

PART 52, EXTERNAL OCCUPATIONAL EXPOSURE CONTROL AND PERSONAL DOSIMETRY

PROGRAM APPLICABILITY: IMC 2504 B

83533-01 INSPECTION OBJECTIVE

01.01 To inspect for readiness of the plant in particular with respect to *Title 10 of the Code of Federal Regulations (10 CFR) Part 20, Standards for Protection against Radiation*, based on the licensee's programs for external exposure occupational controls and personal dosimetry.

01.02 To determine whether the programs for occupational external exposure controls and personal dosimetry meet the program objectives, including normal operation and under accident conditions. This inspection procedure focuses on the program's readiness for use by plant personnel, and effects on the developed program. For program elements where an issue arises directly related to emergency preparedness (EP), the applicable EP inspection procedure should be referred to for follow-up.

83533-02 INSPECTION REQUIREMENTS AND GUIDANCE

General Inspection Guidance

If the unit being constructed is at a site with existing operational units for which the same program will be used at all units, then this program may not require the same level of inspection as that required for units being constructed at sites with no operational units. This is consistent with the Baseline Inspection Program requirements identified in Inspection Manual Chapter 2506, "Construction Reactor Oversight Process General Guidance and Basis Document." At sites with an operating unit where the licensee has chosen to take credit for similar operational programs as those that are already in use, the inspectors shall focus on the differences between the program already in use and the newly developed program. The operational program inspection should focus on those steps in the IMC 2504, "Construction Inspection Program: Inspection of Construction and Operational Programs," inspection procedures where the inspectors cannot verify that the operational program, equipment, and components are the same, or substantially similar to, that of the operating unit. If the operational program, equipment, and components are the same, or substantially similar to, the operating unit, then the following minimum inspection requirements shall be completed, and all other inspection requirements may be omitted:

10 CFR Part 52 Licensees Collocated with an Existing Operational Unit

Minimum Inspection Requirements:

- a. Verify that the 10 CFR Part 52 licensee has incorporated the operational plant's procedures for External Exposure Controls and Personal Dosimetry into their program.
- b. Verify that physical controls designed to limit external exposure are adequate to protect occupational workers, using Section 02.03, Physical Controls, as guidance (Walkdowns).

Inspection Guidance: Verification of procedure incorporation should include a review of procedure cover sheet information (e.g. procedure titles and site applicability, management approvals, revision history, etc.), and a limited review of the procedure itself for applicability to the 10 CFR Part 52 site. The licensee may have developed specific procedures due to differences in plant design or layout. If so, review the site-specific design differences for conformance with the Final Safety Analysis Report (FSAR) and review procedures for adequate inclusion of the site-specific design differences. Applicable guidance can be found throughout IP 83533. Where applicable, review these inspection activities for compliance with 10 CFR Part 20, 10 CFR Part 52, and the FSAR.

02.01 Administrative Controls. Determine whether administrative controls designed to limit and monitor external exposure are adequate to protect occupational workers during normal operations and onsite emergency workers during accident conditions. As part of the review, include any commitments such as program descriptions incorporated by reference or license conditions that invoke industry standards or guidance reviewed and approved by NRC.

Focus should be on the ability to implement the applicable portions of the program for controlling exposure from external radiation. The controls should provide clear distinction as to which workers are considered members of the public and those considered occupational workers for which occupational exposure controls will apply. The following controls should be inspected and evaluated for effectiveness:

- a. Plans and procedures for control of radiation, high radiation, and very high radiation areas, such as work procedure control and radiation work permits (RWP), using a graded approach commensurate with the hazard.
- b. Access controls and postings for radiation (RA), high radiation (HRA), and very high radiation areas (VHRA), including as necessary those potentially produced by testing activities (e.g., radiography), as well as transient dose from plant operations. This should include specific controls and information on each VHRA, developed in advance of any such areas resulting from plant operations.
- c. Determine if administrative limits on exposure and other control or action levels have been developed as specified in 10 CFR Part 20 and other commitments, including those for declared pregnant workers and transient workers.
- d. Evaluate written procedures related to controlling and monitoring external exposures, including for example:
 1. Access control requirements addressed in technical specifications.

2. Remote and local dosimeter monitoring.
 3. Specific training on use and limitations of radiation survey instruments and meters.
 4. Procedures to balance potentially conflicting safety issues, such as effectiveness of safety equipment versus dose reduction and survey capability impairment.
 5. Procedures to provide for non-uniform monitoring, including monitoring of dose gradients, as well as monitoring and calculation of effective dose. Determine the accuracy and effectiveness of the licensee's methods for determining total effective dose equivalent, including the proper use of multiple dosimetric devices.
- e. In addition to administrative controls for normal operations, consider the following for emergency or abnormal operations:
1. Provisions for the authority to authorize and written criteria to invoke planned special exposures.
 2. Compatibility of site exposure limits with Environmental Protection Agency (EPA) Protective Action Guidelines (PAG) for emergency workers.
 3. Adequacy of provisions for contractor or other persons/agencies augmenting the onsite emergency organization. These may include, but not be limited to, contractor health physics (HP) technicians, local fire departments and rescue squads, industry representatives, and reactor plant system vendors.
 4. Adequacy of provisions for controlling exposures of security personnel.
 5. Monitoring and dose assessment capability for applicable radionuclides, including submersion dose, dose to the whole body, lens of the eye, skin of the whole body, and extremities. In addition, capability to provide wound monitoring should be available.

02.02 Dosimetry, Monitoring, and Dose Assessment. Determine whether personnel dosimetry, exposure monitoring, and dose assessment processes and procedures are adequate to protect occupational workers during normal operations and onsite emergency workers during accident conditions.

Evaluate the adequacy of procedures and equipment for monitoring external radiation exposure. Any certifications and quality assurance measures, such as commitments to or compliance with the National Voluntary Laboratory Accreditation Program (NVLAP) as addressed in developmental or licensure documents, should be addressed. Aspects that may be considered include:

- a. Dosimetry and Monitoring. Aspects of dosimetry that may be examined include:
 1. Adequacy of written procedures and methods for converting raw data to dose.
 2. Quality assurance for dosimeter processing.

3. Provisions for timely measurements, recording and dissemination of current dose data; maintenance of records per NRC Form 5, and accurate recording of prior dose on NRC Form 4, if available.
 4. Administrative controls on use of personal dosimetry such as use only by the assigned individual, loss or damage investigations, etc.
 5. Monitoring for photon, beta, and neutron exposure, including mixed fields.
 - (a) Types of radiation, emission modes.
 - (b) Classification with respect to calibration controls.
 - (c) Interferences such as gamma/neutron mixtures.
 6. Dosimeter selection and placement: Adequacy of criteria for use and placement of whole-body and extremity dosimeters, including use in non-uniform radiation fields:
 - (a) Procedures, training in recognition and evaluation of external radiation hazards.
 - (b) Implementation of consistent usage of dosimetry.
 - (c) Records management to address partial/extremity exposures.
 - (d) Dose rates from discrete radioactive particles, streaming fields.
 7. Provisions for special processing of dosimetry devices.
 8. Use of electronic dosimeters and comparison of their measurements with TLD or film badge results, and quality assurance and performance testing.
- b. Dose Assessment.
1. Provision for summation of internal exposure with external exposure, for total dose determinations.
 2. Controls over total dose.
- c. In addition to the applicable factors associated with normal operations, consider the following regarding preparedness for accident conditions:
1. Accessibility of supplies of direct (e.g., self-reading or alarming electronic) and indirect reading (e.g., thermoluminescent, optoluminescent, or film) personnel dosimetry under accident conditions.
 2. Measurement range of direct and indirect reading dosimetry. Measurement ranges should be commensurate with anticipated emergency functions.

- d. NVLAP Accreditation.
 - 1. Accreditation and testing in the types and ranges of radiation fields to which personnel may be subjected, both under normal and emergency/accident conditions, including measures to provide for prompt processing when necessary.
 - 2. Performance consistent with license conditions and 10 CFR 20.1501(c).

02.03 Physical Controls. Determine whether design features, physical controls, and permanent shielding for radiation protection are adequate to meet requirements.

Determine whether engineered features of the plant and additions to the plant design are adequate to control access and limit external exposure. Comparison should be performed regarding commitments made as part of the application and license conditions. Features to be considered may include:

- a. Barricades, doors, shield walls, etc., designed to limit exposure or access to high radiation fields, are capable of achieving this function.
- b. Locks and other features are designed to prevent inadvertent or unauthorized access, and minimize the potential for deliberate thwarting of the control feature. Access methods (e.g., keys, access codes, including administrative controls for keys to HRAs and VHRAs) are under the direct control of radiation protection staff, plant management, or others with responsibility for radiation protection.
- c. Surveillance of both the physical conditions and observation or intrusion detection systems.

02.04 Programs. Determine the licensee's actions to address and properly document development of the program from the functional program description provided to NRC staff during the application review process. Focus is on readiness for operation and on whether the program has been implemented sufficient to adequately evaluate such readiness.

Review the originating documents submitted by the licensee to determine the affected aspects of their program related to external exposure control and monitoring:

- a. Review Agency resources to locate the most current versions of the applicable design control documents and licensee submittals.
- b. Review previous inspections for open or unresolved items. Review inspections of other licensees with similar programs, and in particular the same design, and determine whether more or other measurements of readiness are appropriate relative to the program. If there are ongoing issues at plants of similar design, consider the applicability of those issues in developing the scope of the inspection.
- c. Determine from the licensee's submissions regarding what commitments to or incorporation by reference were made with respect to national standards or other guidance documents, and whether there have been any design changes, amendment proposals, impact evaluations, or other remedial or compensatory actions by the licensee that affect the conclusions made in the Safety Evaluation Report (SER) related

to the COL application, for any modifications not previously evaluated. Include implementation of specific COL Information Items and associated license conditions.

- d. Review the program as developed at the time of the inspection, and evaluate whether programs are adequate for self-assessments, and address any needed modifications to either the external exposure control program or to licensee evaluations of the program.
- e. Review corrective actions to determine if problem identification occurs at a sufficiently low significance level to address problems before they result in inadvertent exposures:
 - 1. Determine whether corrective actions address root causes.
 - 2. Determine whether root causes are identified and corrective actions effectively implemented.
- f. Determine whether a periodic review of radiation protection program content and implementation has been developed and implemented.
- g. Determine whether a performance indicator program or equivalent for external radiation exposure has been prepared for implementation.

83533-03 RESOURCE ESTIMATE

The staff estimates that approximately 40 hours of direct inspection effort will be required to implement this procedure. An inspection of the program and related procedures and records will require health physicists trained in applicable radiation protection procedures and inspection techniques as they relate to nuclear power facilities.

The actual hours required to complete the inspection may vary from this estimate. The inspection hours allocated for this inspection are an estimate for budgeting purposes. The hours expended for this inspection should consider plant specific design features and operational programs. The level of effort expended in such inspections should be recorded for the purpose of planning future inspections and updating budget allocations. If this inspection procedure is performed at a 10 CFR Part 52 licensee collocated with an existing operational unit and the operational program, equipment, and components are the same, or substantially similar to, that of the operating unit, inspection effort is expected to require approximately 20 hours of direct inspection effort.

83533-04 REFERENCES

NRC Inspection Manual Chapters 2501, 2502, and 2504

Regulatory Guide 1.206, "Combined License Applications for Nuclear Power Plants," June 2007. U.S. Nuclear Regulatory Commission, Washington, DC.

NUREG-0800, Rev. 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." Chapters 11, "Radioactive Waste Management," and 12, "Radiation Protection," March 2007. U.S. Nuclear Regulatory Commission, Washington, DC (Rev. 4 for

Section 11.5, "Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems.")

NUREG-1736, "Consolidated Guidance: 10 CFR Part 20 – Standards for Protection Against Radiation," October 2001. U.S. Nuclear Regulatory Commission, Washington, DC.

NUREG/CR-5569, "Health Physics Positions Data Base," May 1992. U.S. Nuclear Regulatory Commission, Washington, DC.

SECY-06-0114, "Description of the Construction Inspection Program for Plants Licensed under 10 CFR Part 52," May 2006. U.S. Nuclear Regulatory Commission, Washington, DC.

SECY-07-0047, "Staff Approach to Verifying the Closure of Inspections, Tests, Analyses, and Acceptance Criteria Through a Sample-Based Inspection Program," March 2007. U.S. Nuclear Regulatory Commission, Washington, DC.

SECY-05-197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses and Acceptance Criteria," October 2005. U.S. Nuclear Regulatory Commission, Washington, DC.

SRM-SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Without Inspections, Tests, Analyses, and Acceptance Criteria," May 2004. U.S. Nuclear Regulatory Commission, Washington, DC.

IE Information Notice No. 81-26, Part 2, "Placement of Personnel Monitoring Devices for External Radiation Exposure," August 28, 1981 and Supplement 1, July 19, 1982.

IE Information Notice No. 83-59, "Dose Assignment for Workers in Non-Uniform Radiation Fields," September 15, 1983.

IE Information Notice No. 84-61, "Overexposure of Diver in PWR Refueling Cavity," August 8, 1984.

IE Information Notice No. 86-22, "Under-response of Radiation Survey Instrument to High Radiation Fields," March 31, 1986.

IE Information Notice No. 86-23, "Excessive Skin Exposures Due to Contamination With Hot Particles," April 9, 1986.

IE Information Notice No. 86-107, "Entry into PWR Cavity with Retractable Incore Detector Thimbles Withdrawn," December 29, 1986.

IE Information Notice No. 87-39, "Control of Hot Particle Contamination at Nuclear Power Plants," August 21, 1987.

RIS 01-025, "NRC Regulatory Issue Summary 2001-25: Use of the Effective Dose Equivalent in Place of the Deep Dose Equivalent in Dose Assessments." U.S. Nuclear Regulatory Commission, Washington, DC.

RIS 03-004 [NEI 99-02, Revision 2], "Voluntary Submission of Performance Indicator Data." U.S. Nuclear Regulatory Commission, Washington, DC.

RIS 04-001, "NRC Regulatory Issue Summary 2004-01: Method for Estimating Effective Dose Equivalent from External Radiation Exposures Using Two Dosimeters." U.S. Nuclear Regulatory Commission, Washington, DC.

RIS 09-009, "NRC Regulatory Issue Summary 2009-09: Use of Multiple Dosimetry and Compartment Factors in Determining Effective Dose Equivalent from External Radiation Exposures." U.S. Nuclear Regulatory Commission, Washington, DC.

ANSI/ANS-10.4-2008, "Guidelines for the Verification and Validation of Scientific and Engineering Computer Programs for the Nuclear Industry," October 2008, American Nuclear Society, La Grange Park, IL.

ANSI/HPS N13.2-1969 (R1982), "Guide for Administrative Practices in Radiation Monitoring," September 1969. American National Standards Institute, Inc., New York, NY.

ANSI/HPS N13.6-1999, "Practice for Occupational Radiation Exposure Records Systems," May 1999, Health Physics Society, McLean, VA.

ANSI N13.7-1983, "American National Standard for Radiation Protection - Photographic Film Dosimeters - Criteria for Performance," November 1981, American National Standards Institute, Inc., New York, NY.

ANSI/HPS N13.11-2001, "Personnel Dosimetry Performance – Criteria for Testing." July 2001, Health Physics Society, McLean, VA.

ANSI/HPS N13.41-1997, "Criteria for Performing Multiple Dosimetry," December 2001, Health Physics Society, McLean, VA.

ANSI/HPS N13.49-2001, "Performance and Documentation of Radiological Surveys," August 2001, Health Physics Society, McLean, VA.

ANSI/HPS N13.52-1999, "American National Standard – Personnel Neutron Dosimeters (Neutron Energies Less Than 20 MeV)," October 1999, Health Physics Society, McLean, VA.

ANSI/HPS N13.54-2008, "American National Standard – Fetal Radiation Dose Calculations," January 2008, Health Physics Society, McLean, VA.

ANSI N42.6-1980 (R1991), "American National Standard - Interrelationship of Quartz-Fiber Electrometer Type Exposure Meters and Companion Exposure Meter Chargers," March 1991 (reaffirmed), Institute of Electrical and Electronics Engineers, Inc, New York, NY.

ANSI N42.20-1995, "American National Standard - Performance Criteria for Active Personnel Radiation Monitors," March 1995, Institute of Electrical and Electronics Engineers, Inc, New York, NY.

ANSI N322-1997, "American National Standard - Inspection, Test, Construction, and Performance Requirements for Direct Reading Electrostatic/Electroscope Type Dosimeters," February 1997, Institute of Electrical and Electronics Engineers, Inc, New York, NY.

ASME NQA-1–2008, “Quality Assurance Requirements for Nuclear Facility Applications,” March 2008, American Society of Mechanical Engineers, New York, NY.

NCRP Report No. 57, “Instrumentation and Monitoring Methods for Radiation Protection,” May 1978, National Council on Radiation Protection & Measurements, Bethesda, MD.

NCRP Report No. 120, “Dose Control at Nuclear Power Plants,” December 1994, National Council on Radiation Protection & Measurements, Bethesda, MD.

NCRP Report No. 158, “Uncertainties in the Measurement and Dosimetry of External Radiation,” 2007, National Council on Radiation Protection & Measurements, Bethesda, MD.

83533-05 PROCEDURE COMPLETION

This procedure will be closed upon satisfactory inspection results verifying that an adequate program exists, and processes are in place to control occupational exposure and monitor personnel with dosimetry. The inspection should demonstrate the program can be inspected under the Reactor Oversight Program.

END

Attachment 1: Revision History for IP 83533

ATTACHMENT 1

Revision History for Construction Inspection Procedure 83533

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 Number (Pre-Decisional, Non-Public Information)
	ML081820685 10/27/10 CN 10-022	<p>Initial issue to support inspections of operational programs described in IMC 2504, Construction Inspection Program – Inspection of Construction and Operational Programs.</p> <p>Derived from original procedure 83524 of 01/01/1984 to address 10 CFR 52, change of program applicability updates of NRC guidance, including risk-informed, performance-based inspection and enforcement policies.</p> <p>Completed search of CNs for previous 4 years and no commitments were found.</p>	N/A	ML102660385
	ML20035D943 03/04/20 CN 20-013	Revises guidance for units being constructed at a site with existing operational units for which the same program will be used at all units and conditionally lowers the Resource Estimate.		ML20035E136