	None Required	None
N/A	ML19270D454 11/14/19 CN 19-036	The procedure is a complete re-write, and was updated to address recent revisions to IMC 2561, overall content and format changes, and to reflect additional lessons learned from ongoing decommissioning activities.	None Required	ML19270D452
N/A	ML2029A772 11/05/20 CN 20-059	Major re-write. This procedure was rewritten to refocus inspection efforts, to risk-inform the inspection and streamline the procedure based on inspector input. This revision was informed by the recently issued health physics procedures under IP 71124.	None Required	ML20289A773