ATTACHMENT 65001.12
INSPECTION OF ITAAC-RELATED INSTALLATION OF
HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS

PROGRAM APPLICABILITY: 2503

65001.12-01 INSPECTION OBJECTIVES

01.01 To determine whether the installation of heating, ventilating, and air conditioning (HVAC) systems and related licensee quality control activities are being performed in accordance with design specifications, Code requirements, regulatory requirements, and approved procedures.

01.02 To determine whether HVAC components, ductwork, and piping installation welding is being conducted in accordance with Code requirements, design specifications, and approved procedures.

01.03 To determine whether HVAC system installation general records, welding records, and test/verification records reflect work accomplished in accordance with design specifications, Code requirements, and approved procedures.

01.04 To determine whether ITAAC-related HVAC system/component test and verification activities are being conducted in accordance with design specifications and approved procedures.

01.05 To determine whether HVAC components have been properly qualified in accordance with regulatory requirements, design specifications, and program requirements.

01.06 To determine whether HVAC components have been designed and fabricated to conform with design specifications.

01.07 To evaluate the adequacy of the implementation of the quality assurance program requirements related to HVAC installation and testing activities, and to assure problems are entered into the corrective action process.

65001.12-02 INSPECTION REQUIREMENTS AND GUIDANCE

For the purposes of this procedure, HVAC includes the air distribution and environmental control systems, thereby including all mechanical, electrical, and I&C equipment that is directly related to HVAC function or performance. Examples of inspectable HVAC components include, but are not limited to: air handling units, dampers, valves, operators, piping, ducts, filters, chillers, fans, pumps, compressors, refrigerant piping, insulation, access doors, supports, sensors, air storage tanks, etc.

02.01 General Installation. Select several HVAC components from at least 2 different

HVAC systems, including targeted HVAC ITAAC as much as practical. Through direct inspection, confirm the following attributes, as applicable, have been met:

a. Installation requirements such as proper location, placement elevation, volume, quantity, material type/shape/size, special features such as coatings and insulation, orientation, alignment, seismic and other mounting requirements (including torquing of bolts and expansion anchors), flow direction, leak testing, pressure testing, flow volume verification, tolerances, and electrical features such as proper grounding and terminations, are met. The inspector must be aware of the testing schedule, as HVAC testing is frequently performed on a section of the system in a sequential method.

b. Precautions to prevent damage during storage, handling, placement, and mounting of components are taken.

c. Properly trained personnel and the correct specified equipment are available and utilized to meet manufacturer's instructions, engineer's specifications, and/or Code requirements.

d. Installation requirements, work procedures, construction drawings, and specifications are available to installers and are of the latest issue.

e. Hold points are observed and quality inspections are conducted in accordance with standards and procedures.

f. Lifting and rigging activities are in accordance with established procedures and requirements.

g. Preparation of installation and inspection records meets quality program requirements.

h. Design changes or field modifications relevant to the work being observed have been processed in accordance with the applicable program requirements.

i. All temporary connections or jumpers are removed after testing to allow proper operation in normal mode.

Guidance: This inspection should be performed as often as possible when significant HVAC system/component installation activities are taking place but no less than necessary during the construction period to meet the objectives stated. Inspectors are reminded that the targeted ITAAC set should not limit the scope of inspections, but complement it. This is especially important to note for HVAC as there may be a small population of targeted ITAAC for these systems.

Generic QA implementation activities such as receiving inspections, equipment storage, and records storage are inspected under separate Inspection Procedures (IPs), the inspector should keep informed of these generic areas that effect HVAC equipment performance. Any generic area problems uncovered while performing this inspection should be reported to NRC management.

For HVAC systems, the inspector should pay particular attention to the traceability of material and equipment. The inspector should check that incorrect, defective, or unqualified materials, parts, and/or components have not been used. The inspector should verify that identification of the item is maintained by part number, heat number, serial number, or other means, either on the item or on records traceable to the item, and that unique markings are on the item. In the case of fasteners, compliance with the material specification (e.g. ASTM or ASME material and grade) should be verified by markings present on the bolts or nuts and certified material test reports or Certificates of Conformance as required by the procurement drawings and specifications and/or by the codes. In the case of vendor-supplied equipment assemblies containing fasteners, samples should be inspected to verify compliance with the vendor drawings, specifications, and other information such as materials used for equipment qualification tests and/or analyses.

Field observations should consist of independent evaluation and verification of work activities, and observation of licensee/contractor inspections. While all applicable attributes do not need to be reviewed for each sample, the majority should be. Those samples or attributes reviewed should include all facets of installation activities.

Records should document the status of installed systems. They should confirm that required inspections have been performed and that the inspector's qualification is current and correct for the inspection. Records should also confirm that all critical installation requirements and ITAAC requirements have been met. Record storage must be in accordance with quality assurance program requirements.

Typical problems discovered by inspection include: inadequate or unclear guidance/instructions for installers and/or inspectors, the use of improper/uncalibrated tools for installation and measurement, weak management coordination leading to skipped hold points in installation, inadequate personnel qualification records, field changes not being processed properly, and record storage and retrieval problems.

02.02 Welding. If welding is required for HVAC installation, select a sufficient sample of welds to review so that the inspection objectives will be demonstrated. Confirm that the applicable attributes listed in IP 65001.B "Welding" have been met.

Guidance: This inspection should be coordinated with IP 65001.B and IMC 2504 "Non-ITAAC Inspections" guidance. Sample size will be dependent on guidance from these procedures and the targeted ITAAC set.

The inspector should determine what specific acceptance criteria are established and select those for observation that are best confirmed through observation. Others should be confirmed through record/data review. The inspector should try to focus on those testing activities related to the more safety significant HVAC systems, which may include control room habitability systems, Class 1E and safety related equipment rooms, and battery room cooling and ventilating systems.

The samples should include sufficient variety to assure the different welding processes and material combinations are observed for each sub-contractor, group, or division performing

ITAAC-related welding. This scope applies to both observations and record reviews. A variety of non-destructive examination processes should also be included in the inspection sample.

Records should provide traceability to all aspects of the welding activity including weld procedures used, welders, material certifications, inspections performed and their results, inspectors, and qualification records for procedures and personnel. These records, including radiographs, should be retained and stored in accordance with QA requirements.

02.03 Post Installation Activities. Select a sufficient number of HVAC components to allow a demonstration of the inspection objectives. The selected components should be from at least 2 different HVAC systems and, if possible, by different subcontractors. The selection should emphasize, but must not be limited to, the targeted ITAAC-related components previously selected for Section 02.01. Confirm these components are properly protected and if necessary, serviced considering the following attributes, as applicable:

a. Licensee surveillance activities are being performed according to instructions.

b. Protection is provided as required, including protection against such conditions as adverse temperature, humidity, flooding, and foreign materials (e.g. dirt, dust, cans, and general debris).

c. Lubrication, rotation, and electrical resistance checks are being performed, if required.

d. Records are being maintained, indicating the status of installed components.

e. Recording methods such as stamps, tags, markings, etc. are being used to prevent oversight of licensee inspections, record the completion of tests, record the acceptances, and to prevent inadvertent operation.

Guidance: Post-installation activities should be observed throughout the construction period every 2-3 months to assure HVAC components, equipment, ducts, and supports are properly maintained until final turnover.

02.04 Testing and Verification. Select ITAAC-related HVAC testing activities to assure testing is conducted in accordance with approved procedures and that test acceptance criteria have been met.

Guidance: This inspection should be coordinated with IP 65001.C “Construction Testing”; IP 65001.D “Operational Testing”; and IMC 2504 guidance. Sample size will be dependent on guidance from these procedures and the targeted ITAAC set.

The inspector should determine what specific acceptance criteria are established and select those for observation that are best confirmed through observation. Others should be confirmed through record/data review. The inspector should try to focus on those testing activities related to the more safety significant HVAC systems, which may include control room habitability systems, Class 1E and safety related equipment rooms, and battery room

cooling and ventilating systems.

02.05 Component Qualification. Select several ITAAC-related HVAC components up to a sufficient number to verify that qualification criteria are met.

Guidance: This inspection should be coordinated with IP 65001.E "Qualification Criteria", which contains more detailed inspection guidance and the attributes that should be considered for this inspection. The sample size will be dependent on guidance from this coordinating procedure, the targeted ITAAC set, and inspector judgment.

HVAC components may be subject to seismic, environmental, or other such qualification criteria. The inspector should review the design specifications to determine the specific qualification criteria for a selected component. For example, an HVAC electrical component may be specified to be environmentally qualified in accordance with IEEE-323-1974 or a similar standard. Such qualification may consist of type tests, analyses, or a combination of both.

02.06 Component and System Design/Fabrication. Select several HVAC ITAAC-related activities up to a sufficient number to assure that tests, analyses, calculations, functional assessments, and bounding condition checks for HVAC systems and/or components demonstrate conformance with design specifications for the as-installed conditions.

Guidance: This inspection should be coordinated with IP 65001.F "Design/Fabrication Requirements," which contains more detailed inspection guidance and the attributes that should be considered for this inspection. The sample size will be dependent on guidance from this coordinating procedure, the targeted ITAAC set, and inspector judgment.

Although the inspection of HVAC design is covered by other procedures, some ITAAC applicable to HVAC exist that test, analyze, or otherwise assess and confirm that as-installed structures, systems, and/or components are within design specifications. For example, the ITAAC with the highest prioritization ranking for HVAC for the AP1000 falls into this section because it involves an analysis that must demonstrate that the heat up of vital equipment rooms and the main control room is within design basis assumptions. Since such an analysis relies on the as-built condition for accurate inputs to the analysis, the inspector can verify that equipment or structures are actually installed as analyzed.

02.07 Problem Identification and Resolution. The inspector should confirm that problems identified during the inspection are entered into the licensee/constructor corrective action program in accordance with program requirements. The inspector may review licensee actions to address similar or related problems that were previously identified in order to check the extent of condition and confirm the effectiveness of the licensee's corrective measures.

Guidance. This inspection is to assure that problems are entered into the applicable process to assure corrective actions appropriate to the circumstances are developed and prioritized. Inspections of Quality Assurance Program implementation, effectiveness of Problem Identification and Resolution, and Self-Assessment will be performed under the IMC 2504 process.

65001.12-03 RESOURCE ESTIMATE

Inspection resources necessary to complete this inspection procedure are estimated to be 520 hours of direct inspection effort over the course of plant construction.

65001.12-04 REFERENCES

Regulatory Guide 1.52, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post Accident Engineered Safety Feature Atmosphere Cleanup Systems in Light Water Cooled Nuclear Power Plants

Regulatory Guide 1.78, Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Hazardous Chemical Release

Regulatory Guide 1.84, Design, Fabrication, and Materials Code Case Acceptability, ASME Section III

Regulatory Guide 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light Water Cooled Nuclear Power Plants

ASME/ANSI AG-1-1997, Code on Nuclear Air and Gas Treatment

ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components

ASME N510-1989, Testing of Nuclear Air-Cleaning Systems

SMACNA, HVAC Duct Construction Standards Metal and Flexible

NFPA 90A, Standard for Installation of Air Conditioning and Ventilation Systems

END

Attachment 1: Revision History for IP 65001.12

Attachment 1

Revision History For IP 65001.12

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	07/29/08 CN 08-021	Researched commitments for 4 years and found none. Initial issuance to support ITAAC related inspections under 10CFR52	N/A	N/A	N/A