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## INSPECTION PROCEDURE 88139

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### VENTILATION AND CONFINEMENT SYSTEMS

PROGRAM APPLICABILITY: 2630

#### 88139-01 INSPECTION OBJECTIVE

01.01 To determine whether quality assurance (QA) plans, instructions, and procedures for inspection of ventilation and confinement systems have been properly established in the facility QA Manual.

01.02 To determine whether the technical requirements, detailed or referenced in the facility Construction Authorization Request (CAR) and the Safety Evaluation Report (SER) associated with safety-related ventilation and confinement systems have been adequately addressed in the construction specifications, drawings, and work procedures.

01.03 To determine, through direct observation and independent evaluation of work, whether the installation, of ventilation and confinement systems, is in compliance with U.S. Nuclear Regulatory Commission, (NRC) requirements, licensee commitments, and applicable codes.

01.04 To determine whether: (1) the licensee is adequately implementing the QA program associated with ventilation and confinement systems, including preparing, reviewing, and maintaining a system of quality records; (2) the records reflect work accomplished consistent with NRC requirements and SER commitments; and (3) the records indicate any potentially generic problems, management control inadequacies, or other weaknesses that could have safety significance.

#### 88139-02 INSPECTION REQUIREMENTS

##### 02.01 Adequacy and Effectiveness of Construction-Implementing Work Procedures.

- a. Verify that contractor/subcontractors, with responsibilities for installing safety-related 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.
- b. Verify that procedures prescribe adequate methods, of quality control (QC) inspection, to ensure that the as-built condition of safety-related ventilation and confinement systems meets specified engineering requirements and drawings. As

part of the assessment of the QC inspection procedures (IPs), ensure the procedures include or reference appropriate quantitative or qualitative acceptance criteria for determining that the prescribed activities have been accomplished satisfactorily.

- c. 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.

02.02 Adequacy and Effectiveness of Construction Work and Work Activities. By direct observation, interviews, and independent evaluation of work performance, work-in-progress, and completed work, determine whether activities regarding ventilation and confinement systems are being accomplished in accordance with NRC requirements, CAR and SER commitments, the QA Plan, and licensee procedures and specifications.

a. Installation Activities.

- 1. Witness portions of the installation activities of safety-related ventilation and confinement systems, to verify the following:
  - (a) The latest issue (revision) of applicable drawings or procedures is available to the installers and is being used.
  - (b) Modifications to supports are approved by appropriate personnel before implementation.
- 2. Witness portions of the installation and testing (if required) of concrete anchor bolts, to verify that anchor-bolt type, diameter, embedment length, shoulder-to-cone measurement, and torque requirements (where applicable), meet installation requirements.
- 3. Determine whether required inspection activities are in process and observe for adequacy. In particular, determine whether QC inspection of welder qualification procedures and welding of supports is conducted.

b. Major Construction Activities.

1. Receipt.

Review receipt-inspection reports for major components of ventilation and confinement systems and verify receipt-inspection requirements have been implemented.

2. Storage.

Review receipt reports for one High Efficiency Particulate Apparatus (HEPA) filter system procurement and at least two other types of Heating Ventilation and Air Conditioning (HVAC) system material (e.g., scrubbers, fans, dampers, weld filler metal, fasteners, expansion anchors). For each report,

independently verify conformance with storage administrative controls and technical requirements.

3. Fit-up and Alignment.

Select two recently completed or in-progress bolted connections and verify the following:

- (a) The bolted connections conform to procedure- or drawing-established tolerances for mutual parallelism and axial alignment.
- (b) 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.

4. Edge Finish.

Select two flanges and two supports that are ready for welding and verify that the flange faces and edges conform to procedure/specification requirements.

5. Anchor Bolts, Embedded Weldments, and Plate Anchors.

Select three anchor-bolt installations and verify the installations conform to established procedure requirements.

6. Bolted Connections.

Select two 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.

7. Welded Connections.

Select four 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.

c. As-Installed Equipment.

Observe the completed installation of the following equipment for proper location, configuration, identification, and damage. The basis for this determination shall be the CAR/SER system description, piping and instrumentation diagrams (P&IDs), specifications, and installation drawings. Select a minimum of five items from the list below.

1. Seismic support for ductwork (required);
2. Ductwork (required);
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.

02.03 Adequacy and Effectiveness of the Training and Qualification of Personnel. 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.

02.04 Adequacy and Effectiveness of the System 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.

- a. 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.
- b. Review nonconformance reports for items of the ventilation and confinement systems.
- c. Review relevant portions of licensee and contractor audit reports concerning the installation of ventilation and confinement systems.

#### 88139-03 INSPECTION GUIDANCE

For each of the inspection elements, the inspectors should: (1) obtain a copy of the

contractor's procedures and the related industry codes and standards to which the contractor has committed; (2) become familiar with the contents of the procedures and standards; and (3) assess whether the procedures and their implementation adequately conform to the applicable commitments.

Suggested sample selections are included in the section below. Follow the suggestions or choose samples more appropriate for the inspection, based on construction progress, completion of contractor's QA/QC reviews, or inspectors experience. Use judgment in determining sample selection, focusing on examining the most important aspects of the particular activity being inspected. The intent is to establish a high level of assurance the end product meets requirements.

### 03.01 General Guidance.

- a. Description of the ventilation and confinement systems is contained in the facility's CAR and the SER. The inspectors should then use the CAR and SER sections during the review of the licensee's implementing construction specifications, drawings, work procedures, and QA implementing procedures. The inspectors also should review the documents listed in the reference section of this procedure for in-depth technical details needed for the inspection.
- b. Because installation work on the ventilation and confinement systems is normally carried out over an extended period of time, a series of inspections may be needed to fully complete this procedure. Additionally, some licensee contracting arrangements may be such that several different contractors will be involved in the installation work. If this is the case, selected parts of this procedure may have to be repeated to adequately cover the total effort. Regional evaluations and appropriate adjustments to this procedure may be necessary to ensure inspection continuity during the extended period of time involved and to accommodate the various contracting arrangements encountered.
- c. Findings from this inspection activity should address each element as being satisfactory, unresolved, and requiring resolution, or in violation and requiring correction. When significant inadequacies are identified in specifications or procedures indicating weaknesses within the preparing technical organization, the inspectors should so inform cognizant regional supervision. The issue should be addressed at the appropriate level of licensee management.
- d. 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/contractors implementing procedures that correspond with American Society of Mechanical Engineers (ASME) NQA-1-1994, Basic Requirement 8, "Identification and Control of Items," and applicable 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, as required, and that required markings are on the

item.

- e. 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, as required by the applicable procurement drawings and specifications, and/or by the applicable codes 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.

### 3.02 Specific Guidance.

- a. Adequacy and Effectiveness of Construction-Implementing Work Procedures. 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.
- b. 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.
- c. Storage. 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.
- d. Fit-up and Alignment. The inspectors should ensure construction procedures or drawings for ventilation and confinement system require flange faces to conform to established tolerances for mutual parallelism and axial alignment.
  - e. Edge Finish. The inspectors should ensure construction procedures for ventilation and confinement system provide criteria for the following:
    1. Flange-face surface finish.
    2. Surface finish of weld preparations.
  - f. Anchor Bolts, Embedded Weldments, and Plate Anchors. The inspectors should assess whether the contractor's construction procedures for ventilation and confinement systems adequately address the following:
    1. The minimum edge distance for bolts, studs, or bars with shear loading.
    2. Expansion-anchor testing.
  - g. 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.

- h. Welded Connections. The inspectors should review the construction procedures for welding material greater than, or equal to 0.125-inches thick. In addition, assess whether 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.
- i. 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.
- j. Nondestructive Examination. The inspectors should review the construction procedures for ventilation and confinement systems, in accordance with the applicable IP. In addition, assess whether 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, as applicable.
  - 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.

03.03 Adequacy and Effectiveness of Construction Work and Work Activities. 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 important-to-safety HVAC systems are listed in Section 02.02. Verify the construction work implemented in the field conforms to the contractor's construction and IPs.

In addition to accomplishing the inspections identified in Section 02.02, inspect a substantial sample of one important-to-safety HVAC system that has some completed



activities and other activities in progress. Verify ducts, housings, fans, dampers, anchors, and services (i.e., electrical power, drains, etc.) are installed according to applicable layout drawings and procedures.

During the field observations, the inspectors should interview and obtain the names of a sample of the craft and QC personnel performing the observed activities, to assess whether their knowledge of the job and procedures is satisfactory. The sample size will be determined by the number of contractor personnel performing the activity. Information on these same personnel will be used pursuant to Section 03.04, below, to determine the adequacy of their experience, training, and qualification, including documentation.

**03.04 Adequacy and Effectiveness of the Training and Qualification of Personnel.** The inspectors should interview craft and QA/QC personnel involved in activities related to the safety-related ventilation and confinement systems and verify the personnel are sufficiently knowledgeable of procedure requirements. The inspectors should also review the training and qualification records for those individuals to determine if they meet the requirements.

**03.05 Adequacy and Effectiveness of the System of Records.** 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 02.02, 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.

## **88139-04     RESOURCE ESTIMATES**

This IP is expected to take, on the average, 32 to 64 hours of inspection time. It is recognized that the construction-installation work associated with this procedure may be carried out over an extended period of time, which may require a series of inspections to fully complete this procedure. Additionally, some licensee contracting arrangements may be such that several different contractors will be involved in the installation work. If this is the case, selected parts of this procedure may have to be repeated, to adequately cover the total effort.

## **88139-05     REFERENCES**

Code of Federal Regulations 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

American Society of Mechanical Engineers, (ASME), ASME AG-1, "Code on Nuclear Air and Gas Treatment," (1991).

American Society of Mechanical Engineers, ASME B31.3, "Process Piping," (1998).

American National Standards Institute, American Society of Mechanical Engineers, ANSI/ASME N509, "Nuclear Power Plant Air Cleaning Units and Components," (1980).

American National Standards Institute, American Society of Mechanical Engineers, ANSI/ASME N510, "Testing of Nuclear Air-Cleaning Systems," (1980).

American Welding Society, AWS D1.1, "Structural Welding Code," (1998).

American Welding Society, AWS D1.3, "Structural Welding Code - Sheet Steel," (1998).

American Welding Society, AWS D9.1, "Sheet Metal Welding Code," (1998).

American National Standards Institute, ANSI N690, "Specification for the Design, Fabrication, and Erection of Safety-Related Steel Structures for Nuclear Facilities," (1994).

American National Standards Institute, ANSI/ANS 8.1, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," (1988).

American Society for Heating Refrigeration and Air Conditioning Engineers (ASHRAE), "Design Guide for Department of Energy Nuclear Facilities," (1988).

Duke, Cogema, Stone and Webster, "Mixed-Oxide Fuel Fabrication Facility, MOX Project Quality Assurance Plan (MPQAP)," Docket Number 070-03098, under U.S. Department of Energy Contract DE-AC02-99-CH10888, latest revision accepted by NRC.

Duke, Cogema, Stone and Webster, "Mixed-Oxide Fuel Fabrication Facility Construction Authorization Request (CAR)," latest revision accepted by NRC.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.100, Rev. 2, "Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants," (1988).

U.S. Nuclear Regulatory Commission, Regulatory Guide 3.12, "General Design Guide for Ventilation Systems of Plutonium Processing and Fuel Fabrication Plants," (1973).

END

# ATTACHMENT 1

## Revision History for IP 88139

| Commitment Tracking Number | Issue Date            | Description of Change  | Training Needed | Training Completion Date | Comment Resolution Accession Number |
|----------------------------|-----------------------|--|-----------------|--------------------------|-------------------------------------|
| N/A                        | 08/08/07<br>CN 07-024 | IP 88139 is a newly issued procedure. Issued for MOX inspection program to improve effectiveness and efficiency by incorporating and consolidating ventilation and confinement system inspection requirements. | None            | N/A                      | ML071980489                         |
|                            |                       |  |                 |                          |                                     |
|                            |                       |  |                 |                          |                                     |