

NRC INSPECTION MANUAL

SFPO

INSPECTION PROCEDURE 60856

REVIEW OF 10 CFR 72.212(b) EVALUATIONS

PROGRAM APPLICABILITY: 2690

FUNCTIONAL AREA: ENGINEERING (ENG)

60856-01 INSPECTION OBJECTIVE

Section 72.210 of Title 10 of the Code of Federal Regulations (10 CFR 72.210) grants a general license for the storage of spent fuel in an independent spent fuel storage installation (ISFSI) at power reactor sites to any person authorized to possess or operate nuclear power reactors under 10 CFR Part 50. Section 72.212 gives the conditions for this general license and 72.212(b) delineates requirements that the general licensee shall meet. This inspection procedure provides guidance for determining whether a general licensee has met these requirements before operating its ISFSI.

60856-02 INSPECTION REQUIREMENTS

02.01 Review of Licensee Evaluations [72.212(b)(2)]¹

Determine whether:

- a. The licensee performed written evaluations which established that the conditions set forth in the Certificate of Compliance (CoC) have been met.
- b. The licensee performed written evaluations which established that the cask storage pads and areas have been designed to support the stored static load of the storage casks.
- c. The licensee performed written evaluations which established that the requirements of 10 CFR 72.104 regarding effluents and direct radiation from an ISFSI have been met.
- d. Provisions are in place for retaining the evaluations (records) referenced above until spent fuel is no longer stored under the general license.

¹ Numbers in brackets refer to the applicable Section of 10 CFR Part 72, Subpart K.

- e. The licensee performed any revisions to the written evaluations required by 10 CFR 72.212 in accordance with 10 CFR 72.48(c).

02.02 Review of Site Characteristics Against SAR and SER [72.212(b)(3)]

- a. Verify that the licensee reviewed the safety analysis report (SAR) referenced in the cask CoC and associated NRC safety evaluation report (SER) and determined that the cask design bases used in these reports are enveloped by the reactor site parameters.
- b. Verify that the results of the above reviews are documented and included with the evaluations retained in accordance with 02.01.d.

02.03 Review of ISFSI Activities for Determination of No Adverse Impact on Site Operations or Technical Specifications [72.212(b)(4)]

- a. Determine if the licensee evaluated whether activities related to storage of spent fuel under the general license involved a change in the facility technical specifications (TS) or required a license amendment for the facility in accordance with 10 CFR 50.59(c).
- b. Verify that the results of the above reviews are documented and included with the evaluations retained in accordance with 02.01.d.

02.04 Safeguards Program Review

Review applicable parts of the licensee's safeguards program and security plan to verify that spent fuel is protected against the design basis threat of radiological sabotage in accordance with the requirements of 10 CFR 73.55, with the conditions given in 10 CFR 72.212(b)(5)(i) through (v).

02.05 Review of Programs Impacted by ISFSI Operation [72.212(b)(6)]

Verify that the licensee reviewed the following programs to determine if their effectiveness is decreased. If so, determine whether the necessary changes were made and if necessary approvals (internal or external) were sought and obtained.

- a. Emergency plan
- b. Quality assurance program
- c. Radiation protection program
- d. Training program

02.06 ISFSI Procedures [72.212(b)(9)]

Verify that activities related to storage of spent fuel under the general license will be performed only in accordance with licensee written procedures.

02.07 Storage of ISFSI Records [72.212(b)(7) and (8)]

Verify that:

- a. The licensee maintains current copies of the CoC and any documents referenced in the CoC for each cask model used at the ISFSI.

- b. The licensee maintains the records provided by the cask supplier for each cask design used, and provisions are in place for transferring these records if a cask is sold, leased, loaned, or otherwise transferred to another user.

60856-03 INSPECTION GUIDANCE²

General Guidance

- a. Questions on ISFSI activities potentially affecting safety-related reactor systems, structures or components (SSCs) and all other ISFSI-related technical questions should be referred to the cognizant Spent Fuel Project Office project manager (SFPO PM). SFPO may request NRR assistance if needed.
- b. In preparation for inspecting the dry cask storage system (DCSS) used by the licensee, review the commitments and key requirements in the SAR, the NRC's SER, and the CoC. SARs and SERs have been written for each type of approved DCSS and describe operation of DCSS components. Information about commitments for a particular DCSS may also be found in the associated CoC. In some cases, the CoC may have an attached Conditions of Use/Technical Specifications document and design bases. DCSS designs vary and care must be taken to review the correct documentation. Copies of these documents may be obtained from the region or the cognizant SFPO PM. (Note: Although the SER can document or clarify commitments made by the licensee or vendor, the SER is not an independent basis for enforcement actions.)
- c. Because of the large amount of design information to be reviewed in carrying out this IP, a pre-inspection site visit may be needed.

Specific Guidance

03.01 Review of Licensee Evaluations

- a. In reviewing CoC conditions, the inspector should:
 1. Review the CoC for the DCSS to be used by the licensee and identify any conditions that should be considered in the licensee's evaluations. The Conditions section of the CoC may refer to an attached Conditions for Cask Use/TS or similar document. This attachment will likely contain regulatory requirements such as site-specific parameters and analyses that the user must verify. It may also contain requirements for additional procedures, heavy load considerations, training and training exercises, and for the "first cask in place." The TS Functional and Operational Limits sections may also contain a number of surveillance requirements, restrictions on the characteristics of the spent fuel (or other contents) that may be loaded in the DCSS, and other physical parameters that must be observed.
 2. Review the licensee's evaluations and verify that the conditions identified in 03.01.a.1 above were considered. Perform independent technical review

² Manual Chapter 2690, Appendix A, requires that review of the licensee's 10 CFR 72.212(b) evaluations of the ISFSI support pad be completed before the licensee begins constructing the pad. Appendix A of this IP should be used in meeting inspection objective 02.01.b. The remainder of this IP should be performed before the ISFSI becomes operational. IP 60853 will be used for inspection of the ISFSI during construction. If after completion of this IP the licensee decides to use a different model or type of DCSS, applicable parts of this IP should be revisited.

of selected parts of the evaluations to help assess whether all the CoC conditions were met. Carefully examine whether the licensee's analysis to ensure that conditions of the CoC were met used SAR conditions and assumptions. For example, in a time-to-boil analysis for a loaded cask that is being sealed, if the licensee used a different initial spent fuel pool water temperature than that in the SAR, the licensee should have adjusted the time-to-boil analysis for the actual starting temperature.

3. While performing this review, verify that applicable conditions have been incorporated into procedures (operational or programmatic, as applicable). This should be documented by the procedure review of 02.06 of this IP.
- b. In reviewing the cask storage pads and areas designed to support the static load of the DCSS, the inspector shall use Appendix A of this IP. As stated in footnote 2, this review shall be performed prior to construction of the ISFSI.
- c. In reviewing whether the requirements of 10 CFR 72.104 for effluents and direct radiation from an ISFSI have been met, the inspector should refer to the radiological protection programs guidance provided in Section 03.05.c of this IP.
- d. A copy of the licensee's evaluations from Section 03.01 (a), (b) and (c) of this IP (reference 10 CFR 72.212 (b)(2)) must be maintained until spent fuel is no longer stored under the general license issued under 10 CFR 72.210. Additional guidance is in Section 03.07 of this IP.
- e. Guidance in this area is be provided in IP 60857 when issued. Check the IP index to see if IP 60857 has been issued yet. Until publication, there is no specific guidance for this review.

03.02 Review of Site Characteristics Against the SAR and SER

Review the licensee's evaluation that reactor site parameters are enveloped by the cask design bases used in the DCSS SAR and SER. Verify that the evaluation of the reactor site parameters includes, at a minimum, earthquake intensity and tornado-generated missiles. Parameters for earthquake intensity and tornado missiles are listed in the reactor site's UFSAR or FSAR.

03.03 Review of ISFSI Activities for Determination of No Adverse Impact on Site Operations or Technical Specifications

- a. Review the licensee's evaluation of the ISFSI's impact on the reactor facility and identify any required license amendments or changes to the reactor technical specifications. Additional guidance for reviewing the reactor licensee's 10 CFR 50.59 evaluations may be found in IP 37001. If the tasks required by 03.03.e through h have been previously performed under IP 60853, they do not need to be repeated.
- b. Verify that any 10 CFR 50.59 evaluations have been performed in accordance with the licensee's administrative requirements. The licensee should have evaluated the impact of the ISFSI or DCSS on the reactor facility and document these evaluations in accordance with the site administrative procedures and 10 CFR 50.59.
- c. Verify that dropping a storage or fuel transfer cask inside the fuel handling or reactor building will not challenge any safety-related facility SSCs. Verify that storage and transfer cask pathways were approved in accordance with the licensee's heavy-load administrative requirements. The licensee's analysis should

indicate whether the weight of the DCSS being used is bounded by the cask weight used in the UFSAR dropped cask analysis and has been evaluated against the NUREG-0612 requirements for controlling heavy loads. Otherwise, the licensee should have fully analyzed the impact of a dropped DCSS on the reactor facility.

Review the assumptions used by the licensee in any cask drop analysis and ensure that these assumptions are consistent with the NRC cask SER. For example, suppose a licensee has taken credit for a cask meeting the hypothetical accident conditions specified in 10 CFR 71.73 for a 30-foot drop onto a flat surface. For this accident, the NRC SER assumed that the cask closure bolts were all installed and tensioned, valve box covers were installed, and any impact limiters were installed. However, these conditions might not be met for a cask while it is being moved inside the reactor or fuel handling building. Therefore, the licensee may not take credit for the radiological consequences analyzed for the 71.73 event.

- d. Verify that the fuel handling or reactor building cranes can safely move the storage or fuel transfer casks (reference NUREG 0612). Verify that any changes to the interlocks and mechanical stops of the fuel handling or reactor building cranes have been evaluated and properly implemented. Be aware that the interlocks or mechanical stops may be controlled by the facility TS.
- e. Verify, by reviewing records and interviewing licensee personnel, that the licensee has considered the maximum expected load and any interferences in evaluating DCSS movement along the proposed roadway and any staging areas between the fuel or reactor buildings and the ISFSI storage site. The licensee should have reviewed the pathway for moving the DCSS to the ISFSI site and determined the right-of-way needed for such movements. The licensee should have also considered the effects of weathering and repeated use on the roadway. The inspection should examine any interferences from overhead lines or nearby structures. Contact with overhead power lines may impact the safety of the reactor plant and endanger the cask transporter.
- f. Verify that an analysis indicates that conduit, piping, and equipment beneath the proposed roadway, ISFSI storage pad, and staging areas can withstand the heavy loads of the storage casks or that modifications have been designed and implemented to reinforce the area and protect any buried systems. The licensee should have determined whether reinforcements are needed for places where the roadway passes over or near buried components (e.g., diesel fuel oil transfer lines, fire mains, service water lines, and electrical conduits). Inspection of any construction activities to reinforce buried components should be performed under IP 60853.
- g. Determine, by observation and interviews with licensee personnel, that the proposed roadway is suitable for the secure movement of spent fuel storage casks and that a cask temporarily halted during transport will not pose a traffic obstruction that adversely impacts facility activities or security. The licensee should have assessed the potential impact of a breakdown of the vehicle transporting the cask on reactor site traffic and security activities.
- h. Verify that the transfer route and the storage pad area do not contain fire hazards beyond those analyzed in the SAR. Movement of a cask through or by vehicle parking lots may expose the cask to more flammable material than assumed in the SAR fire hazard analysis, a possibility that should be reflected in the licensee's analysis.

03.04 Safeguards Program Review

Verify that the licensee's security program reflects the requirements of 10 CFR 72.212(b)(5) for protecting spent fuel against radiological sabotage. Additional guidance for reviewing the reactor licensee's physical security plan may be found in IP 81001.

- a. Review the licensee's evaluation of the ISFSI's impact on the reactor facility's physical security plan. Verify that changes have not decreased the plan's effectiveness. If any changes have decreased the plan's effectiveness, verify that NRC approval of the changes was obtained.
- b. Verify that any ISFSI-specific requirements have been adequately addressed in the facility's physical security plan. Verify that changes have been appropriately incorporated into the plan's implementing procedures and that personnel have been trained regarding these changes.

03.05 Review of Programs Impacted by ISFSI Operation

- a. Review the licensee's evaluation of ISFSI impact on the reactor emergency plan (EP). Additional guidance for reviewing the EP can be found in IP 82701.
 1. Verify that changes have not decreased the plan's effectiveness. If any changes decreased the plan's effectiveness, verify that NRC approval of the changes was obtained.
 2. Verify that any ISFSI-specific requirements have been adequately addressed in the EP. Verify that changes have been incorporated into the EP implementing procedures and that personnel have been trained regarding these changes.
- b. Review the licensee's evaluation of ISFSI impact on the reactor quality assurance program (QAP).
 1. Verify that changes have not decreased the QAP's effectiveness. If any changes decreased the QAP's effectiveness, verify that NRC approval of the changes was obtained.
 2. Verify that any ISFSI-specific requirements have been adequately addressed in the QAP. Verify that changes have been incorporated into the QAP's implementing procedures and that personnel have been trained regarding these changes.
- c. Review the licensee's evaluation of the ISFSI's impact on the reactor radiological protection program (RPP). Additional guidance for reviewing the RPP can be found in IPs 83750 and 83729.
 1. Verify that changes have not decreased the program's effectiveness. If any changes have decreased the program's effectiveness, verify that the necessary approvals (internal or external) were obtained. Changes to an RPP generally do not require NRC approval.
 2. Verify that ISFSI-specific requirements have been adequately addressed in the RPP. Verify that changes have been incorporated into the program's implementing procedures and personnel trained regarding these changes.
 3. Review the licensee's evaluation of the ISFSI's impact on the annual dose-equivalent exposure for normal operations and anticipated occurrences to a

real individual who is beyond the controlled area defined in 10 CFR 72.106. Verify that the limits specified in 10 CFR 72.104(a) have not been exceeded using the exposure requirements in 72.104(a)(1) through (3) (72.104(a)(3) is interpreted to mean any radiation from the reactor facility's licensed activities; consequently, the annual exposures should consider the sum of all these sources).

4. Assess whether the licensee's operating limits on ISFSI radioactive effluents and direct radiation will meet annual dose-equivalent exposure limits.
 5. Assess whether the licensee's operating restrictions on ISFSI radioactive effluents and direct radiation will meet as-low-as-is-reasonably-achievable (ALARA) objectives.
 6. Determine if the licensee has measured the ISFSI pad's background radiation levels before storing spent fuel in the ISFSI. Although information on storage pad background radiation levels is not required, the licensee may want to measure radiation levels to establish the baseline level for future ISFSI decommissioning activities.
- d. Review the licensee's evaluation of the ISFSI's impact on the reactor training program. Additional guidance for reviewing the training program is given in IP 41500.
1. Verify that changes have not decreased the program's effectiveness. If any changes have decreased the program's effectiveness, verify that the necessary approvals (internal or external) were obtained. Training program changes generally do not require NRC approval.
 2. Verify that ISFSI-specific requirements have been adequately addressed in the training program. Verify that changes have been incorporated into the program's implementing procedures and personnel trained regarding these changes.

03.06 ISFSI Procedures No specific guidance.

03.07 Storage of ISFSI Records

The licensee should have specified a retention time limit and a quality standard for any storage facilities used to store the evaluations and records required to be kept by 10 CFR 72.212(b) and 72.174. Retention time limits may vary because some documents must be kept as long as the ISFSI exists, while others are related to an individual loaded DCSS cask and are transferred with the cask to any new licensee (another ISFSI or a disposal facility). Review the licensee's records management program for DCSS activities and verify that:

- a. The licensee established appropriate retention limits for the evaluations required under 10 CFR 72.212(b).
- b. The licensee established appropriate retention limits for copies of the CoC and documents referenced in the CoC, as required by 10 CFR 72.212(b)(7).
- c. The licensee established appropriate retention limits for information required by 10 CFR 72.212(b)(8)(i) and (ii).
- d. The licensee has provided for transferring specific records to any new registered user, as required by 10 CFR 72.212(b)(8)(iii).

60856-04 INSPECTION RESOURCES

To prepare for these inspections each inspector should spend approximately forty hours on in-office review. Inspection activities will require approximately forty hours, by each of three inspectors. Documentation is estimated to require sixteen hours per inspector. Regional inspection staff are expected to have the lead in performing this inspection; however, they may be augmented by SFPO staff. SFPO may request NRR assistance if needed in certain technical areas such as 50.59 evaluations.

60856-05 REFERENCES

ANSI/N14.6-1993, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Radioactive Materials."

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," July 1980. Licensee implementation of this NUREG may vary. Specific commitments to this guidance are covered by licensee responses to NRC Generic Letters 80-113 and 85-11.

NRC Bulletin 96-02, "Movement of Heavy Loads over Spent Fuel, Over Fuel in the Reactor Core, or Over Safety-related Equipment," April 11, 1996.

END

Appendix

A. Review of ISFSI Storage Pad Design

APPENDIX A

REVIEW OF ISFSI STORAGE PAD DESIGN

A. PURPOSE AND OBJECTIVE

This appendix provides guidance on reviewing a general licensee's evaluation of its ISFSI storage pad design before constructing the pad.

B. INSPECTION REQUIREMENTS AND GUIDANCE

General Guidance

A general licensee's ISFSI storage pad is typically classified as not-important-to-safety, so generally accepted commercial standards and practices are considered acceptable in designing the support pad. NUREG-1567, Section 5.3.3 contains additional guidance on construction standards for reinforced concrete structures. If the ISFSI site characteristics require a modification of the storage pad's design as described in the SAR, verify the safety classification of the storage pad before performing any inspections. SFPO may request NRR assistance if needed.

Requirements and Specific Guidance

1. Find out the following from records: whether the reactor site soil structures differ from the soil structures under the ISFSI storage pad, the ground acceleration associated with the safe shutdown earthquake (SSE), and the elevation at which this ground acceleration was applied to the reactor structures.

Review this information to determine whether the licensee used appropriate assumptions in the seismic and liquefaction analyses for the storage pad.

2. Assess the licensee's conclusions about the acceptability of the storage pad's design with respect to the site's hydrology, geology and seismology.

Hydrological data should include the effects of potential flooding and soil erosion on the ISFSI site. Geotechnical data from soil borings and standard penetration tests (SPTs) should include soil descriptions, groundwater table level, effects of long-term consolidation of soil beneath the pad, and the potential for swelling on excavation or removal of overburden.

Geological information should include evidence that the soil borings were to the proper depth (i.e., bedrock or very dense material, as evidenced by high SPT blow counts), the thicknesses of soil layers below the storage pad, and other significant properties of the soil layers (i.e., unit weight, Poisson's ratio, low-strain shear modulus, moisture content, fines content, relative density, and shear-wave velocity).

3. Verify that the ISFSI site's seismic ground motion acceleration analysis envelops the seismic ground motion acceleration specified in the DCSS SAR design bases. Verify that the ISFSI site's seismic ground motion acceleration has been used in the pad's soil liquefaction analysis.

If the soil structures under the ISFSI storage pad are different from the soil structures under the reactor site, the licensee's analysis should consider these differences in providing an accurate analysis of the seismic conditions under the ISFSI storage pad. Similarly, if the seismic acceleration used in the reactor site UFSAR was applied at the base of the seismic Category I reactor containment building foundation, the licensee's analysis should translate this acceleration to the free field ground surface for the ISFSI storage pad and its foundations.

4. Verify that the licensee's evaluation addresses the following criteria:
 - a. The pad's design supports the static load of the DCSS.
 - b. The pad's design uses the total and differential settlements for both static and seismic loadings.
 - c. The pad's design uses ultimate and allowable soil-bearing capacities, including appropriate safety factors, that are less than the actual soil-bearing capacity.
 - d. The pad's design uses the sequential, partial, and total loads that the pad may be subjected to.
 - e. The pad's design uses the soil liquefaction analysis to evaluate the stability of any slopes adjacent to the ISFSI. Adjacent slopes are stable or any potential soil movement during a seismic event will not adversely affect the safety of the ISFSI.

The licensee's analysis should show that the ISFSI storage pad will adequately support both static and dynamic loads, as required by 10 CFR 72.212(b)(2)(ii) and 72.212(b)(3), respectively. This analysis should include the methods used to calculate the total and differential settlements of the pad, the ultimate and allowable soil bearing capabilities, and the stresses and strains resulting from the sequential, partial, and total loads the pad could experience.

These calculational methods should be able to realistically model both static and dynamic soil-structure interaction (SSI) phenomena. The analysis should recognize the uncertainties in SSI phenomena, including (1) the soil and rock configuration, material characteristics, and lack of symmetry in the soil deposits; (2) modeling of soil constituents and soil properties; (3) the effects of a varying water table over time; (4) the effects of soil swelling and corresponding reversed tensile and compressive stresses on the storage pad; and (5) the effects of partial separation of, or loss of contact between, the storage pad and the soil during sequential loading of DCSSs or seismic events.

If the modeling method used a finite element analysis, the criteria for determining the location of the side and bottom boundaries should be assessed. Additional guidance on soil-structure interaction analysis may be found in the references. Questions on the adequacy of the licensee's ISFSI storage pad analysis should be referred to the cognizant SFPO PM. SFPO may request NRR assistance if needed.

REFERENCES

NRC Regulatory Guide 1.132, "Site Investigations for Foundations of Nuclear Power Plants," March 1979.

NRC Regulatory Guide 1.138, "Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants," April 1978.

NRC Information Notice 95-28, "Emplacement of Support Pads for Spent Fuel Storage Installations at Reactor Sites," June 5, 1995.

END