

ATTACHMENT 65001.04

INSPECTION OF ITAAC-RELATED INSTALLATION OF PIPE SUPPORTS AND RESTRAINTS

PROGRAM APPLICABILITY: 2503

65001.04-01 INSPECTION OBJECTIVES

01.01 To determine whether the licensee's work and inspection activities related to the installation of pipe supports and restraints are being performed in accordance with design specifications, applicable codes, approved drawings and procedures, FSAR, and regulatory requirements.

01.02 To verify that the appropriate records support the licensee's installation and inspection of pipe supports and restraints.

01.03 To determine if the inspections, tests, and analysis completed for ITAAC-related pipe supports and restraints met the acceptance criteria for those ITAAC.

01.04 To evaluate whether the appropriate quality assurance (QA) program requirements are implemented for the licensee's installation and inspection of pipe supports and restraints, and to ensure any identified problems are entered into the corrective action process and effectively resolved.

65001.04-02 INSPECTION REQUIREMENTS AND GUIDANCE

This procedure encompasses all classes (ASME and non-safety) of pipe supports and restraints. It includes all components, hardware, or structural elements that support the weight, or restrain possible movement due to design basis loads, of piping, or piping components (fittings, valves, valve actuators, etc.). This inspection procedure (IP) shall be implemented early during the construction period at the construction site for the installation of, or at any other location for the pre-assembly of, pipe supports and restraints. After the initial inspection at a given location, any subsequent inspections will be scheduled as necessary to complete the overall sample for the review of ITAAC-related pipe supports and restraints. Note that some inspection requirements listed in this IP are not required to be performed each time it is implemented. The focus of this IP is to verify that ITAAC for pipe supports and restraints have been met, and pipe supports and restraints important to safety have been installed and inspected in accordance with the provisions of the design specification and drawings, FSAR, applicable codes and standards, and NRC regulations.

02.01 General Installation. Depending on the specific type of support or restraint, verify through direct inspection and record reviews the applicable aspects of the following attributes:

- a. Restraint is assembled and installed at correct location in plant in accordance with the design specifications and drawing(s), and within specified tolerances. (Must be verified for each support or restraint sampled.)
- b. Functional restraint directions are in accordance with the design drawing. (Must be verified for each support or restraint sampled.)
- c. Components are not bent, deformed, loose, or otherwise out of specification.
- d. Clearances between the restraint and piping are within specified tolerances.
- e. Bolts, nuts, washers, locking devices and other fasteners are tight and secure and are of the correct type, size, material, and grade with required identification markings.
- f. Threaded fasteners have sufficient thread engagement, and where required, pre-load requirements have been met through the use of properly calibrated torque wrenches.
- g. Threaded connections used to adjust support load settings have suitable locking devices in place.
- h. Hot/cold settings are correct for the existing condition of the attached piping system or if settings are not indicated, the thermal and/or dynamic displacements are within the working range of the support.
- i. Restraints in high ambient temperature environments or near high temperature components have suitable service ratings to accommodate the expected operating temperatures.
- j. Shear lugs, as required by installation drawings, are welded to piping whenever pipe clamps are used to support vertical lines or to restrain axial movements and have proper distance from each other to ensure equal load distribution among the lugs.
- k. Sliding or rolling supports are provided with material and/or lubricants suitable for the environment and with compatible contact surfaces.
- l. The contact surfaces of sliding or rolling supports are free of paint, weld spatter, concrete, or other construction debris that would invalidate assumed design forces.
- m. Clearances between restraints or supports and adjacent components, equipment, and structures are in accordance with **specified rattle space requirements** or have otherwise been explicitly evaluated.
- n. Spherical end-bearings, if present, are free to rotate and are staked in place, as required.
- o. Snubber installations should consider the following attributes:

1. Bleed holes are open and free from foreign material.
 2. Hydraulic fluid levels are correct or lubricants are applied as specified and there does not appear to be excessive leakage.
 3. Seals are not deteriorated (if visually observable without dismantling).
 4. Connecting joints, moving parts, piston shafts, seals, etc., are free from foreign material such as concrete, paint, weld spatter, excessive dirt, dust, or other material that may obstruct proper operation.
 5. The mechanical Snubber functionality should be, checked if it was installed during construction and debris, i.e. sand, may have entered its internal mechanism.
- p. Contact area between support baseplates and structural elements (concrete floors, walls, etc.) meet specified minimums.
- q. Shims or washers, if used to level baseplates, are within specified limitations and any grouting complies with specified installation procedures.
- r. Energy absorbing materials, if used in high energy pipe break pipe whip restraints, has not been damaged or otherwise deformed.
- s. Verify spring cans are within the expected or required range, and are not pinned.

Guidance: Inspectors performing this inspection should be familiar with the analytical techniques for piping analysis, since the pipe stress analyses dictate the pipe supports or restraints locations, directions, and loads. The significance of any identified deficiency will be limited unless it affects the pipe stress analysis.

For small diameter piping (2-inches and under) that may be field-routed to a specified design criteria, drawings may be prepared or completed onsite. Supports for small diameter piping may be selected, designed, and located by field engineers as specified in the approved design criteria. For some critical small-diameter piping, engineering calculations may be required.

02.02 Pipe Support and Restraint Welding. Inspection of the installation of the pipe restraints and supports should be in accordance with IP 65001.B, "Inspection of the ITAAC-Related Welding Program," and IP 65001.03, "Inspection of ITAAC-Related Installation of Piping." For field welding associated with pipe support and restraint installations (other than integral welded attachments to piping), review and verify the following:

- a. The attributes listed in IP 65001.B, as applicable, have been met.
- b. The integral welded attachments to piping (lugs for riser clamps or axial restraints, stanchions, etc.) that affect pressure boundary material are in accordance with the guidance in IP 65001.03.

Guidance: These inspection requirements can be performed by direct observation and/or record reviews. Inspectors performing this inspection should be familiar with the applicable codes and requirements so they can determine which attributes are applicable to welding pipe supports and restraints. The inspector should also be familiar with other requirements from the design control document (DCD), welding-related design information, welding and QA procedures, and licensee commitments. Knowledge of welding processes, techniques, applications, limitations and evaluations is essential for the assigned NRC inspectors.

The samples should include various welding processes, material combinations, and types of pipe supports and restraints used by the licensee and each of its contractors performing ITAAC-related welding. This scope applies to both visual observations and record reviews. A variety of non-destructive examination processes should also be included.

The inspector should consider the efficiencies gained by performing this inspection in conjunction with pipe and structural welding since the same welding procedures, welders, etc. may be used.

02.03 Concrete Expansion Anchor Installation. For anchor bolts and related components in storage and for installations with concrete expansion anchors perform the following:

- a. Examine the bolts and related components in storage and evaluate any issues involving special preservation requirements, storage conditions, damage controls, material and component identification, and nonconforming material segregation.
- b. Determine whether the installation activities are being adequately controlled by reviewing the applicable procedures, observing work, and checking (e.g., witness torque wrench operation or QA inspection verification) that the bolt has been torqued to the proper tension.
- c. Determine whether the appropriate quality controls have been implemented by using the following items and inspection criteria to determine compliance with work procedures and design and code requirements:
 1. concrete drilling, including depth, perpendicularity, hole diameter, and rebar damage prevention;
 2. embedment depth of the anchor bolt;
 3. bolt length projection beyond the concrete surface and thread engagement for the nut on the bolt;
 4. installation torque to set the anchor bolt;
 5. torque-tension relationship controlled by design;
 6. minimum distance from concrete edges and openings, minimum bolt spacing, and minimum distance from embedded steel;
 7. bolt diameter and applicable markings/stamps;
 8. design provisions for the subsequent installation of the supported components, including quality checks (e.g., use of torque seal).

Guidance: Judgment should be used in selecting the specific sample size for inspection of the concrete expansion anchor installation process. In selecting the sample of installations of concrete expansion anchors, priority should be given to those with ITAAC impact, early installations to do process control checks, and those installations diverse from other installations (e.g., for structural, piping, electrical, or HVAC) for supports using concrete expansion anchors.

QA procedures provide a key element for the effective implementation of inspections, and confirmation that concrete expansion anchor installation controls are adequate. QA inspections should require direct verification of important specification requirements and should not be accomplished merely by surveillance. Laboratory and field testing activities should provide for direct verification of correct material usage, the selection of proper reference standards, and the selection of inspection and testing parameters based on approved procedural direction and guidance. The installation and related procedures should require hold points for in-process inspection activities and address the stop work authority and controls for process control problems.

If any rebar is damaged or cut during installation, ensure design controls are in place to evaluate the cumulative effect on the affected concrete structures. Ensure the anchor bolt embedment depth accounts for any non-structural finish coats, coverings, or grout, on concrete slabs, especially floors.

02.04 Documentation Packages. For records for installations of pipe supports and restraints, verify the following:

- a. Documentation packages for completed pipe support and restraint installations are thorough and accurate.
- b. The installations were in accordance with the provisions of the design specifications and applicable codes for the following attributes:
 1. Material composition and physical characteristics of materials, such as pipe clamps, spring cans, structural members, support components, and welding consumables can be determined by their unique identification (e.g., heat number).
 2. Welding and NDE procedures and personnel are identified for each weld.
 3. NDE records demonstrate that acceptance criteria were met.
 4. Installers were qualified **in accordance with** applicable pipe support and restraint installation procedures, welding procedures, and anchor bolt installation procedures.
 5. As-built drawings are available and any deviations from original design are reconciled with the design documents (e.g., design report).
- c. That the records provide traceability to all aspects of the pipe support and restraint installations, such as materials certification, inspections performed and results, inspectors, and qualification records for procedures and personnel.

Guidance: The final documentation package for pipe support and restraint installation should contain sufficient information and references to demonstrate that the installations met the design specifications and code requirements. The installation records should be retained and stored in accordance with site requirements.

02.05 Problem Identification and Resolution: Select 1 to 2 inspection-identified problems and, if applicable, problems identified prior to this inspection, **and perform** the following:

- a. Verify that the inspection-identified problems were entered, as required, into the licensee's PI&R processes.
- b. Review the associated QA program records for the problems identified during the inspection and identify any specific deficiencies with verification and oversight.
- c. **For previously identified issues, verify** that the licensee addressed the extent of **the** conditions and took the appropriate corrective measures.

Guidance: This inspection is to ensure that problems are entered into the PI&R processes to ensure the appropriate corrective actions are developed and prioritized. **Any** deficiencies **associated with corrective actions should** be considered during inspections of QA Program implementation **(IP 35007)**.

65001.04-03 RESOURCE ESTIMATE

Inspection resources necessary to complete this inspection procedure are estimated to be 400 hours of direct inspection effort over the course of plant construction.

65001.04-04 REFERENCES

NRC Bulletin 79-02, Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts

NRC Bulletin 79-14, Seismic Analyses for As-Built Safety-Related Piping Systems

NRC Bulletin 87-02, Fastener Testing to Determine Conformance with Applicable Material Specifications.

ASME, Section III, Subsection **NF, Supports, Rules for Construction Nuclear Facility Components**.

AISC, Manual of Steel Construction

END

Attachment:
Revision History

Attachment 1 - Revision History for IP 65001.04

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
N/A	04/18/2008 CN 08-012	Researched commitments for 4 years and found none. Initial issuance	N/A	N/A
N/A	ML14197A596 08/13/14 CN 14-018	Corrected designator and title of reference to ASME subsection on supports. Periodic Update.	N/A	N/A