INSPECTION PROCEDURE 48053

STRUCTURAL STEEL AND SUPPORTS WORK OBSERVATION

PROGRAM APPLICABILITY: 2512

48053-01 INSPECTION OBJECTIVES

01.01 To determine by direct observation and independent evaluation whether work and inspection performance relative to structural steel and supports are being accomplished in accordance with specifications and procedures.

01.02 To determine whether inadequacies in work activities associated with structural steel and supports indicate a management control problem or generic weaknesses.

Inspection Schedule

May Be Started	Must Be Started	Must Be Completed
As structural steel or support work is started, including containment floor liner plates	Before structural steel or support work is 10% complete	Before structural steel or support work is 80% complete

48053-02 INSPECTION REQUIREMENTS

02.01 Review the results of the inspection performed under Inspection Procedure (IP) 48051.

02.02 Review the specifications, drawings, and QA/QC and construction procedures applicable to those structural steel and support activities selected to be reviewed in Section 02.03 below.

02.03 Select two containment steel areas (of the steel containment or liner plate), two major equipment steel supports inside containment, one safety-related steel structure, and one major safety-related equipment steel support outside containment. There should be a coordination of inspection effort between the civil, mechanical, and welding disciplines. Ascertain whether the following activities are being controlled, inspected, and accomplished in accordance with the requirements of the documents reviewed in Section 02.02 above:

a. Receipt Inspection and Storage. Verify that the following items have been implemented:

1. Receipt inspections verify the acceptability of inspectable specification requirements.

2. Control, marking, protection, and segregation are maintained during storage.

b. Use of Specified Materials and Components. On a sampling basis verify the following:

1. Type and grade of materials are as indicated in specifications and drawings.

2. Certificates of conformance or mill test reports meet the proper specifications or physical and chemical requirements, including impact tests if required.

c. Installation and Erection. Verify that the following items are implemented in the installation or erection process:

1. The component or support is being erected in accordance with the most current specifications and drawings.

2. The layout crew's instruments and tapes are calibrated.

3. Fit-up and alignment meets the tolerances in the specifications and drawings.

4. Components are being properly handled (including bending or straightening).

5. Specified clearances are being maintained.

6. Edge finishes and hole sizes are within tolerances.

7. Anchor bolts, embedded weldments, liner plate anchors, concrete anchors and studs are of the proper material and grade and have been properly located, and tested and examined.

8. For bolted connections: bolts, nuts, and washers are of the specified type and grade; torque wrenches are calibrated in accordance with approved procedures; other test and measuring equipment used in the bolting process are calibrated, and thread engagement is as specified.

   The inspector should independently sample approximately 200-400 installed and QC-accepted bolts or 20-40 bolted connections of various bolt diameters by use of a calibrated torque wrench to ensure proper tension is being developed in the bolt. Proper torque values may be obtained through the use of site-generated data or the inspector may request licensee assistance in establishing the proper torque tension relationship using a Skidmore-Wilhelm testing machine.

   For friction type connections, ensure the craft follow the procedures properly so that the bolts will have the required bolt tension. For instance when the turn-of-nut method is used, make sure enough bolts are brought to a "snug tight" condition to ensure that the parts of the joint are brought into good contact with each other.

For sliding type connections, ensure the craft follow the procedures properly so that the bolts are not over tightened and that bolts are not at the end of slots, preventing movement of the connection.

9. For the review of welded connections, refer to the inspection procedure (Nuclear Welding or Structural Welding) applicable to the items inspected.

d. Inspection, Testing, NDE, and Records. For inspection, testing, NDE, and records verify the following items:

1. Inspections are performed at the specified frequency in accordance with appropriate codes, specifications, and procedures, and adequate acceptance criteria are specified.

2. Accurate records are developed in accordance with procedures.

3. Proper and calibrated equipment is used as required.

4. Personnel conducting testing and NDE are qualified as required (i.e., in accordance with SNT-TC-1A).

5. For the review of welded connections refer to the inspection procedure (Nuclear Welding or Structural Welding) applicable to the items inspected.

02.04 Informal interviews with field craft and inspection (QA/QC) personnel should be randomly conducted to determine their knowledge of the work activity being performed. Also, a sense of the degree of the adversary or intimidating relationship with the construction forces can be determined. Perceived management support should be identified. Any adverse trend should be identified to regional management.

02.05 Additional inspections, as determined by regional management, may be conducted in the inspection areas covered above when licensee performance is classified as Category 3 by the SALP program or if regional management concludes that recent findings will likely result in a SALP Category 3 rating. In these cases, particular consideration should be given to an expanded sample of items to be inspected under Sections 02.03c and 02.03d above.

48053-03 INSPECTION GUIDANCE

General Guidance. Before observing the activities included in Section 02 above, review the pertinent SAR chapters as well as related specifications, drawings, and procedures. For example, before inspecting materials and components in storage, determine the requirements for such things as storage conditions, protection from damage, special preservation requirements, material and component identification, segregation of nonconforming items, and required records.

The inspector may not be able to observe all facets of all work activities in progress relative to the structures and supports selected in Section 02 above; however, the direct observation of portions of important activities should be made. The inspector should select structures and supports across different stages of work completion, i.e., when the overall installation work is about one-third complete, two-thirds complete, or completed. Emphasis should be placed on those items in the early stages of overall project construction. This will allow for meaningful corrective actions, if required. The intent is to determine whether the activities and end products meet requirements.

Findings from this inspection activity should address each element as being satisfactory, being unresolved and requiring resolution, or being in violation and requiring correction. When significant inadequacies are identified in specifications or procedures indicating weakness within the preparing technical organization, the inspector should inform cognizant regional supervision. The issue should be addressed at the appropriate level of licensee management.

03.01 Specific Guidance

a. Inspection Requirement 02.03. See Section 03.01 and Table 1 of IP 48051 for examples of structural steel and supports to be selected.

b. Inspection Requirement 02.03a. Varying degrees of acceptance inspection may be done by the licensee as part of their vendor shop surveillance program. Results of these inspections should be reviewed.

c. Inspection Requirement 02.03c. Connection joints in structures are usually the area of installation problems and also are generally not given the same engineering attention as other structural steel items. Therefore, it is important to select for review a few connections in each structure or support reviewed in Section 02.03 above.

03.02 Prevalent Errors and Concerns. Prevalent errors and recent concerns are areas in which the inspector should be alert to potential generic issues. These areas include:

a. Storage of structures and support components should ensure that contact with ground surfaces is avoided.

b. Inattention to damage and normal wear and tear of protective coverings may lead to substandard or unacceptable weather protection. The licensee's maintenance of protection (canvas or plastic covering) should be reviewed.

c. Sites near salt water should receive special attention to ensure that protective storage measures consider salt water damage (in particular, components of stainless steel).

d. In some instances, storage locations are selected without consideration for construction traffic patterns or possible falling objects and missiles. (See 10 CFR 50, Appendix B, Criterion XIII; and RG 1.38.)

e. In the area of maintenance of material identification, damage by handling or weather frequently makes paper tags illegible. Paper tags are usually considered to be inadequate.

f. The use of galvanized bolts and nuts in bolted connections may require thread lubricant to ensure minimum torque or pretension requirements are met. There may be frequent adjustments of the minimum torque value.

g. Piece work traceability of structural steel and ASTM-A325/A490 bolting material has been a problem in the recent past.

h. Deficient alignment or fit-up for welded connections has caused improper welding practices.

i. There have been instances of cutting or edge finishes not being in accordance with specifications or drawings.

j. Instances of weld undercut have gone undetected by QC inspections.

k. At some sites, uncalibrated torque wrenches have been used. There should be provisions for the evaluation or reverification of the activities performed by the uncalibrated torque wrench since the last calibration.

l. Difficulties in using the turn-of-nut method for bolted connections are defining the initial snug-tight condition and inadequate gage marks to determine amount of additional turns after snug-tight. Actual observation may be the only means of verifying the proper implementation the turn-of-nut method.

m. Through independent sampling of bolted connections using calibrated torque wrenches, high strength bolted connections at several sites were found by the NRC to not meet project requirements for proper bolt tension.

n. Welding across the flange of loaded members without engineering evaluation is to be done under controlled conditions.

48053-04 REFERENCES

SAR, Chapters 1, 3, 6, and 17, including pertinent codes and standards referenced in these chapters.

Regulatory Guide 1.19, Nondestructive Examination of Primary Containment Liner Welds.[1]

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.

Regulatory Guide 1.94, Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel during the Construction Phase of Nuclear Power Plants.

Regulatory Guide 1.136, Materials, Construction, and Testing of Concrete Containments.

ACI 359, Code for Concrete Reactor Vessels and Containments (also known as ASME, B&PV Code, Section III, Division 2).

ACI 349, Code Requirements for Nuclear Safety-Related Concrete Structures, Appendix B, Steel Embedments.

AISC, Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, American Institute of Steel Construction.

AWS D1.1, Structural Welding Code.

ASME Section III, Division 1, Subsections NB, NC, ND, NE, and NF.

END

[1] This regulatory guide was withdrawn by Regulatory Guide 1.136, Revision 2, June 1981. Implementation of Regulatory Guide 1.136, Revision 2 is for applications docketed after May 1981.