
INSPECTION PROCEDURE 69020 APPENDIX I

INSPECTION OF VENTILATION AND CONFINEMENT SYSTEMS AT NON-POWER PRODUCTION AND UTILIZATION FACILITIES

Effective Date: March 25, 2025

PROGRAM APPLICABILITY: IMC 2550

69020.I-01 INSPECTION OBJECTIVES

- 01.01 To determine if construction/modification work and related quality control activities associated with safety-related ventilation and confinement systems at non-power production and utilization facilities (NPUF) are being performed in accordance with regulatory requirements, the licensing basis, specifications, drawings, and work procedures.
- 01.02 To determine if the applicant/licensee's system for preparing, reviewing, and maintaining records relative to safety-related ventilation and confinement systems is functioning properly, and to determine if the records reflect work accomplishment consistent with specifications and procedures.
- 01.03 To verify the as-built condition of safety-related ventilation and confinement systems meets the specified design requirements, specifications, and drawings.
- 01.04 To determine that the implementation of the quality assurance program (QAP) related to construction/modification work activities for safety-related ventilation and confinement systems is effective and to verify that deviations from requirements are appropriately resolved.

69020.I-02 INSPECTION REQUIREMENTS

- 02.01 For the safety-related ventilation and confinement systems selected for inspection, determine if appropriate and adequate procedures in the following areas are compatible with the QAP and prescribe adequate methods to meet the specifications:
 - a. receipt
 - b. storage
 - c. fit-up and alignment
 - d. installation activities
 - e. as-installed equipment
- 02.02 Determine if the applicant/licensee has an established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements for ventilation and confinement system activities, and for ensuring that examination, inspection, and test personnel associated with performing tests and

inspections of ventilation and confinement systems are qualified and/or certified to perform their assigned work.

02.03 Determine if the following safety-related ventilation and confinement system activities are being controlled and accomplished in accordance with the requirements of the documents reviewed in Section 02.01, above:

- a. receipt
- b. storage
- c. fit-up and alignment
- d. installation activities
- e. as-installed equipment
- f. configuration management

02.04 Review the documentation generated for the safety-related ventilation and confinement system activities. Determine if the applicant/licensee/contractor system for documenting safety-related work is functioning properly. Records should be complete, reviewed by quality control, engineering personnel, or designee, and readily retrievable. Review safety-related records in the following areas:

- a. receipt inspection and material certification (if applicable)
- b. installation inspection
- c. nonconformance/deviation record(s)
- d. training/qualification records of craft, and quality inspection personnel (as required)
- e. configuration management records

69020.I-03 INSPECTION GUIDANCE

General Guidance

Inspectors should review the facility description in the safety analysis report (SAR) or equivalent and be familiar with the requirements for safety-related ventilation and confinement systems being installed at the site. The purpose of these as-built inspections is to verify that the assumptions and critical attributes reviewed during the licensing review process remain valid; the design was appropriately translated to construction specifications; the licensee/applicant constructed the facility in accordance with these specifications; and any changes made to the design described in the SAR comply with the licensee's configuration management program changes made to the design described in the SAR.

Inspectors should also be familiar with the licensee's QAP and use IP 69021, "Inspections of Quality Assurance Program Implementation During Construction of Non-Power Production and Utilization Facilities," to perform "vertical slice" inspections as described in the body of this IP. Inspectors should complete this appendix by inspecting the attributes listed in this appendix with a focus on safety-related mechanical components.

Inspectors should contact the applicant/licensee prior to the on-site inspection to help determine what ventilation and confinement systems are to be inspected. Observation during in-progress construction/installation of the safety-related ventilation and confinement systems is desirable but not required. If necessary, inspectors may select completed ventilation and confinement systems for inspection. Inspectors should not attempt to inspect all ventilation and confinement systems on the site but may expand if significant concerns with the applicant/licensee's control

of ventilation and confinement systems installation/construction arise. Samples should include components or systems within risk-significant areas of the facility. Samples should include work of different subcontractors and work performed at various times throughout the project.

Inspectors should collect applicant/licensee procedures, ventilation and confinement systems specifications, and work completion records in advance, if possible. If unable to review these documents in advance of the on-site inspection, then the licensee should be notified that these documents, and any other relevant documents, should be available when the inspector(s) arrives at the site.

Inspectors should choose one or more safety-related ventilation and confinement systems and review the areas listed in Sections 02.01 through 02.04 to the extent practical and may use their judgment in determining which areas to concentrate on if time is limited. However, inspectors should gain an understanding of the applicant/licensee's program to the extent necessary to determine if the applicant/licensee conforms to regulatory requirements. Not all items in the inspection requirements section will be applicable or required in all situations for all safety-related structures, systems, and components.

03.01 Inspection Requirement 02.01

- a. Review construction specifications related to safety-related ventilation and confinement systems and determine if the specified technical requirements conform to the commitments contained in the licensing basis.
- b. Review ventilation and confinement systems procedures and verify that they specify provisions for adequate on-site engineering direction, are appropriate and adequate related to procurement and use of materials, specify adequate control of hold points, and provide adequate controls for design changes and incorporation of design changes into as-built drawings.
- c. Determine if appropriate and adequate procedures in the following areas are compatible with the QAP, and prescribe adequate methods to meet the construction specifications:
 1. Verify that contractor/subcontractors, with responsibilities for installing safety-significant ventilation and confinement systems, have approved procedures describing the administrative controls and work processes to be implemented to ensure construction activities have been accomplished according to design requirements.
 2. Verify that contractors have established procedures for ensuring that craft and inspection personnel performing construction work on safety-related ventilation and confinement systems are qualified to perform their assigned work.
 3. The inspectors should review the implementing and QC IPs for ventilation and confinement construction. Verify the procedures have been approved and specify the work processes, adequate QC inspections and methods, and management controls for the major construction activities. Ensure the major construction activities are completed according to drawing and procedure requirements and include or reference appropriate quantitative or qualitative acceptance criteria.

4. Receiving. The inspectors should select a sample of procurement documents regarding: (specifications and drawings, various components such as HEPA filters, prefilters, and spark arrestors). Verify that these documents specify the shape, size, dimension, and material type and grade, and the Certificate of Conformance certifies the components meets the construction, material, test, and qualification requirements.
5. Storage. The inspectors should ensure storage and warehousing procedures for ventilation and confinement system components, and/or the procurement documents reviewed require the following:
 - (a) Access is controlled to the storage area to maintain the quality of the materials received.
 - (b) An adequate marking system is used to maintain the identity of material in storage.
 - (c) Material is protected from the environment and weather, as appropriate. Structural steel for supports is protected from corrosion.
 - (d) Nonconforming material is segregated.
 - (e) Motors, dampers, and heaters are checked to ensure wrappings are not disturbed and items are not removed from storage without proper authority.
 - (f) HEPA filters and adsorbers are stored in their original cartons in an environmentally controlled room.
6. Fit-up and Alignment. The inspectors should ensure construction procedures or drawings for ventilation and confinement systems require flange faces to conform to established tolerances for mutual parallelism and axial alignment.
 - (a) Edge Finish. The inspectors should ensure construction procedures for ventilation and confinement system provide criteria for the following: flange-face surface finish, and surface finish of weld preparations.
 - (b) Anchor Bolts, Embedded Weldments, and Plate Anchors. The inspectors should assess if the contractor's construction procedures for ventilation and confinement systems adequately address the following: The minimum edge distance for bolts, studs, or bars with shear loading, and expansion-anchor testing.
 - (c) Bolted Connections. The inspectors should ensure construction procedures for ventilation and confinement systems require the following:
 - (1) Maximum and minimum-edge distance for slotted, oversized, and standard bolt holes for bolted steel-duct support structures.
 - (2) Maximum and minimum hole size for standard, oversized, short-slotted, and long-slotted holes for bolted connections for bolted steel-duct support structures.

- (3) Minimum spacing requirements for bolt holes for bolted steel-duct support structures.
 - (4) Installation of locking devices for fasteners and threaded joints (except for high-strength bolts); engagement of the threads of all bolts or studs for the full length of the thread in the nut (unless approved by the engineer); and conformance of bolting material to drawing requirements.
 - (5) Calibration of torque wrenches.
 - (6) Use of beveled washers to compensate for situations where the surface of the bolted part in contact with the bolt head has a slope greater than 1:20 with respect to the plane normal to the bolt axis.
- (d) Welded Connections. The inspectors should review the construction procedures for welding material greater than, or equal to 0.125-inches thick. In addition, assess if the contractor's procedures adequately address the following:
- (1) identification of welders and weld operators who are welding on steel-duct support structures;
 - (2) weld procedure and welder qualification; and
 - (3) control of welding material.
- (e) Material Physical Dimensions and Tolerances. The inspectors should ensure construction procedures or drawings for ventilation and confinement systems require acceptable dimensioning and tolerances for the following:
- (1) length, elevation, material thickness, joint and seam joining, and span for ducting and supports
 - (2) requirements that the taper of duct transitions be at least five units in length for each one unit in diameter change
- (f) Nondestructive Examination. The inspectors should review the construction procedures for ventilation and confinement systems, in accordance with the applicable IP. In addition, assess if the contractor's procedures adequately address the following:
- (1) visual inspection of production welds according to the visual inspection criteria of American Welding Society (AWS) D1.1 or D1.3, or other code or standard as specified in the licensing bases documents (such as SAR) and/or QAP
 - (2) requirements for visual-inspection proximity of view, qualification of visual-inspection personnel, and the contents of visual-inspection reports
 - (3) inspection sampling for full-penetration and partial-penetration welds on structural steel-duct or equipment supports

03.02 Inspection Requirement 02.02

- a. Review applicant/licensee's established audit program (including plans, procedures, and audit schedule) for assessing the adequacy of work control functions and requirements for safety-related ventilation and confinement system construction activities.
- b. Review audit program to verify if examination, inspection, and test personnel associated with performing tests and inspections of ventilation and confinement system construction activities are qualified and/or certified to perform their assigned work.
- c. Verify records establish that the required audits were performed and that deficiencies identified during audits were appropriately resolved.

03.03 Inspection Requirement 02.03

Determine if the following applicable safety-related ventilation and confinement system activities are being controlled and accomplished in accordance with the requirements of the documents reviewed in 02.01, above:

Select a sample of ventilation and confinement systems for inspection. Inspection should be accomplished by observation and evaluations of both in process and completed work if possible. Sample selection should be based on importance to operational safety.

By direct observation, record review, and/or independent evaluation of work performance, work-in-progress, and/or completed work, determine if activities regarding ventilation and confinement systems are being accomplished in accordance with NRC requirements, the licensing basis, and licensee procedures and specifications.

Before performing work observation inspections in the field, review the applicable procedures and industry standards to ensure familiarity with the requirements and acceptance criteria pertinent to the planned observations. During field observations, the inspectors should carry a copy of the appropriate sections of the contractor's procedures and industry standards, pertinent to the planned observations, and verify work is being accomplished using procedures of the proper revision.

Examples of the major construction activities for safety-related HVAC systems are listed in Section 02.03. Verify the construction work implemented in the field conforms to the contractor's construction and IPs.

- a. Receipt. Review a sample of receipt-inspection reports for major components of ventilation and confinement systems and verify receipt-inspection requirements have been implemented. Verify that these documents specify the shape, size, dimension, and material type and grade, and the Certificate of Conformance certifies the components meets the construction, material, test, and qualification requirements.
- b. Storage. Review a sample of receipt reports for High Efficiency Particulate Apparatus (HEPA) filter system procurement and other types of Heating Ventilation and Air Conditioning (HVAC) system material (e.g., scrubbers, fans, dampers, weld filler metal, fasteners, and expansion anchors). Verify conformance with storage administrative controls and technical requirements. The inspectors should ensure storage and warehousing procedures for ventilation and confinement system components, and/or the procurement documents reviewed require the following:

1. Access is controlled to the storage area to maintain the quality of the materials received.
 2. An adequate marking system is used to maintain the identity of material in storage.
 3. Material is protected from the environment and weather, as appropriate. Structural steel for supports is protected from corrosion.
 4. Nonconforming material is segregated.
 5. Motors, dampers, and heaters are checked to ensure wrappings are not disturbed and items are not removed from storage without proper authority.
 6. HEPA filters and adsorbers are stored in their original cartons in an environmentally controlled room.
- c. Fit-up and Alignment. Inspect a sample of bolted connections and verify the following:
1. The bolted connections conform to procedure- or drawing-established tolerances for mutual parallelism and axial alignment.
 2. Layout instruments are calibrated. Equipment and instruments used for in-process monitoring and inspection should be calibrated to standards traceable to industry-recognized criteria. Calibration and control measures are not applicable for rulers, tape measures, levels, and other such coarse-measurement devices that provide accuracy, as received from the manufacturer.
 3. Inspect a sample of flanges and supports that are ready for welding and verify that the flange faces and edges conform to procedure/specification requirements.
 4. Inspect a sample of anchor-bolts, embedded weldments, and plate anchors installations and verify the installations conform to established procedure requirements.
 5. Inspect a sample of bolted connections and verify that the installations and inspection activities conform to established requirements. Verify that torque wrenches used for these bolted connections had been calibrated as required by the construction specification.
- d. Installation Activities. If work is in progress at the time of the inspection, observe a sample of the installation activities of safety-related ventilation and confinement systems, to verify the following: the latest issue (revision) of applicable drawings or procedures is available to the installers and is being used; and modifications to supports are approved by appropriate personnel before implementation.
1. If work is in progress at the time of the inspection, observe a sample of the installation and testing of concrete anchor bolts, to verify that anchor-bolt type, diameter, embedment length, shoulder-to-cone measurement, and torque requirements meet installation requirements.
 2. Determine if required inspection activities are in process and observe a sample for adequacy. In particular, determine if construction quality control inspection of welder qualification procedures and welding of supports is conducted.

3. Inspect a sample of welded connections in an HVAC system and verify they conform to established requirements for weld identification, use of appropriate welding procedure(s), and control of welding materials, etc.
- e. As Installed Equipment. Observe a sample of the completed installation of the following equipment for proper location, configuration, identification, and damage. The basis for this determination should be the licensing bases documents, piping and instrumentation diagrams (P&IDs), specifications, and installation drawings. Select from the list below:
 1. seismic support for ductwork;
 2. ductwork;
 3. isolation dampers;
 4. recirculation test loops around fans and isolation dampers;
 5. radiation, smoke, and toxic chemical monitor;
 6. pressure-drop instrumentation across filter banks;
 7. instrumentation for the detection of excess ambient temperature;
 8. fresh air intake elevation from grade level;
 9. fans and motors;
 10. air handling units;
 11. exhaust vents; and
 12. filters.
- f. Configuration management. For the activities observed during Inspection Requirement 02.03., verify if changes occurred during these construction activities, the applicant/licensee properly controlled and documented these changes for engineering review, approval, and subsequent incorporation into the final as-built drawings. Verify these actions were completed in accordance with their procedures and QAP.

03.04 Inspection Requirement 02.04

Review the documentation generated for structural concrete construction activities. Determine if the licensee/contractor system for documenting safety-related work is functioning properly. The record-keeping activities should reflect the actual conditions encountered in the field and provide adequate documentation of work and inspections. Determine if records are being maintained, reviewed, and approved, as specified. This is important in activities such as review of concrete strength. A comparison of the actual concrete strength can help in determining the reason for low strengths relatively early in the construction phase, before the completion of extensive concrete work. Records should include sufficient detail to document that: (1) rebar installation met requirements; (2) the concrete strength meets design requirements; (3) curing was adequate; and (4) repairs, if necessary, completed in accordance with design requirements. Records should be complete, reviewed by QC and/or engineering personnel and readily retrievable. Review a sample of the following:

- a. Inspect a sample of records. Verify that records for installing and testing safety-related ventilation and confinement systems are as specified, reviewed by the contractor for accuracy and assurance; and the recorded information meets project requirements, has been approved, and stored and maintained sufficient to support technical and contractual requirements.

1. Review licensee/contractor documentation requirements covering work performed for ventilation and confinement systems. Determine the effectiveness of the document review systems by comparing records against requirements for accuracy and completeness.
 2. Review a sample of nonconformance reports for items of the ventilation and confinement systems.
 3. Review relevant portions of licensee and contractor audit reports concerning the installation of ventilation and confinement systems.
 4. The inspectors should select a sample of records generated during the conduct of HVAC system receiving, storage, fit-up and alignment, bolting, welding, and testing activities and records of qualification for those craft and QA/QC personnel selected during the performance of Section 02.03, above. Verify the records selected for examination were approved by proper authority and were stored and maintained in such a manner as to demonstrate conformance with procedural requirements.
- b. Receipt Inspection and Material Certification (if applicable). Verify receipt inspection and material certification for materials purchased from offsite suppliers, such as cement, concrete aggregate (sand and gravel), concrete admixtures, and reinforcing steel, splices, and other components. Verify records confirm that required material characteristics, performance tests, nondestructive test, and other specification requirements were met.
- c. Installation Inspection. Verify the following:
1. Records confirm that concrete production, concrete placement, and installation of components were performed as specified.
 2. Records confirm that the required inspections (including concrete form removal) were performed, and acceptance criteria defined.
 3. Records indicate specified concrete strength was obtained.
- d. Nonconformance/Deviation Record(s). Verify records include current status of these items. Verify nonconformance reports include the status of corrective action or resolution (e.g., if adequate corrective action were taken when concrete vibration was determined to be inadequate, or concrete strength-test results were not within acceptance criteria).
- e. Training/Qualification Records of Craft, and Construction Quality Inspection Personnel. Verify if records establish that construction quality inspection personnel are adequately qualified to perform their assigned duties and responsibilities and that craft personnel have been trained in their assigned tasks. Verify records are complete and current and show which activities inspectors are qualified to perform. Inspect a sample of qualification records. Verify that craft, testing, and QC personnel involved in performing confinement and ventilation-system construction and inspection activities are qualified to perform their job functions.
- f. Configuration Management Records. Review and evaluate a selected sample of configuration management records, and determine if:

1. Records associated with design and field changes, as well as related work and IP changes, reflect that timely review and evaluation of design and field change documents have been performed by personnel who are qualified.
2. Records of periodic inspections ensure that only the most recent approved documents, including design changes, were used in the field.
3. Design changes are subject to adequate design control, including consideration of the impact of the change on the overall design and on as-built records.
4. Records of nonconformance's to design requirements include preparation of a nonconformance report even if the nonconformance is resolved through the design-change process.

03.05 Additional Guidance

Note: Determine if enough adequately qualified quality control inspection personnel are at the construction site, commensurate with the work in progress, and adequately performing their assigned duties through the established organizational structure.

- a. Particular attention should be given to the traceability of material and equipment, to prevent the use of incorrect or defective materials, parts and components. The inspectors should review the licensee's/contractor's implementing procedures that correspond with applicable QAP requirements, codes and specifications. The inspectors should verify that the licensee has established measures for identification and control of materials, parts, and components, and for traceability to the approved design basis and to the source. The inspectors should assure that required identification of the item is maintained by heat number, part number, serial number, or other appropriate means, either on the item or on records traceable to the item and that required markings are on the item.
- b. The inspectors should note markings on material and equipment and verify that the markings represent material and equipment as specified by the design drawings and specifications. In the case of fasteners, compliance with the applicable material specification (e.g., American Society for Testing and Materials or ASME material and grade) should be verified by required markings on bolts and nuts and certified material test reports or certificates of conformance by the applicable procurement drawings and specifications. In the case of vendor-supplied equipment assemblies containing fasteners, samples should be inspected to verify compliance with approved vendor drawings and specifications and other information such as materials used for equipment-qualification tests and/or analyses. Caution should be exercised to ensure that the required markings on material and equipment, including fasteners, not only exist, but that the markings indicate the correct material and grade as specified.

69020.I-04 RESOURCE ESTIMATE

The appendices, or sections of the appendices, and inspection samples and hours, applicable to a specific facility should be in the range of 40 – 80 hours. Inspection preparation, including review of licensing basis, safety analysis report (SAR), and applicable codes and standards, is not included in this estimate.

69020.I-05 PROCEDURE COMPLETION

This inspection procedure appendix is complete when one inspection sample is complete. Refer to Section 69020-05, "Procedure Completion," of IP 69020, "Inspection of Safety Related Items (and Services) During Construction of Non-Power Production and Utilization Facilities," for details on what constitutes a completed inspection sample. Inspectors are not expected to complete every activity in the appendices of this IP. Instead, inspectors should prioritize inspection activities based on 1) importance of the activity to safety, 2) availability of the onsite activity at the time of the inspection, and 3) available inspection resources. An appendix to this IP need not be completed if there are no safety-related items (or services) covered by that appendix at an NPUF.

69020.I-06 REFERENCES

References listed below may or may refer to the NPUF being constructed or modified. Refer to licensing basis documents for actual facility requirements.

American National Standards Institute, ANSI N690, "Specification for the Design, Fabrication, and Erection of Safety-Related Steel Structures for Nuclear Facilities"

American National Standards Institute, American Society of Mechanical Engineers (ANSI/ASME) N509, "Nuclear Power Plant Air Cleaning Units and Components"

ANSI/ANS 8.1, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors"

ANSI/ASME N510, "Testing of Nuclear Air-Cleaning Systems"

American Society for Heating Refrigeration and Air Conditioning Engineers (ASHRAE), "Design Guide for Department of Energy Nuclear Facilities"

American Society of Mechanical Engineers, ASME B31.3, "Process Piping"

American Welding Society (AWS) D1.1, "Structural Welding Code"

AWS D1.3, "Structural Welding Code - Sheet Steel"

AWS D9.1, "Sheet Metal Welding Code"

Regulatory Guide 3.12, "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants"

END

List of Attachments:

Revision History for IP 69020 Appendix I

Attachment 1: Revision History for IP 69020 Appendix I

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)
N/A	ML24284A217 03/25/25 CN 25-005	Procedure was rewritten for conformance with changes to IMC 2550 and is now a standalone appendix to IP 69020.	N/A	N/A