

## ATTACHMENT 65001.05

### INSPECTION OF ITAAC-RELATED INSTALLATION OF REACTOR PRESSURE VESSEL AND INTERNALS

PROGRAM APPLICABILITY: 2503

#### 65001.05-01 INSPECTION OBJECTIVES

01.01 Verify that the purchased RPV and internal components are in accordance with the approved design.

01.02 Verify that the RPV and internal components are properly stored and handled in accordance with approved procedures.

01.03 Verify by observation or records that the RPV is installed in accordance with design drawings.

01.04 Verify that procedures for protection of the installed reactor vessel are being followed.

01.05 Verify that RPV internals are installed in accordance with approved procedures and design requirements.

01.06 Verify that the RPV head is installed in accordance with contractor and licensee procedures.

01.07 Verify that documentation packages for the RPV and internals installation are thorough and accurate.

01.08 Verify that problems identified during the inspection are entered into the licensee/constructor corrective action program in accordance with program requirements.

#### 65001.05-02 INSPECTION REQUIREMENTS AND GUIDANCE

This inspection procedure (IP) will be performed to verify critical activities related to the storage and handling, installation, examination, and testing of the RPV and internal components. Critical activities for this procedure include receipt and storage of the RPV on site, final placement of the RPV and internals per design drawings, and activities related to the installation and preparation of RPV internal components. For this IP, the field activities related to the RPV and internals installation ITAAC should be in accordance with the provisions of those ITAAC and other appropriate design documents. This IP will probably be performed in several inspections; therefore not all of the steps of this IP have to be performed for each inspection.

02.01 Purchase and Receipt of Components. Verify that the purchased RPV and internal components are in accordance with the approved design.

Guidance: The purchase order and accompanying documentation should be in compliance with the design requirements. The licensee's receipt inspection should identify any nonconformances and whether the disposition of each was acceptable. The purchase order should identify the type of quality documentation required (e.g., Certified Material Test Report (CMTR)). For a CMTR, the chemical and physical test results for materials such as plate, forgings, piping, and welding consumables, including heat treatment as applicable, should comply with the material specification required by the design documents. For example, materials in the beltline region of the RPV may have a minimum Charpy upper shelf value of 75 foot-pounds at a specified temperature. Although the RPV head may not be attached to the RPV at this time, the RPV head if available onsite should be included with this review. Typical attributes included in receipt inspections are:

- Components in conformance with purchase specification
- Marking and identification
- Evidence of damage
- Cleanliness at time of receipt
- Surface protection, closures, and packaging
- Maintenance of inert gas cover

02.02 Storage and Handling. Verify that the RPV and internal components are properly stored and handled in accordance with approved procedures.

Guidance: The RPV and internals require special handling and storage considerations due to their size, mass, and cleanliness requirements. The storage and handling of the RPV head should also be taken into account. Lifting devices, rigging, and pathways must be specifically designed and tested and/or examined by nondestructive examination (NDE) before use. For example, prior to transporting the RPV to the building, the access roadway may require extensive rework, and a test load transported over it. Procedures will require that the lifting device and rigging support the load for some designated time period before commencing the lift, and the lift rate should be controlled. This is done to verify lifting device stability and wire rope stretch. Travel speed while being transported must be controlled. Rigging and lifting procedures for these components must be strictly followed. The inspectors may refer to four listed EPRI documents in the references to this IP for insights on rigging practices.

The RPV and internal components are often stored outside and exposed to the elements in lay-down areas located around the construction site. As such, carbon steel components may develop a light coating of oxidation (rust). This condition is generally acceptable; however, welding surfaces such as machined or ground bevels must have the rust completely removed prior to the welding operation. Stainless steel components should be

stored separate from carbon steel components as contact with carbon steel will contaminate the stainless steel and cause surface rust to appear. Likewise, carbon steel chains should be avoided when rigging to lift stainless components. Any tape used on stainless steel, such as to hold end caps in place, should be verified as containing low halogen and chlorides as these are known to promote cracking.

The RPV may be stored in a covered building or may be stored outside. The following criteria, as applicable, should be addressed for storage of the RPV head. Typical attributes to verify are:

- The reactor vessel is stored in accordance with approved procedures.
- The condition of seals and devices to maintain and indicate vessel internal atmospheric conditions are in accordance with requirements.
- The condition of protective coating or/and protective covering is/are in conformance with requirements.
- The dunnage or packing should prevent entry of dirt and water
- The RPV's support structure should prevent flooding based on its height and have the appropriate strength to be able to bear the weight of the RPV.

02.03 RPV Installation. Verify by observation or records that the RPV is installed in accordance with design drawings.

Guidance: The RPV as-installed elevation and azimuth are most critical. The location of the RPV and support system are generally established with laser equipment that is very precise. Any deviation from design may result in unacceptable cold spring of connecting piping and must be resolved.

02.04 Installed Vessel Protection. Verify that procedures for protection of the installed reactor vessel are being followed.

Guidance: The installed RPV will be exposed to a construction environment within the containment and must be protected from both physical damage and foreign material entry. The vessel closure head flange surface and vessel nozzles are particularly susceptible to physical damage. Foreign material exclusion (FME) practices must be maintained throughout construction. Typical attributes to verify during inspection are:

- Procedures for protection of the installed reactor vessel are followed.
- Protective devices installed around the top of the open vessel prevent entry of foreign objects and debris and protect the flange surface.
- Vessel side openings are blanked off to prevent entry of foreign objects, and nozzle ends are protected from construction damage.

- Work platforms and scaffolding inside vessel are nonflammable or treated to prevent the spread of accidental fires, and fire watch procedures are implemented when applicable.
- Access to RPV is controlled, i.e., entry of authorized tools, equipment, and personnel only.

02.05 Installation and Welding of Reactor Internals. Verify that RPV internals are installed in accordance with approved procedures and design requirements.

Guidance: The extent of field welding activities of reactor vessel internals may vary significantly with different contractors. Historically, BWRs have required more field welding of internals than PWRs. Welds will require some form of nondestructive examination. Accurate orientation of internals and maintenance of cleanliness requirements are of primary concern. The upper and lower internals assemblies, control rod drive mechanisms, and incore instrumentation guide tubes are classified as American Society of Mechanical Engineers (ASME), Section III components. Typical inspection attributes to verify are:

- Documentation, such as Code data reports for internal components is in compliance with ASME Section III requirements.
- The orientation and fit up of internal components is in accordance with the Nuclear Steam Supply System (NSSS) contractor and design document requirements. Application of excessive force to the extent of bending or cold springing of internal components is not permitted unless required by engineering analysis.
- Welding activities are in accordance with NSSS specifications and Code requirements. IP 65001.B, "Welding" can be used as a general guide to inspect RPV internals welding. Historically, alignment of components has necessitated the use of "draw bead" welding. This technique relies on weld bead shrinkage to effect movement of components. If this technique is utilized, there should be strict procedural conformance.
- Bolting material for internal components meets design requirements, and preload specifications have been met. RPV internal bolting will generally include some positive means for preventing loosening.
- Housekeeping and FME procedures must be strictly enforced.
- Final NDE has been performed on any installation welds and found acceptable, in accordance with the applicable code and the work package instructions. Observe NDE in progress on at least three welds, but the inspector can observe more welds in progress than just three. Examiners must be qualified for the method and procedure that they are performing. If NDE is not being performed during the inspection, perform a record review.

02.06 Installation of RPV Head: Verify that the RPV head is installed in accordance with contractor and licensee procedures.

Guidance: This procedure is concerned mainly with the RPV and internals. However, this step is included to ensure that inspectors observe the first installation of the RPV head at a time late in construction.

02.07 Records Review: Verify that documentation packages for the RPV and internals installation are thorough and accurate. Confirm installation in accordance with the provisions of the design specification and applicable codes. Review the completed documentation for the RPV and at least one internal component.

Guidance: The final documentation package for the RPV and internals installation shall contain the necessary information and references to confirm that the installation meets the design and Code requirements, including.

- Components and welding consumables are uniquely identified (e.g., heat number) such that the inspector can verify material composition and physical characteristics are in accordance with the design documents.
- Welding and NDE procedures and personnel are identified for each weld. NDE results indicate that 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).
- Documentation indicates that all required tests (e.g., hydrostatic test) and examinations (e.g., alignment verifications) have met the acceptance criteria.
- Code data reports are complete and signed off by the assigned Authorized Nuclear Inspector.

02.08 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 verify that the licensee identified the extent of conditions and to confirm the effectiveness of the licensee's corrective measures.

Guidance: This inspection activity is to assure that the licensee identifies, prioritizes, and take measures to correct problems. Inspections of QA Program implementation, effectiveness of Problem Identification and Resolution, and Self-Assessment will be performed under IMC 2504.

#### 65001.05-03 RESOURCE ESTIMATE

Inspection resources necessary to complete this inspection procedure are estimated to be

920 hours of direct inspection effort over the course of plant construction.

#### 65001.05-04 REFERENCES

Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants"

Regulatory Guide 1.31, "Control of Stainless Steel Welding"

ASME Boiler and Pressure Vessel Code, Section III, Subsections NA and NB

ASME Boiler and Pressure Vessel Code, Sections V and IX

Regulatory Guide 1.65, "Materials and Inspections for Reactor Vessel Closure Studs"

EPRI 1007914, "Lifting, Rigging, and Small Hoist Usage Program Guide"

EPRI 1009706, "Rigger's Handbook"

EPRI 1007676, "Guidelines for Using Synthetic Slings for Lifting and Rigging"

EPRI 1000986, "Crane Maintenance and Application Guide"

END

Attachment 1: Revision History for IP 65001.05

Attachment 1

Revision History For 65001.05

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 issue to support ITAAC related New Reactor Construction Inspections under 10CFR52	N/A	N/A	N/A