

INSPECTION TECHNICAL PROCEDURE

I-119

HVAC CONSTRUCTION INSPECTION

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INSPECTION TECHNICAL PROCEDURE I-119, REV. 0

HVAC CONSTRUCTION INSPECTION

1.0 PURPOSE

This inspection procedure provides guidance to assess the Contractor's activities for constructing important-to-safety heating, ventilation, and air conditioning (HVAC) systems. This guidance is based on the requirements set forth in the Safety Requirements Document (SRD), the Integrated Safety Management Plan (ISMP), and the Quality Assurance Manual (QAM).

This procedure assesses the adequacy and effectiveness of the following items:

- Procedures and programs for accomplishing construction activities and ensuring ductwork, fans, filters, and supports are installed and constructed as required by design
- HVAC construction activities
- Training and qualification of personnel implementing the program and procedures
- Records system demonstrating the management and completion of the required construction activities.

2.0 OBJECTIVES

This inspection procedure verifies the Contractor has established and implemented effective programs and procedures to ensure the construction activities for important-to-safety HVAC systems are accomplished according to requirements. This includes programs and procedures for (1) implementing the designer's requirements for constructing and installing HVAC system ductwork, fans, filters, and supports; (2) managing and providing oversight to ensure construction activities are performed according to established procedures, drawings, and programs; and (3) managing and providing oversight to ensure the as-constructed condition of the facility equipment is according to the design requirements.

This inspection procedure is designed to be used as a component of a complete construction inspection program. This inspection procedure and others will be used as needed to ensure construction activities are being conducted as required by authorization basis commitments and Contractor procedures. During the construction phase, a significant portion of this inspection procedure is expected to be completed at least once for each major Contractor/subcontractor involved with the activities addressed by this procedure. However, the entire procedure is not expected to be completed during any one inspection or every time the inspection procedure is used.

3.0 INSPECTION REQUIREMENTS

3.1 Adequacy and Effectiveness of Construction Implementing Procedures

- 3.1.1 The inspector should verify the Contractor/subcontractors with responsibilities for installing important-to-safety HVAC 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. (QAM, Policy Q-05, Sections 3.1.1 and 3.3; ISMP, Table 1-3, item 5; and SRD, Safety Criterion (SC) 4.1-2 and 7.3-5)
- 3.1.2 The inspector should verify procedures prescribe adequate methods of quality control (QC) inspection to ensure the as-built condition of important-to-safety HVAC systems meets specified engineering requirements and drawings. As part of the assessment of the QC inspection procedures, ensure the procedures include or reference appropriate quantitative or qualitative acceptance criteria for determining the prescribed activities have been accomplished satisfactorily. (QAM, Policy Q-05.1, Section 3.5.1; ISMP, Table 1-3, items 5 and 8; and SRD SC 4.1-2, and 7.3-7)
- 3.1.3 The inspector should verify procedures require equipment used for process monitoring or data collection be calibrated and maintained. (QAM, Policy Q-12.1, Sections 3.1.2 and Section 3.2; ISMP, Table 1-3, items 5 and 8; and SRD, SC 7.3-5 and 7.3-7)
- 3.1.4 The inspector should verify the Contractor has established procedures for ensuring craft and inspection personnel performing important-to-safety HVAC construction work are qualified to perform their assigned work. (QAM, Policy Q-02.2, Section 3.3.2; and ISMP, Table 1-3, item 2)

3.2 Adequacy and Effectiveness of Construction Activities

The inspector should verify important-to-safety HVAC system construction work is being accomplished under controlled conditions using approved instructions, procedures, and checklists prepared at a level of detail based on the importance and complexity of the work process being performed. (QAM, Policy Q-05.1, Section 3.1.1; SRD, SC 4.1-2 and 7.3-5; and ISMP, Table 1-3, item 5)

3.3 Adequacy and Effectiveness of the Training and Qualification of Personnel

The inspector should verify craft, testing, and quality control (QC) personnel involved in performing HVAC system construction and inspection activities are qualified to perform their job functions. (QAM, Policy Q-05.1, Section 3.1.1; SRD, SC 7.3-5; ISMP, Table 1-3, item 5)

3.4 Adequacy and Effectiveness of the System of Records

The inspector should verify records for installing and testing as-built important-to-safety HVAC system are as specified, reviewed by the Contractor for accuracy and assurance the recorded information meets project requirements, approved, and stored and maintained sufficient to support technical and contractual requirements. (QAM, Policy Q-17.1, Sections 3.1.2, 3.3.1 and 3.6.1; SRD, SC 4.0-3, 4.1-2, and 7.3-4; and ISMP, Section 8 and Table 1-3, item 4)

4.0 INSPECTION GUIDANCE

Inspection guidance is provided to assist the inspector in addressing the inspection requirements set forth in Section 3.0 of this procedure. For each of the inspection elements, the inspector 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.

To prepare for this inspection, the inspector should review the construction/fabrication requirements of this inspection procedure and the following standards:

- American Society of Mechanical Engineers (ASME) N-509, 1989 Edition, *Nuclear Power Plant Air Cleaning Units and Components*, Sections 4, 5, 6, and 7
- American Conference of Governmental Industrial Hygienists (ACGIH) Standard, *Industrial Ventilation, A Manual of Recommended Practice*, 20th Edition, Section 8
- American Society of Mechanical Engineers/American Nuclear Standards Institute (ASME/ANSI) Standard AG-1, *Code on Nuclear Air and Gas Treatment*, 1997 Edition
- Energy Research and Development Administration (ERDA) 76-21, *Nuclear Air Cleaning Handbook*.

Welding of steel supports and any material greater than or equal to 0.125 inches thick is governed by the American Welding Society (AWS) Structural Welding Code, AWS D1.1, 1996 Edition; and welding of material less than 0.125 inches thickness is governed by AWS D1.3 (ASME N-509, Section 7.3). Anchor bolting of supports to walls is governed by the American Concrete Institute (ACI) Standard 349, Appendix B, "Steel Embedments." The SRD, SC 4.1-2, refers to American Nuclear Society (ANS)/American Institute for Steel Construction (AISC) Standard N690-94, "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities."

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 inspector 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.

4.1 Adequacy and Effectiveness of Construction Implementing Procedures

4.1.1 The inspector should review the implementing procedures for important-to-safety HVAC system construction. Verify the procedures have been approved and specify the work processes and management controls for the major construction activities. Examples of the major construction activities are listed in Sections 4.1.1.1 through 4.1.1.9 below. Ensure the procedures adequately address each of the examined construction activities and the requirements of the Contractor's standard commitments.

4.1.1.1 Receiving

The inspector should select a sample of procurement documents (specifications and drawings) that address at least two different types of important-to-safety high-efficiency particulate air (HEPA) filters. Verify these documents specify the shape, size, dimension, and material type and grade and the Certificate of Conformance certifies the filter meets the construction, material, test, and qualification requirements of Military Standard MIL-F-51068 (ASME N-509, Section 5.1).

4.1.1.2 Storage

The inspector should ensure storage and warehousing procedures for important-to-safety HVAC system components, and/or the procurement documents reviewed for Section 4.1.1.1, above, require the following:

- Access is controlled to the storage area to maintain the quality of the materials received.
- An adequate marking system is used to maintain the identity of material in storage.
- Material is protected from the environment and weather, as appropriate. Structural steel for supports is protected from corrosion.
- Nonconforming material is segregated.
- Motors, dampers, and heaters are checked periodically (weekly is recommended) to ensure wrappings are not disturbed and items are not removed from storage without proper authority. (ASME N-509, Section 6.2)
- HEPA filters and adsorbers are stored in their original cartons in an environmentally controlled room; HEPA filters are oriented vertically with the pleats vertical; HEPA filters are stacked no more than three cartons high, unless

intermediate supports are provided; tray type adsorber cells are stored horizontally and stacked no more than five high, unless intermediate supports are provided; and HEPA filter and adsorber cartons are not opened before use or removed from shipping pallets or skids until immediately before installation. (ASME N-509, Section 6.2)

4.1.1.3 Fit-up and Alignment

The inspector should ensure construction procedures or drawings for important-to-safety HVAC systems require flange faces to conform to established tolerances for mutual parallelism and axial alignment. (ASME Standard AG-1, Section AA-5410)

4.1.1.4 Edge Finish

The inspector should ensure construction procedures for important-to-safety HVAC systems provide criteria for the following:

- Flange face surface finish (ASME/ANSI AG-1, Section AA-5410)
- Surface finish of weld preparations. (AWS D1.1 or D1.3, as applicable)

4.1.1.5 Anchor Bolts, Embedded Weldments and Plate Anchors

The inspector should assess whether the Contractor's construction procedures for important-to-safety HVAC systems adequately address the following:

- The minimum edge distance for bolts, studs, or bars with shear loading (ACI Standard 349, Appendix B, "Steel Embedments," Section B.5.1.2.1)
- Expansion anchor testing. (ACI Standard 349, Appendix B, "Steel Embedments," Section B.7.4)

4.1.1.6 Bolted Connections

The inspector should ensure construction procedures for important-to-safety HVAC systems require the following:

- Maximum and minimum edge distance for slotted, oversized, and standard bolt holes for bolted steel duct support structures. (ANS/AISC Standard N690-94, Sections Q1.16.5.1-3 and Q1.16.6)
- Maximum and minimum hole size for standard, oversized, short slotted, and long slotted holes for bolted connections for bolted steel duct support structures. (ANS/AISC Standard N690-94, Section Q1.23.7)
- Minimum spacing requirements for bolt holes for bolted steel duct support structures. (ANS/AISC Standard N690-94, Section Q1.16.4)

- 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. (ASME/ANSI AG-1, Section AA6000)
- Calibration of torque wrenches.
- 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. (ASME/ANSI AG-1, Section AA-6255)

4.1.1.7 Welded Connections

The inspector should determine whether the inspection procedure for Structural Steel Welding, I-115, has recently been performed for the HVAC Contractor. If not, review the construction procedures for welding material greater than or equal to 0.125 inches thick according to that procedure (ASME N-509, Section 7.3). Review the program for welding material less than 0.125 inches thick according to that procedure, except that the reference should be to AWS D1.3 (ASME N-509, Section 7.3) instead of AWS D1.1. In addition, assess whether the Contractor's procedures adequately address the following:

- Identification of welders and weld operators who are welding on steel duct support structures. (ANS/AISC Standard N690-94, Section Q1.7.4)
- Weld procedure and welder qualification. (ASME/ANSI AG-1, Section 6310 and ASME N-509, Section 7.3, which references AWS D1.1 and AWS D 1.3, as applicable)
- Prohibition of welding on material less than 0.047 inches thick. (ASME N-509, Section 5.10.4)
- Control of welding material. (AWS D1.1 and D1.3).

4.1.1.8 Material Physical Dimensions and Tolerances

The inspector should ensure construction procedures or drawings for important-to-safety HVAC systems require acceptable dimensioning and tolerances for the following:

- Length, elevation, material thickness, joint and seam joining, and span for ducting and supports. (ANS/AISC Standard N690-94, Section Q1.23.11.1; ACGIH, Section 8)
- Requirements that the taper of duct transitions be at least five units in length for each one unit in diameter change. (ACGIH, Section 8).

4.1.1.9 Nondestructive Examination

The inspector should determine whether the construction inspection procedure for Nondestructive Testing, I-120, has recently been performed for the HVAC Contractor. If not, review the construction procedures for important-to-safety HVAC systems according to that procedure. In addition, assess whether the Contractor's procedures adequately address the following:

- Visual inspection of production welds according to the visual inspection criteria of AWS D1.1 or D1.3, as applicable. (ASME N-509, Section 7.3)
- Requirements for visual inspection proximity of view, qualification of visual inspection personnel, and the contents of visual inspection reports. (ASME/ANSI AG-1, Sections AA-5221 and 5250)
- Inspection sampling for full-penetration and partial-penetration welds on structural steel duct or equipment supports. (ANS/AISC Standard N690-94, Sections Q1.26.2.1 and Q1.26.2.2)

4.1.2 The inspector should review the QC inspection procedures for important-to-safety HVAC system construction. Verify that the procedures are approved and provide adequate QC inspections and inspection methods to ensure the major construction activities are completed according to drawing and procedure requirements and include or reference appropriate quantitative or qualitative acceptance criteria. Examples of the major construction activities are listed in Sections 4.1.2.1 through 4.1.2.9 below, with guidance on the activities that should be in the Contractor's QC procedures. Note: Sections 4.1.2 and 4.1.3 should be performed together.

4.1.2.1 Receiving

The inspector should verify QC inspection procedures for important-to-safety HVAC systems are adequate to ensure the following:

- Material received meets the design specification and the appropriate critical characteristics and procurement document requirements (e.g., shape, size, dimension, and material type and grade).
- The certified mill test report or Certificate of Conformance, as required by procurement documents, is provided.
- Certificates of conformance for HEPA filters are provided and certify the filter conforms to the construction, material, test, and qualification requirements of MIL-F-51068. (ASME N-509, Section 5.1)

4.1.2.2 Storage

The inspector should verify QC inspection procedures for important-to-safety HVAC systems ensure the following:

- Access to the storage area is controlled.
- A marking system or other suitable method is used to maintain the identity of material in storage.
- Material is protected from the environment and weather, as appropriate.
- Nonconforming material is segregated.
- Motors, dampers, and heaters are checked periodically (weekly is recommended) to ensure wrappings are not disturbed and items are not removed from storage without proper authority. (ASME N-509, Section 6.2)
- HEPA filters and adsorbers are stored in their original cartons in an environmentally controlled room; HEPA filters are oriented vertically with the pleats vertical; HEPA filters are stacked no more than three cartons high, unless intermediate supports are provided; tray type adsorber cells are stored horizontally and stacked no more than five high, unless intermediate supports are provided; and HEPA filter and adsorber cartons are not opened before use or removed from shipping pallets or skids until immediately before installation. (ASME N-509, Section 6.2)
- The manufacturer's recommendations, or an engineering-approved alternative, for preventive maintenance are accomplished while the above major materials are in storage.

4.1.2.3 Fit-up and Alignment

The inspector should verify QC inspection procedures for important-to-safety HVAC systems ensure the following:

- Flange seating surfaces are visually examined for cleanliness and acceptable surface finish; flange faces are visually examined for conformance with established tolerances regarding mutual parallelism and axial alignment; and gaskets are visually examined to verify conformance with specified dimensional tolerances and freedom from tears, breaks, or other defects. (ASME/ANSI AG-1, Section AA-5410)
- Measuring and test equipment is calibrated and controlled. Acceptance criteria should be according to engineering specifications and drawings. (ASME/ANSI AG-1, Section AA-5130)

4.1.2.4 Edge Finish

The inspector should verify QC inspection procedures for important-to-safety HVAC systems ensure the following:

- Flange faces are examined for acceptable surface finish. (ASME/ANSI AG-1, Section AA-5400)
- The surface finish of weld preparations conforms to AWS D1.1 or D1.3, as applicable.

4.1.2.5 Anchor Bolts, Embedded Weldments, and Plate Anchors

The QC procedure should reference ACI Standard 349-97 for acceptance criteria for anchor bolts, embedded weldments, and plate anchors, as appropriate.

4.1.2.6 Bolted Connections

The inspector should verify QC inspection procedures for important-to-safety HVAC systems ensure the following:

- For bolted connections, bolts are in place and of the proper material and grade; a minimum of 25% of the bolts in the connection are tested with a calibrated torque wrench and verified to conform to established torque requirements; gaskets are visually examined for uniform compression; and if any sampled bolt fails to meet the torque requirements, bolts in the connection are re-torqued and re-inspected. (ASME/ANSI AG-1, Section AA-5410)
- Torque wrenches are calibrated.

4.1.2.7 Welded Connections

The inspector should determine whether the inspection procedure for Structural Steel Welding, I-115, has recently been performed at the site. If not, review the QC inspection procedures for examining the welding of material greater than or equal to 0.125 inches thick according to that procedure. The QC inspection procedures for examining the welding of material less than 0.125 inches thick should be examined using Inspection Technical Procedure I-115, except that the requirements are contained in AWS D1.3, instead of AWS D1.1. In addition, the inspector should assess whether the QC procedures adequately address the following:

- Identification of welders and weld operators. The procedure should reference ANS/AISC Standard N690-94, Section Q1.7.4 for acceptance criteria, as appropriate.
- Weld procedure qualification. The procedure should reference AWS Standard D.1.1-96 or D1.3, Section 4, for acceptance criteria, as appropriate.

- Control of welding material. The procedure should reference AWS Standard D1.1-96 or D1.3, Sections 5.3.1.4 and 5.3.2 for acceptance criteria, as appropriate.
- Visual weld inspection criteria and requirements as provided by ASME/ANSI AG-1, Section AA-6331, and in detail in AWS D1.1 or D1.3, as appropriate.

4.1.2.8 Tolerances for Material Physical Dimensions

The inspector should verify QC inspection procedures for important-to-safety HVAC systems ensure the following:

- Specified tolerances are verified for length, elevation, material thickness, joint and seam joining, and span for ducting and supports. (ANS/AISC Standard N690-94, Section Q1.23.11.1; and ACGIH, Section 8)
- The taper of duct transitions is verified to be at least five units in length for each one unit in diameter change. (ACGIH, Section 8)

4.1.2.9 Nondestructive Examination

The inspector should determine whether the construction inspection procedure for Nondestructive Testing, I-120, has recently been performed at the site. If not, review the construction procedures for nondestructive examination of welds according to that procedure. In addition, assess whether the Contractor's QC procedures adequately address the following:

- Visual inspection of production welds according to the visual inspection criteria of AWS D1.1 or D1.3, as applicable. (ASME N-509, Section 7.3)
- Requirements for visual inspection proximity of view, qualification of visual inspection personnel, and the contents of visual inspection reports. (ASME/ANSI AG-1, Sections AA-5221 and 5250)
- Required inspection sampling for full-penetration and partial-penetration welds. The procedure should reference ANS/AISC Standard N690-94, Sections Q1.26.2.1 and Q1.26.2.2 for acceptance criteria, as appropriate.

4.1.3 When determining the adequacy of the QC procedures per Section 4.1.2 of this procedure, the inspection should also determine whether the procedures require test equipment or instruments used for process monitoring or data collection identified in Sections 4.1.2.1, 4.1.2.3, 4.1.2.6, and 4.1.2.8 be calibrated and maintained. The calibration standards should be traceable to industry-recognized criteria (for example, the National Bureau of Standards, **Not Committed**).

4.1.4 The inspector should review the procedures establishing the requirements for qualifying craft and inspection personnel and determine whether the procedures conform to the requirements of the QAM.

4.2 Adequacy and Effectiveness of Construction 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 inspector 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 Sections 4.2.1 through 4.2.8 below, with guidance for inspection of each of these activities. Verify the construction work implemented in the field conforms to the Contractor's construction and inspection procedures.

In addition to accomplishing the inspections identified below, 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 inspector 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 but should not be less than one or more than four of each discipline (craft and QC personnel). Information on these same personnel will be used pursuant to Section 4.3 below, to determine the adequacy of their experience, training, and qualification, including documentation.

4.2.1 Receiving

The inspector should select two receiving inspection reports for HVAC system HEPA filters and verify receiving inspection requirements have been implemented.

4.2.2 Storage

The inspector should select two receiving reports for one HEPA filter procurement, one adsorber procurement, and two other types of HVAC system material (e.g., fans, dampers, weld filler metal, fasteners, expansion anchors) and for each report, independently verify conformance with storage administrative controls and technical requirements. Additional storage verifications are as follows:

- Access to the storage area is controlled.
- The material is identified with a marking system. The system is effective with legible marking (tags that are easily read and not subject to weather) to identify material.

- Material is protected from environment and weather, as appropriate. Materials are not subject to deleterious dust, rain, grease, corrosion, etc.
- Nonconforming material is segregated, as necessary.

4.2.3 Fit-up and Alignment

The inspector should select two recently completed or in progress bolted connections and verify the following:

- The bolted connections conform to procedure- or drawing-established tolerances for mutual parallelism and axial alignment.
- Layout instruments are calibrated. Equipment and instruments used for in-process monitoring and inspection should be calibrated to standards traceable to industry-recognized criteria (e.g. the National Bureau of Standards, **Not Committed**). 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. (QAM, Policy Q-12.1)

4.2.4 Edge Finish

The inspector should select two flanges and two supports are ready for welding and verify that the flange faces and edges conform to procedure requirements.

4.2.5 Anchor Bolts, Embedded Weldments, and Plate Anchors

The inspector should select three anchor bolt installations and verify the installations conform to established procedure requirements.

4.2.6 Bolted Connections

The inspector should select two bolted connections and verify the installations and inspection activities conform to established requirements. Verify torque wrenches used for these bolted connections had been calibrated as required by the construction specification.

4.2.7 Welded Connections

The inspector should select four welded connections in an HVAC system and verify the following attributes conform to established requirements:

- A number, letter, or symbol identifies the welders and weld operators; and the identifier is used to identify the work.
- The weld procedures are qualified according to Section 4 of AWS Standard D1.1-96 or D1.3, as applicable.
- Welding material is controlled according to procedures implementing the requirements of AWS Standard D1.1-96 or D1.3, as applicable.

4.2.8 Tolerances

The inspector should select one tapered duct transition and verify the criteria of paragraph 4.1.2.8 above have been implemented.

4.3 Adequacy and Effectiveness of the Training and Qualification of Personnel

During the observation of work activities (Section 4.2 above), the inspector should carry a copy of the procedures specifying the Contractor's requirements for education and experience levels, training, and certification. The inspector should interview four craft and four QA/QC personnel involved in activities related to the HVAC system and record which job they were performing. Verify the personnel are sufficiently knowledgeable of procedure requirements. The inspector should also review the training and qualification records for those individuals to determine if they meet the requirements.

4.4 Adequacy and Effectiveness of the System of Records

The inspector should select a sample of ten (10) 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 4.3 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.

5.0 REFERENCES

ACGIH Standard, *Industrial Ventilation, A Manual of Recommended Practice*, 20th Edition, American Conference of Governmental Industrial Hygienists.

ACI Standard 349-2001, *Standard Code Requirement for Nuclear Safety-Related Concrete Structures*, American Concrete Institute, 2001.

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Safety Requirements Document (SRD), Volume I, 24590-WTP-SRD-ESH-01-001-01, Rev. 0, Volume 2, 24590-WTP-SRD-ESH-01-001-02, Rev 0d, Bechtel National, Inc., 2002.

6.0 LIST OF TERMS

ACI	American Concrete Institute
AISC	American Institute for Steel Construction
ACGIH	American Conference of Governmental Industrial Hygienists
ANS	American Nuclear Society
ANSI	American Nuclear Standards Institute
ARI	American Refrigeration Institute
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
ERDA	Energy Research and Development Administration
HEPA	High-efficiency particulate air
HVAC	heating, ventilation and air conditioning
ISMP	Integrated Safety Management Plan
QA	quality assurance
QAP	Quality Assurance Program
QC	quality control
RPP	River Protection Program
SC	Safety Criteria
SRD	Safety Requirements Document
WTP	Waste Treatment Plant