
INSPECTION PROCEDURE 83535

PART 52, CONTROL OF RADIOACTIVE MATERIALS AND CONTAMINATION, SURVEYS, AND MONITORING

PROGRAM APPLICABILITY: 2504

83535-01 INSPECTION OBJECTIVE

01.01 To inspect for readiness of the plant with respect to 10 CFR 20, based on the licensee's programs for control of radioactive materials, contamination, surveys, and monitoring.

01.02 To determine whether the programs for control of radioactive materials and contamination, and performance of surveys and monitoring are adequate to support the radiation protection program objectives, including normal operation and under abnormal or 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.

83535-02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Radioactive Material and Contamination Control. Determine whether provisions for control of radioactive materials and contamination meet requirements as described in the licensee's FSAR are adequate. Key aspects of the Radiation Protection program, such as facilities, instrumentation and equipment, training, and procedures are implemented by the radiation protection program procedures, similar to those described in NEI 07-03A "Generic FSAR Template Guidance for Radiation Protection Program Description." NEI 07-03A describes a radiation protection program that will be implemented in stages consistent with the following milestones:

- a. Prior to initial receipt of by-product, source, or special nuclear materials (excluding Exempt Quantities as described in 10 CFR 30.18).
- b. Prior to receiving reactor fuel.
- c. Prior to initial load of fuel.
- d. Prior to initial transfer, transport, or disposal of radioactive materials.

Licensee capability and performance in this area is evaluated on the basis of whether the licensee has taken appropriate measures to establish and maintain the program. Some aspects of a complete program, such as calibration of equipment, are not fully described in full in NEI 07-03A, and should be evaluated based on current guidance and the program developed by the licensee.

For those licensees that elect to demonstrate compliance with the requirements of 10 CFR 20 via alternate methods, SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Application Without Inspections, Tests, Analyses, and Acceptance Criteria" addresses the absence of ITAAC, wherein the term "fully described" should be understood to mean that the program is clearly and sufficiently described in terms of the scope and level of detail that will support a reasonable assurance finding of acceptability at the COL stage.

In addition, 10 CFR 20.1501(b) requires that instruments used for radiation measurements be periodically calibrated. However, while NEI 07-03A discusses instrument calibration, it does not specifically address the process to be used to ensure that calibration of portable and laboratory instruments is performed using known standards (i.e. traceability to the National Institute of Standards and Technology (NIST) or equivalent international standards). Since NEI 07-03 does not specifically address methods for establishing reference values for calibration standards or the methods for establishing calibration intervals, the licensee's program should describe those program elements related to establishing traceability of calibration sources for portable and laboratory radiation protection instruments to recognized national or international standards, and the basis of the method for setting instrument calibration intervals, to ensure consistency with national standards and regulatory requirements in effect.

Focus should be on the ability to implement the applicable portions of the program for controlling radioactive materials and contamination, with additional emphasis on contamination minimization per 10 CFR 20.1406. The following aspects should be evaluated:

- a. Documented plans and procedures should describe the system and responsibilities for identification, accountability, control, movement, storage, and inventory of radioactive materials outside of controlled areas; for identification, control, movement, and storage within controlled areas; for receipt of radioactive material; and criteria for release and unrestricted use in uncontrolled areas of materials from contaminated areas.
- b. Provisions should be made for proper work techniques for contamination control and prompt correction and cleanup of contamination.
- c. Provisions for minimizing the introduction of uncontaminated materials into contaminated areas.

- d. Contamination control as a measure of the effectiveness of health physics, maintenance, and operations programs.
- e. Provisions to detect, control, and promptly control and repair leaks in radioactive systems.

02.02 In-Plant Surveys and Monitoring. Determine whether provisions for surveys and monitoring of radiation and radioactivity meet requirements as described in the controlling documents and are adequate.

- a. This inspection requirement is primarily limited to surveys and monitoring used to evaluate potential occupational exposure. Surveys for radiation exposure rate, airborne radioactivity, radioactive contamination, and radioactive materials are included. Internal and external exposure monitoring and assessment (dosimetry and bioassay programs) are further addressed in other MC2504 procedures, IPs 83533 and 83534, respectively.
- b. Procedures, or other survey program documents, should describe:
 - 1. Frequency of periodic surveys, including criteria for conducting special surveys.
 - 2. Nature and extent of surveys, including equipment to be used and suitable instrument types.
 - 3. Reviews of surveys and uses of survey data in work planning and procedures, including administrative controls over work involving radiation and radioactive materials, such as radiation work permits, ALARA¹ plans, and tag-out processes.
 - 4. Identification, investigation, evaluation, and correction of abnormal or negative performance trends in radiological conditions.
 - 5. Health physics supervision/management review of survey results.
 - 6. Contamination surveys should address prevention and detection of the spread of contamination, such as:
 - (a) Checks for contamination of individuals using procedures and equipment that provides acceptable detection levels.
 - (b) Adequate detection of contaminated or activated materials before release for unrestricted use (see Generic Communications listed in Section 83535-04 References below).

¹ As Low As Reasonably Achievable

- (c) Surveys of waste areas not designated for radioactive materials, salvage areas, storage areas, etc.
- 7. Processes have been established to periodically evaluate and assess areas of the plant to ensure that personnel exposure to transuranic isotopes are anticipated and controlled (i.e. alpha monitoring program).

02.03 Area Radiation and Airborne Radioactivity Monitors. Determine whether area radiation and airborne radioactivity monitors for normal and emergency operations are installed as described in the application and in NUREG-0737, Item II.F.1, Attachment 3, and that adequate procedures have been developed for calibration, performance checks, maintenance, and use.

Aspects of protective equipment and monitoring programs that should be examined include:

- a. For area radiation monitors, factors that should be examined include:
 - 1. Conformance with the guidance of ANSI/ANS-HPSSC-6.8.1 (for monitoring and normal operations), of Regulatory Guide 1.97 (for accident monitors), and of NUREG-0737, Item II. F.1, Attachment 3 (containment high-range radiation monitor).
 - 2. Procedures for calibrations and checks of monitors.²
 - 3. Alarm setpoints.
 - 4. Procedures and guidance on actions to be taken when installed or portable radiation monitors alarm, including as provided in 10 CFR 70.24(a)(3).
- b. For airborne radioactivity monitors, factors that should be examined include:
 - 1. Locations at normally occupied areas where airborne radioactivity may exist.
 - 2. Representative air concentration measured at detectors located as close as possible to sampler intakes.
 - 3. Provisions for calibrations (routinely and after maintenance) and periodic performance checks.
 - 4. The processes used to determine alarm set-points and calibration intervals.

² See NUREG/CR-5569, HPPOS-001, for guidance on calibration of accident monitors.

Where licensees use airborne activity monitoring equipment to directly determine local activity concentrations, the processes used should evaluate the effects of sample collection losses.

- c. For instrumentation to monitor accidental criticality, factors that should be examined include:
 - 1. Criteria of 10 CFR 70.24(a)(1).
 - 2. Guidance in Regulatory Guide 8.12 and ANSI/ANS 8.3-1979.
 - 3. Assess the effectiveness of the training and procedures required per 10 CFR 70.24(a)(3).

02.04 Portable Survey, Sampling, and Contamination Monitoring Instruments. Determine whether the type and quantity of portable survey, sampling, and contamination monitoring instruments are as described in the application for both normal and emergency operations, and that adequate procedures have been developed for calibration, performance check, maintenance, and use.

Evaluation of the instruments and equipment available for these purposes should address whether they are sufficient for normal operations, including maintenance outages, and for emergency conditions. Examples would include those contained in the emergency kits and in designated operating centers such as the Operations Support Center and the Technical Support Center.

- a. Portable instruments for measuring radiation or radioactivity normally include the following types of instruments:
 - 1. Low- and high-range gamma exposure rate meters (see Regulatory Guide 1.97 for ranges).
 - 2. Portable beta-gamma and alpha counters.
 - 3. Neutron dose equivalent rate meters.
 - 4. Air samplers for use with particulate filters and iodine collection devices (such as charcoal cartridge or equivalent filters) and airborne radioactivity monitors, and provisions for collecting noble gas samples. See NUREG-0737, Item III.D.3.3 regarding inplant iodine monitoring instrumentation for accident conditions.
 - 5. For those plants utilizing recycled water in the Reactor Coolant System, determine how plant processes and equipment assess airborne activity where expected system tritium concentrations are greater than the values listed in NUREG-0938, Table 1, Column 3.

6. Instruments for performing underwater surveys and exposure monitoring of diving operations.
 7. Electronic dosimeters, including bases for dose- and dose-rate setpoints.
- b. Dedicated instruments for monitoring contamination of individuals include handheld contamination monitors, hand and foot counters, and portal monitors. Factors that may be examined for these include:
1. Capability of the instruments to detect contamination at acceptable levels.
 2. Procedures for using the instruments for monitoring and provisions for ensuring compliance with procedures.
 3. Where facilities are utilizing radiologically controlled area (RCA) exit gamma detectors, or whole body contamination monitoring equipment for the purpose of assessing internal depositions of radioactive material on exit, review the processes and methods used to determine, maintain and assess the capability of the equipment to quantify internal depositions, and limit personnel exposures in accordance with 10 CFR 20.1204.
- c. For instruments intended for use during emergency operations, additional factors that may be examined include:
1. Special procedures for calibration of high range instruments.
 2. Sufficient supplies of appropriate instruments should be readily available and accessible under accident conditions. (See NUREG-0654, Planning Standard H, I, J, K, and L, which is endorsed by Regulatory Guide 1.101.)
 3. Instruments in emergency kits should be operable, calibrated, and maintained on a specific schedule (see NUREG-0654, Planning Standard H, endorsed by Regulatory Guide 1.101).
 4. Personnel should be trained in proper use of instruments and be aware of their locations.
- d. The references pertaining to test and calibration of survey and monitoring instruments should be reviewed to determine appropriate standards and performance criteria.
1. Determine the adequacy of the processes used to establish the initial radiation detection counting efficiency values and the evaluation processes for verifying and adjusting counting efficiencies, as needed, during initial testing and power ascension.

2. Determine that portable instruments provided to monitor radiation and airborne radioactivity concentrations in the facility and the site environs where it is impractical to install stationary monitors capable of covering both normal and accident levels, and are appropriately classified in accordance with RG 1.97 and IEEE-497.
- e. Determine the effectiveness of the processes and procedures utilized to specify, acquire and use instruments and equipment, in a manner that is consistent with actual or expected site environmental conditions. Examples of environmental conditions which may impact the use or storage conditions of equipment include outside air temperature impact on dew point requirements for air cylinders stored in outside emergency vehicles, or temperature and pressure conditions expected inside the reactor containment building during power operation.
- f. Determine the effectiveness of processes provided for evaluating routine equipment performance checks (e.g. daily source checks) and for ensuring regulatory compliance (i.e. adequate personnel protection per 10 CFR 20, or compliance with transportation limits) in the event of equipment failures.
- g. Instruments, alarming dosimeters, video monitoring equipment and communications equipment required to satisfy site Technical Specifications section 5 regarding Locked High Radiation Area access controls.

02.05 Protective Clothing and Equipment. Determine whether the type and quantity of protective clothing and equipment (other than respiratory protection equipment), are as described in the application for both normal and emergency operations, and that adequate procedures have been developed for their use.

Evaluation of protective clothing and equipment should address whether they are sufficient for normal operations, including intensive maintenance outages, and for emergency conditions. Representative samples would include those contained in the emergency kits and in designated operating centers such as the Operations Support Center and the Technical Support Center

- a. Examples of this clothing and equipment (other than respiratory protection equipment) are anti-contamination clothing; plastic suits for liquid contamination control; head covers; shoe covers; and gloves.
- b. Use of this equipment should be specified by procedures, including criteria for use, protective equipment/clothing donning and doffing, disposal of contaminated clothing and protective equipment, laundering, and contamination control.
- c. Sufficient supplies should be readily available and accessible for both normal and emergency operations. See NUREG-0654, Planning Standards H and J, for emergency operations.

- d. Determine the program elements and procedures associated with evaluating decontamination options and the impact on personnel heat stress exposure due to the use of protective clothing or respiratory protection devices.
- e. Assess the effectiveness of site procedures for:
 - 1. Implementation of design elements provided for radioactive material control.
 - 2. Identifying, assessing and implementing current industry practices associated with radioactive material control.
 - 3. Examining how performance indicators have been established, based on expected plant operations involving fuel receipt, fuel loading and initial startup testing

02.06 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.

Review the originating documents submitted by the licensee to determine the affected facilities and equipment:

- a. Review Agency resources to locate the most current versions of the applicable documents and functional program description.
- b. Determine the specific measurements that will be needed to verify the readiness and acceptability of the program as implemented, in comparison with the program description provided in the application. Review inspections of other licensees of similar design. 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 changes, amendment proposals, impact evaluations, or other remedial or compensatory actions by the licensee that affect adequacy of the program, or that have not already been reviewed by NRC staff.

83535-03 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.

It is expected that 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 take into account 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.

83535-04 REFERENCES

NRC Inspection Manual Chapters 2501, 2502, 2503, and 2504

Public Law 91-596 84 Statute 1590 December 29, 1970, as amended through January 1, 2004 ("Occupational Safety and Health Act of 1970.") "General Duty Clause", Section 5(a)(1)

Regulatory Guide 1.97, Rev. 4, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants." June 2006. U.S. Nuclear Regulatory Commission, Washington, DC

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NUREG-1400, "Air Sampling in the Workplace." September 1993. U.S. Nuclear Regulatory Commission, Washington, DC

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, ORNL/TM-12067, Rev. 1, "Health Physics Positions Database", HPPOS-001 "Proposed Guidance for Calibration and Surveillance Requirements to Meet Item II.F.1 of NUREG-0737." April, 1994. Oak Ridge National Laboratory, Oak Ridge, TN

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RIS 2001-25 NEI 99-02, Revision 2, "Voluntary Submission of Performance Indicator Data." 2001. U.S. Nuclear Regulatory Commission, Washington, DC

Information Notice 82-49: "Correction for Sample Conditions for Air and Gas Monitoring." 1982. U.S. Nuclear Regulatory Commission, Washington, DC

Information Notice 88-100: "Memorandum of understanding between NRC and OSHA relating to NRC-licensed facilities (53 FR 43950, October 31, 1988) - ML0311406410." 1988. U.S. Nuclear Regulatory Commission, Washington, DC

Information Notice No. 93-30: "NRC Requirements For Evaluation Of Wipe Test Results; Calibration Of Count Rate Survey Instruments." 1993. U.S. Nuclear Regulatory Commission, Washington, DC

ANSI/ANS-6.3.1-1987 (R2007), "Program for Testing Radiation Shields in Light Water Reactors (LWR)." [July 1987]. American Nuclear Society, La Grange Park, IL

ANSI/ANS-6.4-2006: Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants." September 2006. American Nuclear Society, La Grange Park, IL

ANSI/ANS-6.4.2-2006: Specification for Radiation Shielding Materials." September 2006. American Nuclear Society, La Grange Park, IL

ANSI/ANS-6.6.1-1987 (R2007), "Calculation and Measurement of Direct and Scattered Gamma Radiation from LWR Nuclear Power Plants." [June 1987]. American Nuclear Society, La Grange Park, IL

ANSI/ANS-HPSSC 6.8.1-1981, "Location and Design Criteria for Area Radiation Monitoring Systems for Light-Water Nuclear Reactors." 1981. American Nuclear Society, La Grange Park, IL

ANSI/ANS-8.3-1997 (R2003), "Criticality Accident Alarm System." [May 1997]. American Nuclear Society, La Grange Park, IL

ANSI/ANS-8.10-1983 (R2005), "Criteria for Nuclear Criticality Safety Controls in Operations With Shielding and Confinement." [September 1983]. American Nuclear Society, La Grange Park, IL

ANSI/ANS-8.17-2004: Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors." November 2004. American Nuclear Society, La Grange Park, IL

ANSI/ANS-8.19-2005: Administrative Practices for Nuclear Criticality Safety." September 2005. American Nuclear Society, La Grange Park, IL

ANSI/HPS N13.12-1999,"Surface and Volume Radioactivity Standards for Clearance." August 1999. Health Physics Society, McLean, VA

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

ANSI/ANS-18.1-1999, "Radioactive Source Term for Normal Operation for Light Water Reactors." September 1999. American Nuclear Society, La Grange Park, IL

ANSI N42.25-1997, "American National Standard Calibration and Usage of Alpha/Beta Proportional Counters." January 1997. Institute of Electrical and Electronics Engineers, Inc., New York, NY

ANSI N42.30-2002, "American National Standard for Performance Specification for Tritium Monitors." November 2002. Institute of Electrical and Electronics Engineers, Inc., New York, NY

ANSI/ANS-55.1-1992 (R2000), "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants." [July 1992]. American Nuclear Society, La Grange Park, IL

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ANSI N323A-1997, "Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments." April 1997. Institute of Electrical and Electronics Engineers, Inc., New York, NY

ANSI N323B-2003, "American National Standard for Radiation Protection Instrumentation Test and Calibration, Portable Survey Instrumentation for Near Background Operation." February 2004. Institute of Electrical and Electronics Engineers, Inc., New York, NY

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ANSI N323-1978 (R) 1991), "Radiation Protection Instrumentation Test and Calibration." March 1991. Institute of Electrical and Electronics Engineers, Inc., New York, NY

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ASTM D4537 REV A-2004, "Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating Work Inspection in Nuclear Facilities", August 2004. ASTM International, West Conshohocken, PA

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EPRI Technical Report 1003106-2001, "Guideline on Nuclear Safety-Related Coatings Revision 1 (Formerly TR-109937)", November 2001. Electric Power Research Institute, Concord, CA

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IEEE Std 497-2002, "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations."

DHHS (NIOSH) Publication No. 86-113, "Criteria for a Recommended Standard--Occupational Exposure to Hot Environments." April 1986. National Institute for Occupational Safety and Health, New York, NY

NEI 99-02 Revision 6 "Regulatory Assessment Performance Indicator Guideline" ML0929311230 [the latest NEI approved revision]

NEI 07-03A [Revision 0] "Generic FSAR Template Guidance for Radiation Protection Program Description" and the associated NRC SER, ML0914906841

83535-05 PROCEDURE COMPLETION

This procedure will be closed upon satisfactory inspection results verifying that an adequate program exists and processes are in place to control and assess internal

exposure. The inspection must demonstrate the program can be inspected under the ROP.

END

Attachment 1: Revision History for Construction Inspection Procedure 83535

ATTACHMENT 1

Revision History for Construction Inspection Procedure 83535

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
	10/27/10 CN 10-022	Initial issue to support inspections of operational programs described in IMC 2504, Construction Inspection Program – Inspection of Construction and Operational Programs. Derived from original procedure 83526 of 01/01/1984 to address 10 CFR Part 52, initial test program, updates of NRC guidance, including risk-informed, performance-based inspection and enforcement policies. Completed search of CNs for previous 4 years and no commitments were found.	None	N/A	ML102660381