

# NRC INSPECTION MANUAL

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## INSPECTION PROCEDURE 71124 ATTACHMENT 03

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### IN-PLANT AIRBORNE RADIOACTIVITY CONTROL AND MITIGATION

Effective Date: January 1, 2020

PROGRAM APPLICABILITY: IMC 2515 App A

CORNERSTONES: Occupational Radiation Safety

INSPECTION BASES: See IMC 0308 Attachment 2

#### SAMPLE REQUIREMENTS:

Sample Requirements		Minimum Baseline Sample Completion Requirements		Budgeted Range	
Sample Type	Section(s)	Frequency	Sample Size	Samples	Hours
Permanent Ventilation Systems	03.01	Biennial	1 per site	1-2 per site	16 +/- 4 per site
Temporary Ventilation Systems	03.02	Biennial	1 per site	1-2 per site	
Use of Respiratory Protection Devices	03.03	Biennial	1 per site	1 per site	
Self-Contained Breathing Apparatus for Emergency Use	03.04	Biennial	1 per site	1 per site	

#### 71124.03-01 INSPECTION OBJECTIVES

- 01.01 To verify that in-plant airborne concentrations are being controlled consistent with as low as is reasonably achievable (ALARA) principles to the extent necessary to validate plant operations as reported by the performance indicator (PI) and to verify that the practices and use of respiratory protection devices on site do not pose an undue risk to the wearer.
- 01.02 To conduct a routine review of problem identification and resolution activities per Inspection Procedure (IP) 71152, "Problem Identification and Resolution."

## 71124.03-02 GENERAL GUIDANCE

Inspectors should review the plant final safety analysis report (FSAR) and surveys to identify areas of the plant that have the potential to be airborne radioactivity areas. Inspectors should review the FSAR description of the respiratory protection program and any associated ventilation systems or airborne monitoring instrumentation. Inspectors should review FSAR, technical specifications, and emergency planning documents to identify the locations and quantity of respiratory protection devices stored for emergency use. Instrumentation may include continuous air monitors, particulate-iodine-noble-gas-type instruments, or other monitors used to identify changing airborne radiological conditions.

Inspectors should review the licensee's procedures for maintenance, inspection, and use of respiratory protection equipment including self-contained breathing apparatus (SCBA). Additionally, review procedures for breathing air quality maintenance. Inspectors should review and understand the licensee's basis for the use of SCBAs in emergencies; e.g., plant-specific application of General Design Criteria 19.

For each sample, conduct a routine review of problem identification and resolution activities using Inspection Procedure (IP) 71152, "Problem Identification and Resolution." Per IP 71152, it is expected that routine reviews of PI&R activities should equate to approximately 10 to 15 percent of the resources estimated for the associated baseline cornerstone procedures, this is a general estimate only based on the overall effort expected to be expended in each strategic performance area. It is anticipated that the actual hours required to be expended may vary significantly from attachment to attachment, depending on the nature and complexity of the issues that arise at the particular facility. Overall, an effort should be made to remain within the 10 to 15 percent estimate on a strategic performance area basis. Inspection time spent assessing PI&R as part of the baseline procedure attachments should be charged to the corresponding baseline procedure.

## 71124.03-03 INSPECTION REQUIREMENTS

### 03.01 Permanent Ventilation Systems Sample

**Verify permanently installed ventilation systems used to mitigate the potential for airborne radioactivity are correctly configured to perform their intended function.**

#### Specific Guidance

- a. Walk down permanently 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 licensing basis documents and licensee procedures.
- b. During plant tours, be alert to plant ventilation flow problems that may result in airborne radioactivity moved by incorrect flows from elevated airborne radioactivity areas to non-airborne radioactivity areas.
- c. Review procedural guidance for use and maintenance of installed air recirculating systems. Consider, to the extent practical, when these systems are used to mitigate airborne radioactivity. Inspectors should focus on work activities likely to result in

airborne radioactivity areas in the event of a deficiency that impacts this ventilation equipment.

- d. Consider if ventilation airflow capacity, flow path (including the alignment of the suction and discharges), and filter/charcoal unit efficiencies are consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable.
- e. Consider if the licensee has established trigger points for evaluating levels of airborne beta-emitting and alpha-emitting radionuclides. The licensee's program for airborne radioactivity controls should consider alpha emitters that have been incorporated into plant piping corrosion layers or other areas of the plant from a previous failed fuel event and may be released during grinding, welding, or other work activities generating airborne radioactivity. See the Electric Power Research Institute's "Alpha Monitoring Guidelines for Operating Nuclear Power Stations".

### 03.02 Temporary Ventilation Systems Sample

**Verify temporary ventilation systems used to mitigate the potential for airborne radioactivity are correctly configured to perform their intended function.**

#### Specific Guidance

- a. 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.

Temporary ventilation system setups include high-efficiency particulate air (HEPA)/charcoal negative pressure units, downdraft tables, tents, metal "Kelly buildings," and other enclosures).

- b. During plant tours, be alert to plant ventilation flow problems that may result in airborne radioactivity moved by incorrect flows from elevated airborne radioactivity areas to non-airborne radioactivity areas.
- c. Consider if ventilation airflow capacity, flow path (including the alignment of the suction and discharges), and filter/charcoal unit efficiencies are consistent with maintaining concentrations of airborne radioactivity in work areas below the concentrations of an airborne area to the extent practicable.
- d. During plant tours, be alert to plant ventilation flow problems that may result in airborne radioactivity moved by incorrect flows from elevated airborne radioactivity areas to non-airborne radioactivity areas.
- e. Consider reviewing the adequacy of other licensee engineering control implementation and actions to mitigate airborne radioactivity (e.g., vacuums, wetting, using a bandsaw instead of a grinder). Improperly maintained and controlled vacuum cleaners have been the source of elevated airborne radioactivity events. Consider how the licensee ensures that the vacuum cleaners are maintained and do not present an unevaluated source of airborne radioactivity.

### 03.03 Use of Respiratory Protection Devices Sample

**Verify that the licensee's use of respiratory protection devices to limit the intake of radioactive material meets the requirements of a respiratory protection program.**

#### Specific Guidance

- a. It is the NRC's position that any respiratory protection device used in a contaminated area or potentially contaminated area (i.e., inside the radiologically controlled area) is, by definition, being used to limit intake of radioactive material. This is true regardless of whether the licensee is taking credit for the respirators' applied protection factor.
- b. As available, review work activities where respiratory protection devices are used to limit the intake of radioactive materials and consider if the licensee performed an evaluation (i.e., a Total Effective Dose Equivalent – As low as is reasonably achievable ("TEDE-ALARA") evaluation) concluding that further engineering controls are not practical and that the use of respirators maintains doses ALARA.

The level of detail and scope of the licensee's TEDE-ALARA evaluations should be commensurate with the radiological hazards (both airborne and external, direct radiation exposure). These evaluations may also consider factors other than the exposure to radioactive materials (e.g., worker acceptance, contamination control, heat stress, and exposure to other Occupational Safety and Health Administration hazards).

- c. Consider how the licensee determines that the level of protection provided by the respiratory protection devices during use is at least as good as that assumed in the licensee's work controls and dose assessment. For example, consider if the licensee has established adequate air sampling, surveys and bioassays, as necessary, to estimate doses and evaluate actual intakes.
- d. Consider if devices are used consistent with their NIOSH/MSHA certification or any conditions of their NRC approval and that their use in the field does not interfere with their proper operation.

NIOSH certification (or NRC approval) is required for all respiratory protection devices used to limit intake of radioactive material (10 CFR 20.1703). Respirators and equipment (e.g., filter canisters) certified by NIOSH must have a label attached with a certification number (TC-#). The TC-# is unique to the specific configuration and application of the respirator. Use of replacement parts not listed under the NIOSH published TC-# voids the certification, even if those parts are certified for use for another respirator.

Several licensees have obtained NRC approval to use non-NIOSH-approved respiratory protection devices. Examples of these include the Mine Safety Appliance GRM-I canister for radioiodine adsorption/filtration, and several models of the Delta Protection air-supplied and powered air purifying suits. If the licensee has non-NIOSH approved devices, consider referring to the NRC approvals.

- e. Consider if the test results of air used in supplied air devices meets or exceeds applicable requirements (i.e., Grade D). Also, consider if plant breathing air supply

systems meet the minimum pressure and airflow requirements for the devices used. Grade D air is defined in 10 CFR 20.1703(g).

The air intake for compressors servicing breathing air supplies should be controlled and/or monitored by the licensee to ensure that fumes or other contaminants cannot be introduced into the supplied breathing air systems.

- f. Consider if individuals qualified to use respiratory protection devices have been deemed fit to use the device(s) by a physician. Medical physicals and tests can be administered by a non-physician medical practitioner. The medical practitioner may even sign the documentation that the subject has passed the physical. However, the tests administered, acceptance criteria, and the basis for judging the individual fit to use a respirator should be established by a licensed physician. Note: Only review records used by a physician or non-physician medical practitioner documenting the individual is medically fit to use respiratory protection equipment. Do not request or review workers' personal medical records unless the licensee has the physician's judgement records comingled with these medical records.
- g. As available, consider observing respirator fit-testing. If observation opportunities are not available, consider reviewing fit-testing procedures.
- h. Consider sampling individuals assigned to wear respiratory protection devices and observe them donning, doffing, and functionally checking the device as appropriate. If the opportunity for observations is not available, consider conducting interviews with these individuals to determine if they know how to safely use the device and how to properly respond to any device malfunction or unusual occurrence (loss of power, loss of air, etc.). Additionally, if in-field observations are limited, review training curricula for users of the devices.
- i. Select a representative sampling of respiratory protection devices that are staged and ready for use in the plant, or stocked for issuance, and evaluate their physical condition and review records of periodic inspection (do not repeat inspections on devices evaluated under section 03.04 of this inspection procedure). Observe the physical condition of the device components (mask or hood, harnesses, air lines, regulators, air bottles, filter cartridges, etc.). Be mindful of the end of service life for the respirator filter medium since indicators for the end of service life may not be obvious (e.g., damaged, misshapen). Licensees should have an estimate of the service life for the filter mediums.
- j. Review records of maintenance and/or records of periodic inspection on the vital components (e.g., pressure regulators, inhalation/exhalation valves, hose couplings). Consider whether onsite personnel assigned to repair vital components have received adequate (e.g., vendor-provided) training.

The level of quality assurance should be commensurate with the safety significance of the respirator application. The inspector should consider whether implementation of safety-significant elements of the respiratory program (e.g., fit-testing, training, providing a standby rescue person, and equipment configuration) for SCBAs and respirators used in low-oxygen or other atmospheres immediately dangerous to life and health is appropriate.

### 03.04 Self-Contained Breathing Apparatus for Emergency Use Sample

**Verify that personnel who are required to use SCBAs are properly fitted, trained and qualified in their use and that the licensee has the capability to properly stock and maintain the SCBAs.**

#### Specific Guidance

- a. Review the status and surveillance records of SCBAs staged in-plant for use during emergencies. The inspection should focus on SCBAs used for radiological emergency response. SCBAs may be used for other emergency response situations in addition to radiological emergency response. For example, fire brigade or response in toxic environments. Any issues that arise that are outside the scope of this inspection should be discussed with the resident inspector.
- b. If required by the licensee's emergency preparedness procedures, evaluate the licensee's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions. Determine if personnel assigned to refill bottles are trained for that task.
- c. Consider if selected individuals are trained and qualified to use SCBAs. Selected individuals should be from control room shift crews or the emergency response organization (e.g., onsite search and rescue duties). The individuals' training should include SCBA bottle change-out.
- d. SCBA fit-testing is more safety significant than respirator fit-testing in general. Use of a poorly fitting SCBA can result in excessive air leakage from the face covering. Such leakage can significantly reduce the service life of the SCBA bottled air supply and jeopardize the mission of the wearer, as well as his or her personal safety.

Items to consider include:

1. That fit testing of these respirators is performed appropriately. Observations may be made, as available, of the fit-testing process or a review of the process may be conducted if observations are not performed.
  2. That appropriate mask sizes and types are available for use (in-field mask size and type should match what was used in fit-testing).
  3. That on-shift operators have no facial hair that would interfere with the sealing of the mask to the face.
  4. That vision correction that does not penetrate the face seal (e.g., glasses inserts or corrected lenses) is available as appropriate.
- e. Consider if the control room(s) is/are stocked with an adequate variety of respirator face-piece sizes to accommodate the expected variation in shift crew compositions.
  - f. Review maintenance records (to include hydrostatic testing and air cylinder markings) for SCBAs staged for support of operator activities during accident conditions and designated as "ready for service."

The respirator manufacturer (or vendor) provides information to ensure continued unit operability. This information can include information such as SCBA use, maintenance/repair, and required surveillances. Discuss any differences between the vendor and the licensee procedures and practices, especially procedures governing maintenance of vital components, and determine the potential impact of these differences on unit operability and NIOSH certification.

- g. Consider if maintenance or repairs on an SCBA unit's vital components were performed by an individual, or individuals, certified by the manufacturer of the device to perform the work. These vital components typically include the pressure-demand air regulator and the low-pressure alarm. See pertinent sections of Regulatory Guide 8.15 (Revision 1) and NUREG-0041 (Revision 1) for current staff guidance on acceptable maintenance training, practices, and activities for vital respirator components.

#### 71124.03-04 REFERENCES

RG 8.15, "Acceptable Programs for Respiratory Protection"

NRC Information Notice 1998-20, "Problems with Emergency Preparedness Respiratory Protection Programs"

NRC Information Notice 1999-05, "Inadvertent Discharge of Carbon Dioxide Fire Protection System and Gas Migration"

NRC Information Notice 2014-15 "Inadequate Controls of Respiratory Protection Accessibility, Training, and Maintenance"

NUREG-0041, "Manual of Respiratory Protection against Airborne Radioactive Material"

EPRI Technical Report 1013509, "EPRI Alpha Monitoring and Control Guidelines for Operating Nuclear Power Stations, Revision 2"

National Institute for Occupational Safety and Health (NIOSH) Certified Equipment List, January 2018, <https://www.cdc.gov/niosh/npptl/topics/respirators/cel/>. Accessed November 12, 2019.

END

Attachment 1 – Revision History for IP 71124 Attachment 03

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number (Pre-Decisional, Non-Public Information)
N/A	12/02/09 CN 09-030	<p>Conducted four-year search for commitments and found none.</p> <p>This new procedure is being issued as a result of the 2009 ROP IP Realignment. It supersedes inspection requirements in IP 71121 and 71122.</p>	09/09/2009	ML092810396
N/A	ML15344A317 02/24/16 CN 16-008	<p>Revisions to the IP 71124.03 procedure attachment were made in response to the 2013 ROP Enhancement Project.</p> <p>The revisions clarified the existing inspection requirements and enhanced the inspection guidance section.</p> <p>The revision also changed how samples are counted.</p>	N/A	ML15344A322

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment and Feedback Resolution Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML17286A286 12/21/17 Cn 17-031	<p>Major editorial revision of IP 71124.03.</p> <p>Section 02 was audited and modified to move guidance to Section 03 and concisely state actions necessary to complete each requirement</p> <p>PI&amp;R was transitioned from an independent sample to a requirement that would be completed as part of each sample. Guidance section updated to reflect resource estimates for routine review of PI&amp;R activities per IP 71152 Section 04.01.</p>	Verbal discussion of changes during 2017 HP Counterpart meeting, 09/06/2017	ML17300A472
N/A	ML19253D103 12/23/19 CN 19-042	Major editorial revisions of IP 71124.03 to conform with IMC 0040 formatting guidance.	Verbal discussion of changes during 2019 HP Counterpart Meeting. 09/04/2019	ML19253D118