



# Component Fabrication Inspections

**Taiwan ISFSI Workshop**

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# Outline

- Inspection Procedure 60852
- Fabrication Inspections
  - Inspection Findings
- NAC/GE-Hitachi Inspection
  - Lessons Learned

## **Procedure 60852**

### **Inspection Objectives**

- **To determine whether a dry cask storage system (DCSS), fabricated by an offsite (non-ISFSI location) entity and for use in an independent spent fuel storage installation (ISFSI), is constructed in accordance with the commitments and requirements specified in the safety analysis report (SAR), the U.S. Nuclear Regulatory Commission's (NRC's) corresponding safety evaluation report (SER), 10 CFR Part 72 and, as applicable, the certificate of compliance (CoC) or the site-specific license and technical specifications (TS).**
- **To determine whether the offsite (or outside) fabricator's activities are conducted in accordance with NRC-approved Quality Assurance Program (QAP) requirements.**

## **60852 INSPECTION REQUIREMENTS**

- **Determine whether the fabrication specifications are consistent with the design commitments and requirements documented in the SAR, and, as applicable, the CoC or the site-specific license and TS.**
- **Determine whether corrective actions for identified fabrication deficiencies have been implemented in a time frame commensurate with their significance, and whether nonconformance reports documenting the deficiencies have been initiated and resolved.**
- **Determine whether individuals performing quality-related activities are trained and certified where required.**

# **60852 INSPECTION REQUIREMENTS (Continued)**

- **Determine whether the offsite fabricator's personnel are familiar with the specified design, designated fabrication techniques, testing requirements, and quality controls (QCs) associated with the construction of the DCSS.**
- **Determine whether:**
  - a. **Materials, components, and other equipment received by the fabricator meet DCSS design procurement specifications.**
  - b. **The procurement specifications conform to the design commitments and requirements contained in the SAR and, as applicable, the CoC or the site-specific license and TS.**

## **60852 INSPECTION REQUIREMENTS (Continued)**

- **Determine whether DCSS components are being fabricated per approved quality assurance (QA) and 10 CFR Part 21 implementing procedures and fabrication specifications.**
- **With regard to fabrication activities, determine whether:**
  - a. **They are conducted under an NRC-approved QAP (10 CFR 72.140).**
  - b. **The provisions of 10 CFR Part 21, “Reporting of Defects and Noncompliance,” for reporting defects that could cause a substantial safety hazard have been implemented.**

## **60852 INSPECTION REQUIREMENTS (Continued)**

- c. The fabricators personnel are familiar with the reporting requirements of 10 CFR Part 21.**
- d. The fabricator has complied with 10 CFR 21.6, “Posting requirements.”**
- With regard to QA activities, determine whether:**
  - a. The fabricator has been audited by either the licensee or CoC holder.**



## **60852 INSPECTION REQUIREMENTS (Continued)**

**b. For selected audits and inspection findings from (as applicable) QA audit or surveillance and/or inspection reports issued in the previous 2 years, the findings were appropriately handled with corrective actions implemented in a time frame commensurate with their safety significance.**

**c. Supervision and QC/QA personnel perform appropriate oversight during fabrication activities.**

## 60852 INSPECTION GUIDANCE

### Definitions.

- **a. Participants.** The terms “licensee,” “vendor,” “CoC holder,” “fabricator,” “general licensee,” and “site-specific licensee” are terms the inspectors will commonly encounter while reviewing ISFSI activities. Refer to Inspection Manual Chapter (IMC) 2690, “Inspection Program for Dry Storage of Spent Reactor Fuel at Independent Spent Fuel Storage Installations,” Section 03, for definitions of these terms.
- **b. Safety Classification.** ISFSI systems, structures, and components (SSCs) are classified as either “important to safety” or “not important to safety” by the ISFSI designer.

## Definitions (Continued)

- If “important to safety,” the SSC will typically either:
  1. Maintain the functions or conditions (i.e., confinement, criticality, shielding, and heat removal) necessary to store spent fuel safely;
  2. Prevent significant damage to the spent fuel container (DCSS) during handling and storage; or
  3. Provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to public health and safety.

If an SSC does not perform any of the preceding functions, it may be classified as “not important to safety.”

- **General Guidance.**
- a. **Overall Focus.** The inspection focus is to determine whether the fabricator is constructing ISFSI components in accordance with an NRC approved QAP, and whether the DCSS component, as fabricated, will perform its intended function as stated in the SAR and, as applicable, the CoC or the site-specific license and TS. DCSS components must be constructed under an NRC-approved QAP, which may be either the licensee's, CoC holder's, or the fabricator's. Refer to inspection procedure (IP) 60851, "Design Control of ISFSI Components," for guidance on inspecting design changes.

## 60852 INSPECTION GUIDANCE (Continued)

- **General Guidance** (Continued)
- **b. Additional Assistance**. The inspectors may obtain additional assistance for both technical and design questions from the cognizant Spent Fuel Storage and Transportation (SFST) project manager (PM).
- **c. ISFSI SSCs Safety Classification**. Before performing an inspection of ISFSI SSCs, the inspectors should review the licensee's design basis documents to determine whether the licensee has applied an appropriate safety classification to a particular SSC. Note that site-specific variations in ISFSI designs may affect the safety classification of some SSCs

## General Guidance (Continued)

- d. ISFSI SSCs Not Important to Safety. For this class of SSCs, the licensee's use of generally accepted commercial-grade standards, practices, and materials in design, fabrication, and construction activities is acceptable. However, these SSCs must still conform to the design requirements described in the SAR and supporting engineering documents.

## **60852 INSPECTION GUIDANCE (Continued)**

- **General Guidance** (Continued)
- e. **Design Changes**. Each DCSS design has been approved by the NRC through the licensing process, for a site-specific license, or the 10 CFR Part 72, Subpart L, process for a general license. Effective with a rule change that became effective April 5, 2001, licensees, vendors and CoC holders are all authorized by the provisions of 10 CFR 72.48 to make changes to the ISFSI or DCSS described in the SAR, to approve changes to procedures described in the SAR, or to perform tests or experiments not described in the SAR without prior NRC approval. Refer to IP 60857, “Review of 10 CFR 72.48 Evaluations,” for additional guidance in this area.

## 60852 INSPECTION GUIDANCE (Continued)

- **General Guidance** (Continued)
- f. **Component Functionality**. Functionality is the ability of a component to meet its design requirements. Some components may have multiple design requirements and several functions. These requirements and functions are defined in the SAR, SER, and, as applicable, the CoC or the site-specific license and TS for the DCSS. For example, the cask support basket that separates the individual fuel bundles serves several functions: structural integrity, criticality control, heat transfer, and radiation shielding. Assistance in identifying the function(s) of a given component may be obtained from SFST.

## **60852 INSPECTION GUIDANCE (Continued)**

- **General Guidance** (Continued)
- g. **Document Review**. Before any onsite inspection activity, for each DCSS in use, review (as applicable) the:
  1. SAR and corresponding NRC SER;
  2. CoC;
  3. Site-specific license and TS; and
  4. 10 CFR 72.48 evaluations performed since the last update to the DCSS SAR.

## 60852 INSPECTION GUIDANCE (Continued)

- **General Guidance** (Continued)

SARs and SERs describing DCSS components have been written for each type of approved DCSS. Information on operational commitments for a particular DCSS may also be found in the CoC or the site-specific license and TS. As DCSS designs vary, be careful to review the appropriate documentation. The inspectors can obtain copies of these documents from the appropriate regional division or cognizant SFST PM.

## **60852 INSPECTION GUIDANCE (Continued)**

- **General Guidance** (Continued)
- h. Since fabricators build components for several licensees, the fabricators may have been previously inspected by the Nuclear Materials Safety and Safeguards (NMSS), Nuclear Reactor Regulation (NRR), or regional staff. The inspectors can obtain information on inspections of ISFSI vendors and fabricators from NMSS/SFST. These reports should be reviewed for identified fabricator program weaknesses that the inspectors may want to consider inspecting to assess the fabricator's effectiveness in addressing the weaknesses.

## **60852 INSPECTION GUIDANCE (Continued)**

- **Specific Guidance**
- (Note: The following inspection activities should be performed primarily at the fabricator's facility. However, document reviews may be performed elsewhere as conditions require. It may also be advantageous to inspect subcontractors used by the fabricator if time permits.)
  - a. **Inspection Requirement 02.01**. Fabrication specifications include, but are not limited to, component material specifications, fabrication techniques, examination techniques, and required dimensions and tolerances. Previously identified problems related to DCSS component fabrication include:

## **60852 INSPECTION GUIDANCE (Continued)**

- **Specific Guidance (Continued)**
- 1. Incomplete documentation of actual fabrication activities in fabrication traveler documents;
  - (a) Failure to explicitly state required critical component dimensions, such as minimum allowable wall thickness, on fabrication traveler documents;
  - (b) Failure to require verification of critical component dimensions using a specified non-destructive examination (NDE) technique (i.e., ultrasonic testing) as required in the DCSS design documentation;

- **Specific Guidance (Continued)**

(c) Design changes made outside of the approved design change process (e.g., by letter or memorandum);

(d) Inadequate oversight of fabrication activities by the licensee or CoC holder; and

(e) Fabrication of a component to a different safety classification than that shown in the design specifications.

## **60852 INSPECTION GUIDANCE (Continued)**

- **Specific Guidance(Continued)**

**b. Inspection Requirement 02.02** For nonconformance reports in which the adverse condition is determined to be acceptable “as is,” the report should contain sufficient information to justify why the nonconforming condition does not compromise the ability of the component to perform its intended function(s).

Nonconformances should be dispositioned before the DCSS is released to the licensee, unless otherwise authorized by the licensee. Review nonconforming conditions that are resolved by design changes to ensure that component function is not compromised. The inspectors may obtain assistance in determining component function from NMSS/SFST. Also, the inspectors can find supplemental information on inspecting design changes in IP 60851.

- **Specific Guidance** (Continued)

c. **Inspection Requirement 02.03.** Fabricator personnel performing quality functions may be welders, NDE inspectors, QC staff, and QA auditors. A program for certification of each of these personnel should have been defined and implemented by the fabricator and approved by the licensee prior to performance of quality activities by these individuals.

d. **Inspection Requirement 02.04.** No specific guidance.

- **Specific Guidance** (Continued)

e. **Inspection Requirement 02.05.** Verify that the procurement specifications conform to the design requirements contained in the SAR, CoC, and other applicable engineering documents.

Place emphasis on instances in which components or raw materials do not meet the procurement specifications thus representing a nonconforming condition.

Verify that the licensee's or CoC holder's design change process has evaluated and handled these nonconformances. Reference Section 03.03.b of this IP for guidance on the evaluation of nonconformances.

The inspectors can find supplemental guidance on the quality classification levels of ISFSI components from references found in Section 05 of this IP.

## 60852 INSPECTION GUIDANCE (Continued)

- **Specific Guidance** (Continued)

f. **Inspection Requirement 02.06.** The inspectors may find a discussion of the required methods of fabrication in the SAR or CoC and, if applicable, the site-specific license.

g. **Inspection Requirement 02.07.** No specific guidance.

h. **Inspection Requirement 02.08.** Determine if and when the licensee's QA staff or other licensees' QA staffs have audited fabricator activities. The inspectors can obtain information about audits of specific fabricators from the licensee's QA staff, or NMSS/SFST.

- **Specific Guidance (Continued)**

The inspectors should obtain and review copies of audits and surveillances performed by onsite QA personnel (the fabricator's or other oversight groups such as the CoC holder's or licensee's).

Assess the quality and depth of the audits and surveillances and determine if appropriate corrective actions were implemented for negative findings.

The inspectors should also review fabrication documents, such as travelers, to ensure that hold points are identified and QA signatures made where required.



## 60852 INSPECTION RESOURCES

To prepare for these inspections, each inspector should spend approximately 16 hours on in-office review.

Inspection activities will require approximately 30 hours, each, by three inspectors at the vendor's or fabricator's facilities.

Documentation is estimated to require 16 hours for each inspector.

SFST Rules, Inspections, and Operations Branch will primarily conduct the inspection of fabricators and vendors, with assistance from other NMSS and regional inspectors. Inspection hours may vary, depending on the amount of activity occurring at the fabricators.

## Fabrication Inspection Findings

- 10 CFR 72.150, “Instructions, procedures, and drawings”

Process to input data and maintain control of a computer data base welder continuity program implemented incorrectly

Nonconforming borated aluminum plate, marked as “scrap,” was not appropriately tagged

Changes were made to travelers without obtaining required signatures from Quality Assurance

Some traveler steps specific to the performance of QC cleanliness inspections were not signed

Failure to document nonconforming conditions during assembly

## **Fabrication Inspection Findings (Continued)**

### 10 CFR 72.150, “Instructions, procedures, and drawings” (Continued)

NDE specifications not approved by a Method Level III

Failure to follow procedures requiring thickness inspection of temporary attachment weld removal areas and recording of the thickness

Quality records required for use of temporary weld attachments were either not generated or consistently maintained

Failure to document the removal of temporary attachment welds and associated NDE by Magnetic Test (MT)

# Fabrication Inspections

## Findings (Continued)

10 CFR 72.150, “Instructions, procedures, and drawings”  
(Continued)

Use of a ‘white-out’ to correct a leak test report

Failure to record visual examination inspection results

Failure to perform a required monthly resin ‘reactivity’ test

Failure to verify shelf life of the materials important to safety

## **Fabrication Inspections Findings (Continued)**

### **10 CFR 72.158, “Control of special processes”**

Welding performed by an unqualified welder

### **10 CFR 72.174, “Quality assurance records”**

Certification for a liquid penetrant (PT) examiner was not available in the certification files

Failure to maintain records of temporary attachment welds by qualified welders

## Lessons Learned

1. Consider performing limited scope inspections
2. Reinforcement of vendor preparation
3. Schedule inspection to coincide with abundant shop activities
4. Request independence when evaluating shop activities
5. Request schedule of planned work activities during week of inspection

## **NAC/GE-Hitachi**

### **Inspection (Continued)**

- Lessons Learned (Continued)
  6. Consider technical specialist participation in known problem areas
  7. Consider periodic use of project manager as inspection team member
  8. Consider process for evaluating potentially significant conditions discovered during inspection

## **NAC/GE-Hitachi**

### **Inspection (Continued)**

- Lessons Learned (Continued)
  9. Consider process to assess technical issues outside the scope of the inspection
  10. Consider process for immediate follow-up or reevaluation of potentially significant issue(s)
  11. Consider process of scheduling inspections to coincide with production

# Summary

- **Inspection Procedure 60852**

Used to determine construction in accordance with the SAR, NRC's SER, Part 72 and, as applicable, the CoC or the site-specific license and TS.

Used to determine if outside fabricator's activities are conducted in accordance with NRC-approved Quality Assurance Program (QAP) requirements.

# Summary

(Continued)

- **Fabrication Inspections**

We reviewed multiple findings in various areas from multiple fabricators on various cask models. The findings demonstrate that there are many ways for errors to occur during fabrication. Look for them using a methodical approach and by using formal guidance.