ATTACHMENT 65001.13

INSPECTION OF ITAAC-RELATED INSTALLATION OF LOAD HANDLING EQUIPMENT AND FUEL RACKS

PROGRAM APPLICABILITY: 2503

65001.13-01 INSPECTION OBJECTIVES

01.01 To determine whether installation activities of both New Fuel Storage Racks (NFR) and Spent Fuel Storage Racks (SFR) are in accordance with the Design Control Document (DCD), Final Safety Analysis Report (FSAR), industry code requirements, owner and vendor approved procedures, and regulatory requirements.

01.02 To determine whether installation of Refueling Light Load Handling and Overhead Heavy Load Handling Equipment is in accordance with the FSAR, DCD, industry code requirements, owner and vendor approved procedures, and regulatory requirements.

01.03 To determine whether post installation activities are being performed according to applicable instructions and quality assurance requirements.

01.04 To determine whether Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) related activities are being conducted in accordance with established procedures and test acceptance criteria have been met.

01.05 To evaluate the adequacy of the implementation of the specific Quality Assurance (QA) program requirements related to installation activities including the identification, resolution, tracking and trending of problems within the corrective action program.

65001.13-02 INSPECTION REQUIREMENTS AND GUIDANCE

For purposes of this procedure, load-handling equipment and fuel racks may include the following components.

a. Fuel Racks

    1. New Fuel Dry Storage Racks consist of the supported racks that will contain the new reactor fuel in dry storage within the new fuel storage area.

    2 Spent Fuel Storage Racks consist of the supported racks that will contain the new fuel until placed in the reactor and the spent reactor fuel under water within the Spent Fuel Pool.

b. Load Handling Equipment

1. Light Load Handling Equipment (Related to Refueling) includes the fuel handling and refueling system which consist of equipment and structures used for conducting refueling operations.

2. Overhead Heavy Load Handling Systems consist of equipment which lift loads whose weight is greater than the combined weight of a single spent fuel assembly and its handling device. This equipment would be used for activities such as reactor disassembly, spent fuel cask handling, and movement of critical parts of the reactor or support components. These cranes are generally safety related and seismically qualified and remain in the vicinity of the reactor or refuel floor. For example, the AP1000 Heavy Load Handling Systems include the following: Containment Polar Crane, Equipment Hatch Hoist, Maintenance Hatch Hoist, Spent Fuel Shipping Cask Crane, Main Steam Isolation Valve (MSIV) Monorail Hoists.

02.01 Fuel Rack Installation. Select a sample of installation activities for both NFR and SFR described above. Through direct inspection, confirm that both the general QA attributes described in section 01.05 and the following attributes, as applicable, have been met:

a. NFR and SFR are fabricated using the proper material (base metal and neutron absorbing material) as described in the design documents and manufacturer's specifications.

b. NFR and SFR are properly supported and/or restrained so as to comply with appropriate seismic classification specified in the design documents.

c. Installation requirements have been met such as: proper location, orientation, alignment, spacing, placement, dimensions, tolerances, and quantity.

d. A seismic stress analysis for the safe shutdown earthquake and a stress analysis for the fuel rack design loads should be complete and have been reviewed and approved by the licensee prior to installation.

e. Utilization of specially trained and qualified personnel and equipment where required to meet manufacturers' instructions.

f. Appropriate drawings and work procedures are available to installation personnel. Installation requirements, construction drawings, specifications, and work procedures are of the latest approved revision.

g. Proper QA controls are implemented for installation activities in accordance with program procedures and regulatory requirements.

General Guidance. This inspection should be performed on a sampling basis during component installation activities and will conclude when the licensee's final acceptance tests are completed. Field observations can include independent

measurement/observation or observation of licensee/contractor inspections. While all applicable attributes do not need to be reviewed for each sample, the majority should be reviewed and samples/attributes reviewed should include all facets of installation activities including backshift activities. Generally, Fuel Storage and Handling is addressed in Chapter 9, Auxiliary Systems, of the FSAR. If welding is performed within the scope of fuel rack installation, refer to inspection procedure 65001.B for additional guidance. (Applicable welding codes may be found in the FSAR)

Specific Guidance.

a. Reference the applicable FSAR and licensee purchase / design and installation specifications.

b. As an example, for the AP1000, the NFRs rest on the floor, but lateral supports are attached to New Fuel Pit. SFRs are free standing and not anchored to the floor nor the spent fuel pool wall.

c. Rack installation should not distort the rack geometry or have any detrimental impact on rack mechanical integrity (over stress, exposure to contamination, etc). Handling and rigging of the racks should be carefully planned and effectively implemented. Installation rigging points on the racks should be inspected for localized damage. Dimensional and visual checks should be made to assure no distortion prior to and post installation. Distortion could impact a smooth fuel assembly fit into the racks. Dummy fuel assembly loading into all/random rack storage areas should be used to identify any anomalies or non-conforming conditions. The racks should comply with the installation requirements including dimensional clearances and leveling criteria.

   Confirm that precautions are included in work instructions to prevent rack damage during storage/installation and are adhered to. For example, prior to installation lifts, pre-job briefs should take place, and rigging equipment should be inspected per both site administrative controls and appropriate ANSI standards. Spread lift rigs should be utilized as recommended by the vendor

   Post-installation conditions should periodically be observed throughout the construction period to assure components are properly protected and maintained until final turnover.

d. Both NFRs and SFRs shall have a vendor provided confirmatory dynamic and stress analysis. The licensee shall have reviewed and accepted these analyses and installation instructions shall assure installation meets the design that was analyzed. The racks shall also have a Seismic Category 1 (Per RG-1.29) stress analysis that the licensee has reviewed and approved if completed by a vendor. The inspector should reference the DCD and FSAR for specific guidance.

   For seismic components, the inspector should pay particular attention to the traceability of material and equipment to prevent the use of incorrect or defective materials, parts, and components. The inspector should ensure that required identification of the item is maintained by part number, bolting grading, serial number, or other appropriate means, either on the item or on records traceable to

the item, and that any required markings are on the item. In the case of critical fasteners, compliance with the applicable material specification (e.g. purchase order and vendor identification) should be verified by required markings on bolts and nuts and certified material test reports or certificates of conformance as required by the applicable procurement drawings and specifications and/or by the applicable codes. In the case of vendor-supplied equipment assemblies containing fasteners, samples should be inspected to verify compliance with approved vendor drawings, design and code specifications, and other information.

Field observations should include independent measurement/observation, or alternatively, observation of licensee/contractor inspections. While all applicable attributes do not need to be reviewed for each sample, the review should include all facets of installation activities.

e. Review the manufacturer's instructions for installation of the NFR and SFR. Determine if they specify that personnel with special training should be utilized for the installation. If so, determine if specially trained personnel are being utilized to meet the specification.

f. Height of the SFRs relative to the anticipated pool water depth should be confirmed for required water coverage/protection. Water flow paths around the SFRs and the clearance between the pool walls and the rack shall be in accordance with installation requirements. The licensee's analysis shall demonstrate the ability of cooling water to naturally circulate through the racks and provide adequate cooling to the spent fuel. If applicable, ensure that new fuel storage area floor drains are installed and free from obstruction and are protected from foreign material being trapped in the drain during installation. Ensure that if foreign material covers are installed they are then removed when the pit is put in service.

g. Additional guidance for QA requirements are in section 65001.13-02.05. QA items that the inspector should pay particular attention to include the following: quality control hold points, quality of QA records, QA record management, and field changes are properly controlled. The inspector should review the licensee's procurement packages for equipment inspected under this procedure.

02.02 Refueling Light Load Handling and Overhead Heavy Load Handling Equipment Installation. Select a sample of installation activities for both the Light Load Handling Equipment and Overhead Heavy Load Handling Systems described above. Through direct inspection, confirm that both the general QA attributes described in section 01.05 and the following attributes, as applicable, have been met:

a. Load handling equipment has been fabricated using the proper materials and techniques as described in the construction code and design documents.

b. Crane installation is in accordance with design drawings, design specification, and licensee procedures.

c. Crane maximum load is adequate for its use and has been analyzed by the licensee. If appropriate, review load limit set points for compliance to design requirements.

d. Refueling equipment specified in the DCD and the FSAR meets purchase specifications and has been installed or stored in accordance with established site procedures.

e. Verify that the crane meets the Single Failure Proof Guidelines stated in NUREG-0554.

f. Crane complies with seismic design criteria.

g. Utilization of specially trained personnel and equipment where required to meet manufacturers' instructions.

h. Installation requirements, construction drawings, specifications, and work procedures contain the latest revisions and are available to craft personnel.

I. Proper QA controls are implemented for installation activities in accordance with program procedures and the licensee's QA program requirements.

j. Structural and/or fabrication welding is completed in accordance with applicable welding codes, standards, manufacturer's installation requirements, qualified welding procedures and the licensee's QA program requirements related to the control of special processes.

General Guidance. This inspection should be performed as often as significant component installation activities are taking place. Field observations can include independent measurement/observation or observation of licensee/contractor inspections. While all applicable attributes do not need to be reviewed for each sample, the majority should be reviewed and samples/attributes reviewed should include all facets of installation activities. Generally, Load Handling Equipment is addressed in Chapter 9, Auxiliary Systems, of the FSAR.

Specific Guidance.

Light Load Handling Systems.

a. The LLHS design shall conform to applicable requirements specified in ANS 57.1-1992, "Design Requirements for Light Water Reactor Fuel Handling Systems."

b. Verify allowable crane movement has been analyzed by the licensee. For example, movement of the AP1000 New Fuel Jib Crane is positioned such that it cannot reach the spent fuel storage positions. Test movement and verification of limitations shall be conducted on all possible load paths.

   Other installation requirements such as: coatings, orientation, alignment, dimensional tolerances, and other mounting requirements should be verified.

The rails for the fuel moving equipment should be checked for dimensional acceptability; the successful transport of fuel is in the alignment and smoothness of operation of the machine to rail interface.

Distance between rails and the level of the rail should be checked. The rails should be parallel along their length. Centerline distance between rails and the wheels of carts shall meet drawing tolerances. Lift cabling installation, installation requirements and method of attachment/adjustment are potential critical points for inspection. Hydraulic equipment should be checked for leak tightness and smooth operation.

Verify adequate precautions are taken to prevent damage during placement/mounting. For example, prior to installation lifts, pre-job briefs should take place, and rigging equipment should be inspected per site administrative controls and appropriate ANSI standards. Spread lift rigs should be utilized as recommended by the vendor and other documentation.

For additional electrical installation guidance, utilize IPs 65001.8 and .9. Power sources/supplies to components should be reliable. The breaker for the component should not have other intermittent, permanent, or temporary loads that can overload the supply breaker.

c. If present for the reactor type, the jib crane has a maximum load rating. This crane as well as all cranes should be clearly marked with their maximum rating. The licensee shall verify that the crane is capable of this maximum load. The jib crane may get used as a general lift apparatus and its load limit can unintentionally be exceeded. Administrative controls should be used to limit the crane's use. Fuel handling cranes and platforms typically have a maximum load rating. There shall be a vendor provided analysis on this topic.

d. Fuel handling tools should be sampled for compliance with drawing dimensional tolerance.

e. Review the DCD and FSAR to determine if the licensee is committed to follow NUREG-0554. If so, verify that the crane meets the Single Failure Proof Guidelines stated in NUREG-0554.

f. A particular crane may be designed to Seismic Category 1 requirements as described in Regulatory Guide (RG) - 1.29. Some cranes may be designed to Seismic Category II (such as the Fuel Handling Jib Crane for the AP1000).

g. Review the manufacturer's instructions for installation and first operation of the cranes and light load handling equipment. Determine if they specify that personnel with special training should be utilized for the installation. If so, determine if specially trained personnel are being utilized to meet the specification.

h. Installation requirements, construction drawings, specifications, and work procedures are of the latest approved revision.

i. Additional guidance for QA requirements are in section 65001.13-02.05. QA items of particular interest include: verification of QC hold points, QA record quality and retention requirements, QA records management, and review of field changes to confirm that they do not deviate from the approved design. The inspector should review the licensee's procurement packages for purchased equipment inspected under this inspection procedure.

j. If welding is required for component installation, select a sample of welds for review. Through direct observations and/or record reviews, confirm the applicable attributes listed in IP 65001.B have been met.

Inspectors performing this inspection should be familiar with the applicable industry code requirements such as the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section IX, Welding and Brazing Qualifications. (NOTE: ASME Section IX is only a qualification code, the code requirements for fabrication using welding techniques are contained in the appropriate construction code, such as ASME Section III or ASME NOG-1). The inspector should also be familiar with the other requirements from the FSAR, DCD, other welding related design information, applicable process procedures, QA program requirements, and commitments. The inspector should be familiar with general welding practices and specific welding techniques. Additionally, the inspector should be competent in nondestructive testing techniques such as, visual examination, Magnetic Particle, Liquid Penetrant, Radiographic, and Ultrasonic.

The selected samples should include sufficient variety to assure that various welding processes and material combinations are observed for each constructor performing ITAAC-related welding. This scope applies to both observations and record reviews. A variety of nondestructive examination processes should also be included.

The inspector should consider efficiencies gained by performing this inspection along with other welding activities since these may be the same craft personnel, procedures, welders, etc.

Records shall provide traceability of the welding activity such as weld procedures used, identification of welders, material certification, inspections performed and results, inspectors, and qualification records for procedures and personnel. These records shall be retained and stored in accordance with QA requirements.

Overhead Heavy Load Handling Systems (OHLHS)

Based on review of design specifications, industry codes, ITAAC requirements, drawings, engineering calculations, station procedures, and field observations, verify:

a. The OHLHS is seismically qualified, where applicable, and that the as-installed equipment including anchorage is seismically bounded by the tested or analyzed conditions.

b. The OHLHS meets one of three safety guidelines for load drops as described in Standard Review Plan 9.1.5, Overhead Heavy Load Handling System.

c. Procedural controls have been established for the design, operation, testing, maintenance, and inspection of the OHLHS consistent with section 5.1.1 of NUREG-0612 and SRP 9.1.5.

d. Load testing of the OHLHS cranes main and auxiliary hoists is satisfactory, meet applicable Code and ITAAC requirements, and bound the expected load weights. Pre-operational inspection and testing of overhead cranes is typically governed by ASME NOG-1. Tests shall include operational testing with 100 percent load to demonstrate function and speed controls for bridge, trolley, and hoist drives and proper functioning of limit switches, locking and safety devices. A rated load test is performed with a 125 percent load.

e. Testing is completed satisfactorily to confirm that the uncontrolled lowering of a heavy load is prevented. Testing meets applicable Code and ITAAC requirements, and bounds the expected load weights. The crane braking subsystem should be clearly understood prior to testing. Dynamic and Emergency braking pretest shall verify proper operation prior to the application of loads. For highly reliable/single failure proof cranes, Section 8 of NUREG-0554 provides additional testing guidance.

f. Programmatic controls are established and in place for the inspection and use of slings and special lifting devices.

g. Crane rails shall be inspected for dimensional acceptability prior to setting the crane. Vendor rail installation instructions in the containment may require an understanding of rebar locations in the concrete matrix. Installation may have to be coordinated with containment welding inspections or roof closure. The rails should be circular and in a common plane within tolerance.

h. Power sources/supplies to components should be reliable and should not have other intermittent permanent or temporary loads that can overload the supply breaker. For additional electrical installation guidance, utilize IP 65001.08 and IP 65001.09.

i. Crane movement paths are to be clearly prescribed. Exact locations relative to crane movement position must be established such that fuel, crane, and other equipment are not damaged. Interlock position detectors for crane movement limitations should be identified and mounted appropriately. Interlocks for load paths shall be tested. The cask handling crane shall be interlocked such that it cannot traverse over the spent fuel pool, new fuel pit, or fuel transfer canal

j. Review appropriate references (below) for inspection details.

02.03 Post Installation Activities. Select at least one component from each group of equipment for review (NFR, SFR, Load Handling Equipment), with emphasis on the more significant ITAAC-related components previously selected for Section 02.01 and 02.02. Confirm these components are properly protected and maintained considering the following attributes, as applicable:

a. Periodic inspections are being performed in accordance with established procedures.

b. Protection is provided as required against adverse temperature, humidity, flooding, and foreign materials such as dirt, dust, and construction debris.

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

d. Records are being maintained as to the status of installed components.

e. Appropriate stamps, tags, markings, etc. are in use to prevent missing required inspections and tests, and the prevention of inadvertent operation.

f. If applicable, ensure that new fuel storage area floor drains are free from obstruction and are protected from foreign material being trapped in the drain during installation, fabrication, and post installation.

Guidance. Post-installation activities should be observed monthly throughout the construction period to assure components are properly maintained until final turnover.

02.04 Testing and Verification. Select a sufficient number of component ITAAC-related testing activities to assure testing is conducted in accordance with established procedures and test acceptance criteria have been met.

General Guidance. The inspector should review the FSAR, DCD and review the ITAAC that are associated with this inspection procedure. The inspector should determine what specific acceptance criteria are established and select those for observation that are best confirmed through direct observation. Others should be confirmed through record/data review although direct observation is the preferred method of inspection for most.

This inspection should be coordinated with IP 65001.C, Construction Testing; IP 65001.D, Operational Testing; and MC 2504 guidance. Sample size will be dependant on guidance from those IPs and the size of the targeted ITAAC sets.

Specific Guidance.

a. NFR and SFR

As indicated in the installation section above, dummy (go/no-go) assembly trial insertions using the fuel handling equipment should be used to identify fuel rack installation problems. All interlocks associated with design minimum and maximum rack positions shall be tested in accordance with the applicable ITAAC.

b. Light Load Handling Equipment (Refueling)

1. The fuel handling equipment should have a visible maximum load rating. The vendor provided analysis on the adequacy of a particular load value shall be available for review. Load testing shall be completed per code requirements and in accordance with specific administrative procedures. Testing shall be completed prior to placing the equipment in service, and prior to any fuel handling.

2. Cabling, electrical operation of components, and hydraulics should move smoothly during testing. Other components of the handling equipment such as upenders should not vibrate or bind during operation.
Power sources/supplies to components should be reliable. The breaker for the component should not have other intermittent loads that can overload the supply breaker with the components in operation. With power removed from the component, the component should fail to a braked, non-moving position.

Pivot fasteners should not tend to loosen themselves while in operation.

Interlock position detectors for fuel movement limits should be clearly identified and mounted appropriately. Trial movement of equipment should be accomplished on all load paths.

c. Overhead Heavy Load Equipment

1. ITAAC and FSAR should require specific load testing. Review those requirements prior to testing initiation. Preoperational inspection and testing of overhead cranes is typically governed by ASME NOG-1. Tests shall include operational testing with 100 percent load to demonstrate function and speed controls for bridge, trolley, and hoist drives and proper functioning of limit switches, locking and safety devices. A rated load test shall be performed with a 125 percent load.

2. Crane movement paths are to be clearly prescribed. Exact locations relative to crane movement position must be established such that fuel, crane, other equipment are not damaged.

The crane braking subsystem should be clearly understood prior to testing. The dynamic and emergency braking pretests shall confirm proper operation prior to the application of loads. Section 8 of NUREG-0554 provides additional testing guidance.

3. Interlock position detectors for crane movement limitations should be identified and mounted appropriately. Interlocks for all load paths shall be tested.

Review appropriate references for cranes for other details of inspection (see below references).

02.05 Quality Assurance Program (Corrective Action Program). Evaluate the adequacy of the implementation of the specific quality assurance program requirements related to installation of load handling equipment and fuel storage racks. Confirm that problems identified associated with installation of load handling equipment and fuel storage racks 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 activity is to assure that problems are identified and entered into the applicable process to assure corrective actions appropriate to the circumstances are developed, prioritized, and implemented. Inspections of Quality Assurance Program implementation, effectiveness of Problem Identification and Resolution, and Self-Assessment will be performed under the MC 2504 process.

65001.13-03 RESOURCE ESTIMATE

The average resource expenditure for this inspection procedure is estimated to be 200 hours per Unit.

65001.13-04 REFERENCES

IP 65001.B, Welding

IP 65001.11, Containment Integrity

IP 65001.C, Construction Testing

IP 65001.D, Operational Testing

NUREG-0554, Single-Failure-Proof Cranes for Nuclear Power Plants

NUREG-0612, Control of Heavy Loads at Nuclear Power Plants (Microfiche location 6411/280)

RG 1.13, Spent Fuel Storage Facility Design Basis

RG 1.29, Seismic Design Classification

RG 1.54, Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants

RG 1.84, Design and Fabrication Code Case Acceptability, ASME Section III, Division 1

RG 1.124, Service Limits and Loading Combinations for Class 1 Linear-Type Component Supports (Rev. 1, ML003739380)

RG 1.130, Service Limits and Loading Combinations for Class 1 Plate-and-Shell-Type Component Supports (Rev. 1, ML003740123)

ANS 57.1, Design Requirements for Light Water Reactor Fuel Handling Systems

ANSI N210-76, Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Stations

ANSI-N 14.6, Standard for Special Lifting Devices for Shipping Containers Weighing

10,000 Pounds (5 ton) or More for Nuclear Materials

ANSI B30.9, “Slings”

ANSI B30.10 , “Hooks”

ANSI B30.2, Performance Standards for Overhead Electric Wire Rope Hoists

ANSI B30.16, Performance Standards for Air Wire Rope Hoists

ANSI B30.11, Overhead and Gantry Cranes

ASME NOG-1, Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)

ASME B&PV Code Section III

AWS D1.1, Structural Welding Code

AWS D14.1, Specification for Welding Industrial and Mill Cranes

CMAA-70, Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes

ANSI/ANS 57.3, Design Requirements for New Fuel Storage Facilities at Light Water Reactor Plants

NUREG-0800, Standard Review Plan 9.1.4, Light Load Handling System (Related to Refueling)

NUREG-0800, Standard Review Plan 9.1.5, Overhead Heavy Load Handling Systems

NUREG-0800, Standard Review Plan 9.1.2, New and Spent Fuel Storage

END

Attachment 1: Revision History for IP 65001.13

Attachment 1

Revision History for IP 65001.13

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment Resolution Accession Number
N/A	08/05/09 CN 09-019	Researched commitments for 4 years and found none. Initial issuance to support ITAAC related inspections under 10 CFR 52	No	N/A	N/A