ATTACHMENT 65001.03

INSPECTION OF ITAAC-RELATED INSTALLATION OF PIPING

PROGRAM APPLICABILITY: 2503

65001.03-01 INSPECTION OBJECTIVES

01.01 To determine whether work activities related to piping systems met all requirements for the purchase, receipt inspection, storage, handling, installation, inspection, and testing in accordance with design specifications, approved drawings and procedures, Final Safety Analysis Report (FSAR), and applicable codes and standards.

01.02 To verify that the appropriate records support the receipt, storage, installation, examination, testing, and material traceability of piping systems.

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

01.04 To evaluate whether the appropriate quality assurance (QA) program requirements are implemented for the installation and testing of all piping activities, and to ensure any identified problems are entered into the corrective action process and resolved.

65001.03-02 INSPECTION REQUIREMENTS AND GUIDANCE

This inspection procedure (IP) shall be implemented at the construction site where ITAAC-related piping is finally installed and any location where such piping is first assembled into piping modules prior to installation. 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 piping. 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 piping ITAAC have been met, and piping systems important to safety have been installed and tested in accordance with the provisions of design specifications, drawings, and FSAR. Installation of piping supports and mechanical equipment, such as, pumps and valves are not covered by this procedure.

02.01 Purchase and Receipt of Materials: Select at least seven purchase orders for materials, such as, welding consumables, piping, including pre-fabricated spool pieces, and fittings, then verify the following.

a. The selected materials and their purchase orders met design requirements and verify conformance with design requirements.

b. The documentation of site receipt inspections for the selected materials conforms to their purchase orders.

Guidance: The sample should be a representative cross section of materials and vendors and include several different components as well as welding consumables. The sample should be of various types materials and sizes of piping, e.g., small bore - 2 inch diameter and under and large bore - greater than 2 inch diameter. When comparing the materials purchased against their purchase orders, direct observation of the actual materials in the field is preferred even though the review of receipt inspection reports is permissible. Generally, receipt inspections include the following inspection items:

- The selected materials conform with their purchase specifications, e.g., all piping is the correct size, material type, thickness, seamless or with seams, the specified length and quantity, and with the ends of the piping suitable for welding.

- Documented involvement of engineering staff in the procurement and product acceptance process to identify and prevent potential use of fraudulent materials.

- Quality documentation is the type required by the purchase order (e.g., Certified Material Test Report (CMTR) or Certificate of Compliance).

- Any chemical and physical test results, including heat treatment, as applicable, for a CMTR comply with the material specification required by the design documents.

- Markings and identification of the materials are clear and legible.

- There is no evidence of damage to the materials, e.g., excessive corrosion, gouges, chemical damage, etc.

- The materials are clean, e.g., piping is free of dirt and mud.

- The necessity of surface protection, closures, and packaging for the materials is stated in purchase order.

- Receipt inspection reports were generated and conform to the licensee's procedures.

- Nonconformances affecting the integrity of the materials were properly addressed in accordance with the licensee's procedures.

02.02 Storage and Handling: Select at least five types of materials from the purchase orders in the sample selected in 02.01, then perform the following:

a. Verify that the materials such as, welding consumables, piping, including pre-fabricated spool pieces, and fittings are being properly stored and handled in accordance with approved procedures.

b. For the selected materials, verify that their storage procedures comply with the contractor's (vendors) storage requirements.

Guidance: Welding consumables, such as, coated electrodes, bare weld rod and spools,

and inserts require special handling and storage considerations because these materials are melted during the welding process and become part of the welded joint. Welding material storage procedures must contain requirements for control of contaminants like dirt, grease, and moisture. Contaminants can cause weld defects, such as, lack of fusion, porosity, and cracking due to hydrogen embrittlement. When determining whether the selected materials are stored correctly, the storage conditions of some of the materials should be directly observed in the field.

Piping and fittings are often stored outside, exposed to the elements in lay-down areas at the construction site. As such, carbon steel components may develop a light coating of oxidation (rust). This condition is generally acceptable; however surfaces such as machined or ground bevels must have the rust completely removed prior to the welding operation. All carbon steel components, including chains, should be kept from contact with stainless steel components to prevent surface rusting of the stainless steel components. Only tape containing low levels of halogens and chlorides should be used on stainless steel to help avoid cracking.

Typically, storage inspections include the following inspection items for the materials stored.

- Proper storage classification of materials.
- Status of protective measures at the time of receipt and initial storage.
- Soundness of dunnage or packing material.
- Soundness and correct placement of such things as end caps for piping and protective coverings for weld preparation areas.
- Soundness and correct placement of weather protection in the form of canvas or plastic coverings.
- Protective storage measures to prevent salt water damage (chloride contamination), e.g., near oceans.
- Protective storage measures against invasion of sand or windblown grit.
- Correct and readily visible material identification, in accordance with the purchase order, and with no damage incurred by handling and/or environment.
- Controls against the use of fire retardants near stainless steel piping to prevent any exposure to excessive halogens or chlorides.
- Segregation of all sizes and types of material to the extent possible.

02.03 Installation and Welding: Select at least ten in-process welds, then verify that those welds and the installation of associated piping components are accomplished in accordance with approved drawings, qualified procedures, construction specifications, and

applicable codes and standards by qualified welders as specified in the design documents by verifying the following as applicable.

a. The piping is being installed at the proper location in the plant, at the slope specified, and with the proper clearances from other piping and obstructions in accordance with approved drawings.

b. Welding procedures are in accordance with the codes and standards specified in the design documents (See guidance for clarification of when this should be performed).

c. Welder(s) are qualified for the piping material, electrode/process, and their positions.

d. Welding procedures, detailed drawings and instructions, if applicable, and weld data sheets are at the work station or readily available.

e. Surfaces to be welded have been prepared, cleaned, and inspected in accordance with applicable procedures.

f. Weld joint geometry is as specified in the drawings.

g. Examinations, e.g., by visual (VT) or dye penetrant (PT), of the surfaces to be welded have been performed, and the surfaces were found acceptable in accordance with the specified codes.

h. Components to be welded are assembled at specified gap and alignment within the limits allowed by the drawings or codes.

i. Piping material and welding consumables are of the specified type and grade and are uniquely identified (such as by heat number) preferably by markings on the material or at least in the traveler or accompanying documentation.

j. Tack welds and temporary attachments, such as, bridging bars or fit-up clips have been performed by qualified welders, in accordance with qualified welding procedure specification (WPS).

k. Gas purging, if specified, is used in accordance with the applicable procedure and is provided to shield the welding operation from adverse environmental conditions.

l. Preheat and interpass temperature, if specified, is maintained in accordance with applicable procedure requirements by observing welder's instrumentation.

m. Welding equipment, including power cables and gas lines, are in good condition, and ammeters and voltmeters used for automatic welding have been calibrated in accordance with applicable procedure requirements.

n. Procedures specify appropriate holding and baking temperatures and out-of-oven exposure time for each class of coated electrode.

o. Welding consumable cleanliness is maintained, and electrode moisture pickup is limited in accordance with procedures.

p. Control and identification of welds rods after being issued to the welder are maintained in accordance with procedures.

q. Rod stubs are controlled and disposed of in accordance with procedures.

r. Interpass cleaning, grinding (especially starts and stops) and backgouging, if applicable, are conducted in accordance with the applicable procedures.

s. Temporary attachments, arc strikes and weld splatter are removed and inspected in accordance with specified procedures.

t. A welder's identity is recorded by stamping the weld or by other means, such as, documentation.

u. Repairs performed after the weld is completed and found acceptable by visual inspection or other NDE method shall be accomplished in accordance with approved repair procedures and shall be documented.

v. Any repairs or modifications to ASME Code-stamped components shall be properly documented in the applicable Code data report as required by ASME Sections III and XI.

Guidance: The sample of welds should represent various stages of welds in progress (e.g., weld joint preparation, fit-up, root pass, final pass), types of welding processes (e.g., SMAW, GTAW), pipe sizes, and material types (generally those materials designated in the applicable edition of the ASME Boiler and Pressure Vessel Code, Section IX as P1, P5, and P8) to the extent possible. Consideration should also be given to welds that, because of their physical location or other reason, are difficult to accomplish. The total weld sample after the inspections for this IP are completed should include at least one weld from each major risk component or its associated large bore piping, such as, reactor vessel nozzles, steam generator, pressurizer, etc.

The welding process is generally controlled by a traveler which will specify the steps in completing the weldment, materials to be used, and will also document QA inspections and step completion. Material traceability should be maintained since it has been a significant issue at some construction sites in the past. Cold springing of pipe should be avoided. Any observed cold spring of piping during installation must be in accordance with allowance provided in the approved procedures. The interpass temperature for welding austenitic stainless steels and high nickel alloys should not exceed 350^{o} F. Weld material removal, such as, by light grinding and rewelding is generally permissible during the welding process. Any chain, cable, or brace should not apply anything other than a vertical load on any component of a piping assembly ready for welding.

"Qualified welders" means those employees who have achieved suitable proficiency to do specific welds, to use certain welding processes, and to employ certain welding techniques

based on their training and/or previous experience, and who understand the welding procedures, drawings, and specifications necessary for their work. The licensee must have qualification records that indicate the welder's experience and education.

If welding records were reviewed under IP 65001.B, then do not duplicate that review here to determine if the procedures meet the applicable codes and standards.

02.04 Post Weld Heat Treatment. Select three welds requiring post weld heat treatment (PWHT) over the course of the piping installation phase of construction, then verify that PWHT is performed in accordance with the design specifications and applicable code requirements. The inspector should also verify that when Charpy impact qualification is required for welds requiring PWHT, that both the base metal and the weld material were properly qualified in accordance with the applicable code.

Guidance. The need for PWHT is generally determined by the material type and thickness. For example, carbon steel, low alloy piping such as ASME SA106 typically requires PWHT when the thickness is 1-1/2" or greater when ASME is the applicable code however, PWHT is required when the thickness is greater than 3/4" when B31.1 is the applicable code.

The PWHT procedure shall be in accordance with the applicable code and specify essential parameters such as number and placement of thermocouples, heat up and cool down rate, and soak time and temperature. The PWHT documentation should support that these variables were controlled throughout the process. Typically, chart recorders are used to demonstrate that the heat treat operation was successfully completed.

Governing codes generally require that final NDE of the weld joint be performed after PWHT. Direct observation of PWHT is preferred; however, since most welds do not require PWHT, a review of records is acceptable.

02.05 Pressure Testing. Observe the hydrostatic tests (hydros) of piping installations during the construction phase, then verify that the hydros are in accordance with the applicable codes ,as specified, in the design specifications.

Guidance. The sample size selected for this inspection requirement should be representative of the total sample of hydros associated with the ITAAC selected for review. The inspection of the hydrostatic tests should be in accordance with IP 65001.C.

02.06 Nondestructive Examination (NDE). Observe three welds with NDE in progress and verify that the final NDE has been performed and found acceptable, in accordance with the applicable codes by verifying the following as applicable.

a. The NDE procedure is in accordance with the applicable code as specified in the design specification.

b. The NDE is performed in strict accordance with the procedure by examiners that are qualified for that NDE method.

c. The radiographs of the three welds indicate the welds were acceptable per the applicable code.

d. The temperature of the weld surface is within that qualified for the procedure.

e. For liquid penetrant testing (PT), adequate dwell time was allowed for penetrant application.

f. For magnetic particle testing (MT):

1. Yoke strength was demonstrated at the intervals specified in the procedure.

2. The spacing and current for prods are in accordance with the procedure.

3. Arc marks caused by prods are removed.

g. For ultrasonic testing (UT), the examiner's qualifications, the UT equipment used complies with the procedure, and all UT process variables were strictly controlled.

h. For radiography testing (RT):

1. The type of source, source strength, film type, source to film distance, use of intensifying screens, type and thickness of material being radiographed and exposure times are in accordance with the procedure.

2. The image quality indicators are the correct type and thickness.

3. The required sensitivity and radiograph density meet the applicable code requirement.

4. Applicable radiological safety requirements are met during testing.

Guidance. The sample should include the NDE methods used for piping such as PT, MT, UT, and RT. If NDE is not being performed during the inspection, then a record review would be acceptable of the welds selected. For RT, refer to standards of American Society for Testing and Materials (ASTM) E94-04 and E1032-06.

Typical issues with the performance of NDE are the following:

- Inadequate cleaning of the surface for PT and MT. False indications may result if surface contaminants are present.

- For MT, inadequate magnetic field due to a defective yoke.

- The sensitivity of UT to equipment condition and examiner's performance and interpretation of results.

02.07 Review of Records. Select three installed piping sections, then verify that their documentation packages are thorough, accurate, and support installation in accordance with the provisions of the design specification and applicable codes.

Guidance. The final documentation package for piping installation including welds shall contain the necessary information and references to support the installation met all design, regulatory, and code requirements. The following are examples of where the inspector can focus this review of records.

- Identification of materials, such as, piping, fittings, and welding consumables by, for example, heat number to assess material composition, physical characteristics, and traceability for their receipt, storage, installation, and testing.

- Welding and NDE procedures and welders and examiners are identified for each weld.

- NDE results indicate that all acceptance criteria were met.

- As-built drawings are available and any deviations from original design are reconciled with the design documents (e.g., design report).

- Code data reports are complete and signed off by the assigned Authorized Nuclear Inspector.

- The work or traveler packages conform with the relevant work procedures and other requirements.

02.08 Problem Identification and Resolution. Select 1- 2 problems identified during the inspection and then confirm that the problems 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 MC 2504 process.

65001.03-03 RESOURCE ESTIMATE

Inspection resources necessary to complete this inspection procedure are estimated to be 1600 hours of direct inspection effort over the course of plant construction.

65001.03-04 REFERENCES

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section III (applicable edition)

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section II (applicable edition)

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section V (applicable edition)

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section IX (applicable edition)

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI (applicable edition)

Regulatory Guide 1.38, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants"

Regulatory Guide 1.58, "Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel"

ASTM E94-04, “Standard Guide for Radiographic Examination”

ASTM E1032-06, “Standard Test Method for Radiographic Examination of Weldments”

ANSI N45.2.2, "Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants"

ANSI N45.2.6, "Qualifications for Inspection, Examination and Testing Personnel"

END

Attachment 1: Revision History for IP 65001.03

Attachment 1

Revision History for IP 65001.03

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	08/19/08 CN 08-024	Researched commitments for 4 years and found none. Initial issuance to support ITAAC related inspections under 10CFR52.	N/A	N/A	N/A