

U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

NRC Preoperational and Loading ISFSI Inspections

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Outline

- ISFSI Inspection Procedures 60854, 60856, 60857
- Preoperational Inspections
 - Welding & Weld Removal
 - Fluid Operations (canister mock-up)
 - Heavy Load Movements (simulated loads)
 - Wet Operations (SFP and dummy fuel movements)
 - Program Inspections
- ISFSI Inspection Procedure 60855
- Operational Inspections
- NRC Findings
- Conclusions



ISFSI Inspection Procedure 60854

- IP 60854 – Preoperational Testing of an Independent Spent Fuel Storage Installation
 - Verify that the preoperational test procedures for loading and unloading meet the commitments and requirements in the Certificate of Compliance (CoC), Technical Specifications, FSAR, Safety Evaluation Report, 10 CFR Part 72, the site specific license
 - Verify that personnel have been trained and certified per the licensee’s approved training program
 - Determine if the licensee has applied an appropriate safety classification (ITS vs. NITS)
 - Verify that the licensee has integrated requirements into plant programs (operations, heavy loads, radiation protection, security, emergency planning, maintenance, fire protection, training, QA activities, administrative procedures)



ISFSI Inspection Procedure 60856

- IP 60856 – Review of 10 CFR 72.212(b) Evaluations
- Only applies to the user of a general license for spent fuel storage
 - Verify site characteristics meet the requirements specified in the cask vendor FSAR (missile, seismic, flood, etc.)
 - Review the facility requirements to determine if a change is necessary under 10 CFR Part 50.59
 - Review the reactor emergency plan, quality assurance program, radiation protection program, training program to determine if their effectiveness is decreased
 - Maintain cask records



ISFSI Inspection Procedure 60857

- **IP 60857 – Review of 10 CFR 72.48**
 - Review the licensee's program for regulatory reviews to ensure that it conforms to the requirements of 10 CFR 72.48
 - Verify that the licensee's training and qualification program incorporates the requirements of 10 CFR 72.48
 - Review the 72.48 evaluations performed by the licensee to ensure that they meet the requirements of 10 CFR 72.48



Preoperational Inspections

- Licensee must demonstrate ability to perform preoperational requirements and demonstrations specified in the CoC or specific license
- Majority of NRC findings result in licensee condition reports with no violation being issued
- Licensee must demonstrate the ability to both load and unload a cask before beginning the loading campaign
- Licensee determines how and when the demonstrations will take place
 - All demonstrations occur over 1 to 2 week duration
 - More often, the licensee performs preoperational demonstrations in stages over several months



Preoperational Inspections

- Many portions of the demonstrations are performed using mock-ups to simulate actual conditions to the maximum possible extent
- Licensee must integrate all the participants in the demonstration, including operations and radiation protection
- Agency expects that licensee will be proficient before the NRC is invited to observe. This means that the utility may have to perform the demonstration several times before proficiency is established.



Preoperational Inspections

- Radiological dose rates are simulated
- Procedures for preoperational demonstrations should be in place
- Training requirements should be identified, even if all the participants have not completed the training at the time of the demonstration

Welding & Weld Removal

Welding and Weld Removal

- Licensee must demonstrate ability to successfully perform all the welding operations and cut the lid welds to remove the canister lid, should canister unloading become necessary
- Welding inspection includes necessary NDE (visual exam, dye-penetrant, hydro test, helium leak test)
- Weld thickness limited by critical flaw size (3/8 inch in thickness) between each weld layer
- Demonstration normally performed on canister mock-up

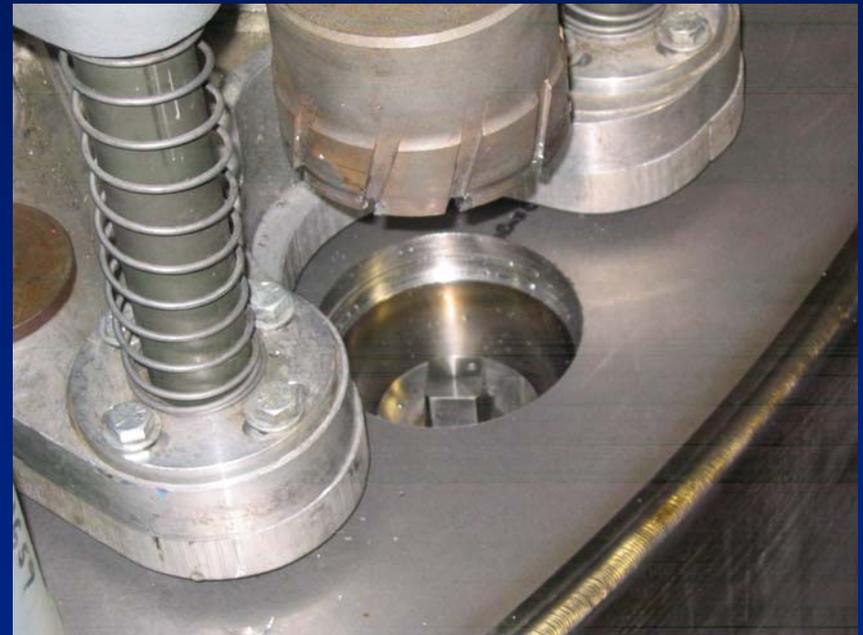
Welding & Weld Removal



Welding & Weld Removal



Welding & Weld Removal



Welding & Weld Removal



Fluid Operations

Fluid Operations

- Most utilities utilize canister mock-ups with simulated work area and transfer cask dimensions
- Demonstration includes adding and removing water from the canister
- In the event that the time to boil time clock is about to be reached, demonstration should include water recirculation through canister
- Hydro static test is normally demonstrated during this phase
- Vacuum drying or forced helium dehydration process demonstrated
- Helium backfill process demonstrated
- Licensee must demonstrate ability to perform the CoC or specific license list of preoperational requirements and demonstrations

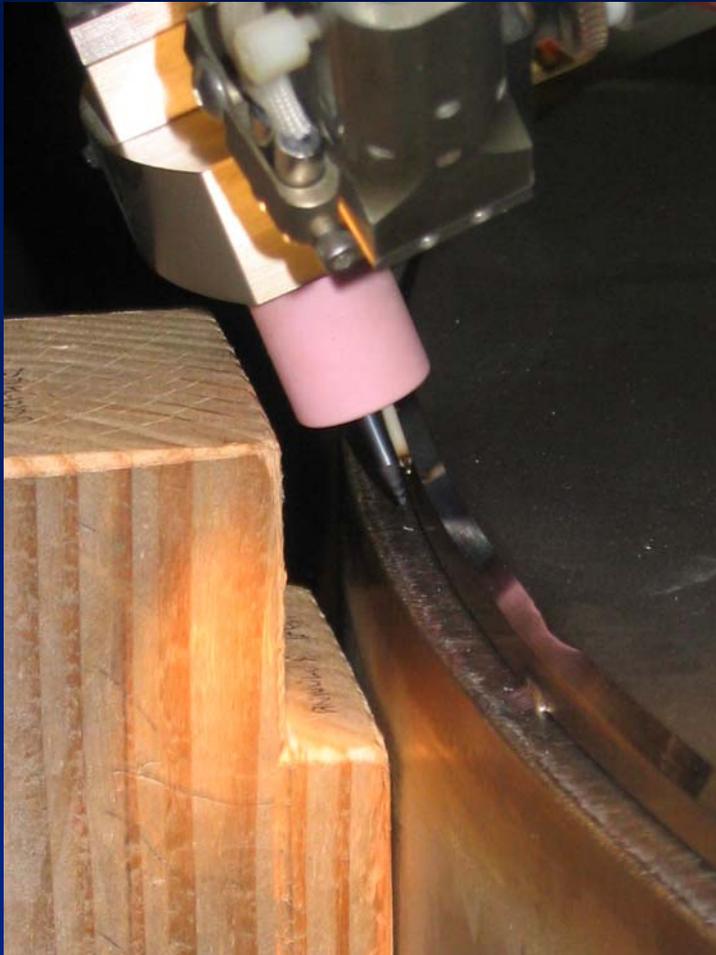
Fluid Operations



Fluid Operations



Fluid Operations



Fluid Operations





Heavy Loads

Heavy Load Movements

- Includes heavy load movements from the building to the ISFSI pad and inside the Part 50 facility
- Heavy load movements include:
 - Overhead crane use to lift the cask and place in the spent fuel pool along with subsequent removal
 - Movement of the cask from inside the Part 50 building to the point where the transporter will be used. Many licensees use a low profile type of transporter to exit the building.
 - Transfer of the canister from the transfer cask to the storage cask including the “stack-up”
 - The transporter device that takes the cask to the ISFSI pad. May use transporter, truck and trailer or air pads
 - Includes all lifting devices (lift yoke, slings, etc.)

Heavy Loads



Heavy Loads



Heavy Loads



Heavy Loads



Heavy Loads



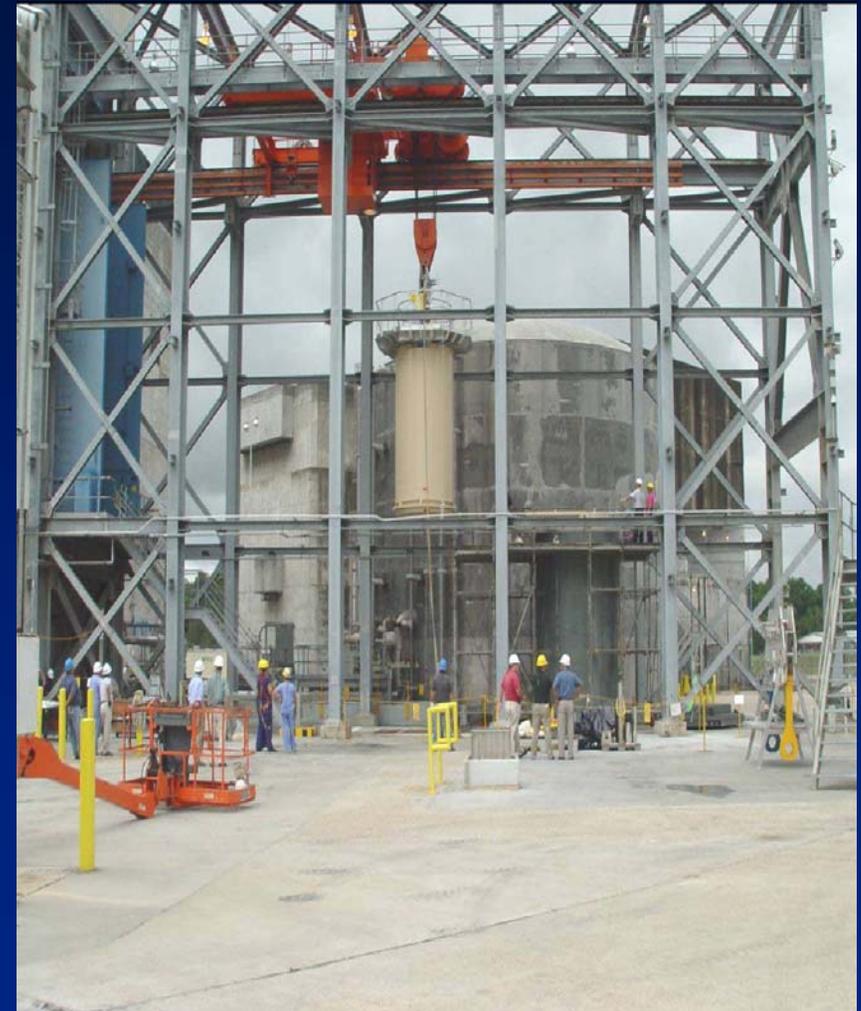
Heavy Loads



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Heavy Loads



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Heavy Loads

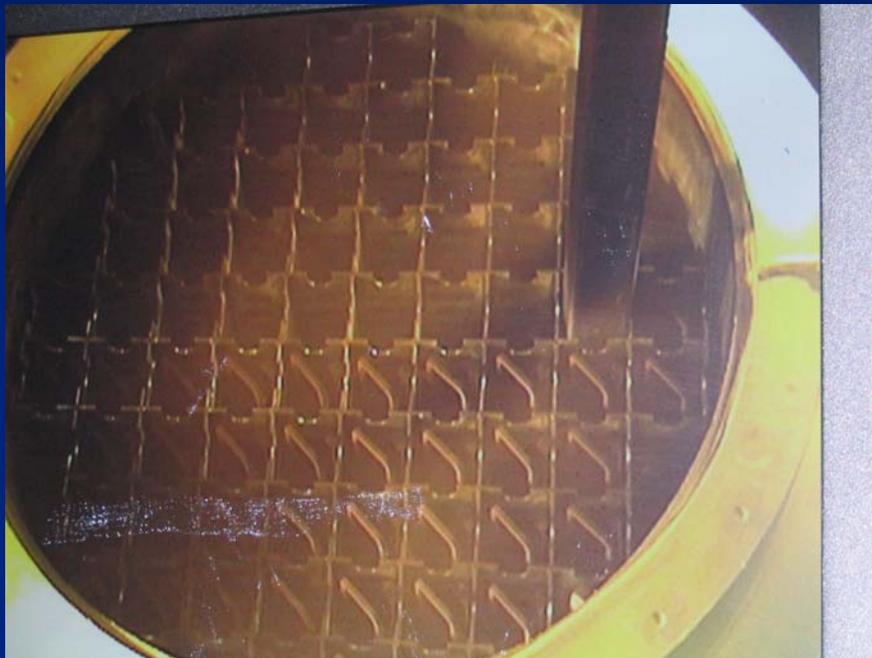
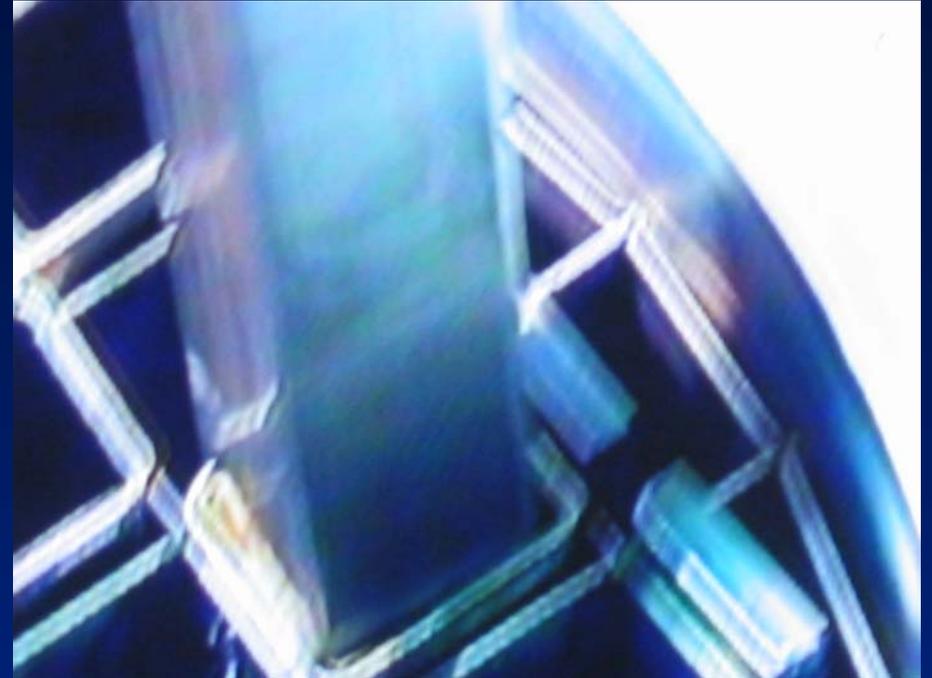


Wet Operations

Wet Operations

- Normally performed immediately prior to the initial cask loading
- Demonstration activities include:
 - Insertion and removal of the cask into the spent fuel pool
 - Insertion and removal of a dummy fuel assembly in the most extreme canister locations
 - Fuel verification technique
 - Insertion of the canister lid while underwater
 - Radiation protection and decontamination practices
 - Licensee procedures should accurately reflect the dose and contamination limits imposed by the Technical Specifications

Wet Operations



Wet Operations



Wet Operations





Program Inspections

Program Inspections

- General licensee must implement the requirements of the dry cask system into the existing Part 50 programs
- Normally performed as a team inspection
- Programs that should be inspected include:
 - Fire Protection
 - Regulatory reviews (50.59 and 72.48)
 - Quality Assurance
 - Emergency Planning
 - Corrective Actions
 - Radiation Protection
 - Records
 - Security
 - Training



ISFSI Inspection Procedure 60855

IP 60855 – Operation of an Independent Spent Fuel Storage Installation

- Verify that the licensee is operating the ISFSI in conformance with the commitments and requirements in the CoC, Technical Specifications, FSAR, Safety Evaluation Report, 10 CFR Part 72, the site specific license
- The focus of routine operational inspections is on the changes that the licensee has made to their procedures and programs. Reviews include 10 CFR 72.48 screenings/evaluations and the 72.212 report.



ISFSI Inspection Procedure 60855

- The focus of the initial cask loading inspection is to verify that the licensee has successfully implemented the procedures necessary for loading and completed all the open items from the preoperational demonstrations
- Findings from the NRC inspections are more likely to be categorized as violations during loading operations



Operational Inspections

Routine Operational Inspections

- The FOCUS is on CHANGES
 - Verify which CoC License Amendment and FSAR revision are being used for the loading operations
 - Review the current licensing basis for the ISFSI
 - Note specific changes between the original licensing basis and the “new” licensing basis
 - Verify that the licensee has incorporated the necessary changes into the loading and unloading procedures and conducted necessary training
 - Review recent condition reports associated with the ISFSI to ensure that the licensee is identifying adverse trends and issues and taking adequate corrective actions
 - Review all the changes noted in the 10 CFR 72.212 report and ensure that important changes were recognized and incorporated by the licensee



Operational Inspections

Routine Operational Inspections

- Review selected regulatory reviews (10 CFR 72.48 and 50.59) performed by the licensee
- Review any QA audits and surveillances that have been conducted of ISFSI operations
- Compare the characteristics of the fuel assemblies selected for loading to the Technical Specification requirements
- Review and compare selected licensing basis requirements that the licensee has been responsible for completing (example - inspection of inlet/outlet vents) to licensee records to ensure that the required actions are being conducted



Operational Inspections

Routine Operational Inspections

- Review the collective dose rates associated with the cask loading activities for adverse trends. Normally as the crew becomes familiar with the loading operations, the collective dose is reduced.
- Witness as many of the loading operations as possible to ensure that the licensee is correctly following their procedures and licensing requirements. This is where many of the findings originate, since the discrepancies are not visible from reading a procedure.

Operational Inspections



Operational Inspections





NRC Findings

Changes to Implementing Procedures

- The licensee had changed the loading procedure to remove all the water from the canister earlier in the process that described in the FSAR
- The Technical Specification assumed that all the water remained in the canister until the start of vacuum drying process to serve as a heat sink
- The assumed Technical Specification initial fuel temperature condition could be invalid based on water removal
- Non-Cited Violation (NCV) issued for implementing changes that affect Technical Specification without prior NRC approval - 10 CFR 72.48(c)(1)

NRC Findings

Cask Lift Height

- Technical Specification condition limited cask lift height to 11 inches without redundant drop protection
- Licensee planned to limit cask height to 12 inches through analysis documented in 72.212 report
- Inspectors discovered the discrepancy and potential Technical Specification violation before cask loading
- Licensee was able to limit cask lift height to 11 inches



NRC Findings

Fire Protection

- The Technical Specification required that a visual inspection be performed within 4 hours of a fire event
- The licensee had included the contingency for a fire at the ISFSI, but had overlooked the transport route and the fuel building
- Fire plan changed to include all potential locations where fire could affect loaded cask



NRC Findings

- The licensee program changes were not ready for the NRC inspection and the inspection had to be postponed
- The licensee schedule for the planned ISFSI demonstrations had not been adequately communicated to the NRC and resources were not available
- The inspector found an uncalibrated thermometer that was being used to monitor a Technical Specification requirement – NCV issued
- Equipment that was being leased from the cask vendor had not been adequately maintained and experienced failure during cask transport

NRC Findings

Welding and Weld Removal

- The licensee used non-safety related weld wire to weld the canister vent/drain covers
- The weld wire had not been reconciled to the requirements of the design basis year edition of the ASME Code
- The canister lid tack welds were not completely removed or properly prepared according to the ASME Code requirements
- The vendor performing the lid cutting demonstration had insufficient detail in the procedure to enable successful use of the equipment if needed

NRC Findings

Hydrogen Burn

- The Technical Specification required the area beneath the canister lid to be purged and monitored for hydrogen during the entire welding process
- The licensee did not perform the required purging or hydrogen monitoring and a hydrogen burn event occurred during the welding process (after the root pass had been completed)
- The licensee changed the procedure to require the purge and hydrogen monitoring activities during the entire welding process, but a second hydrogen burn event occurred due to the inadequate process in use by the licensee

NRC Findings

Hydrogen Burn

- The cask was placed in a safe condition and a team established to determine root cause and corrective actions
- Corrective actions included placing an inert gas beneath the lid and monitoring for hydrogen levels during the entire welding process
- Notice Of Violation (NOV) issued on violation of Technical Specification requirement

Fuel Selection Criteria

- Intact fuel defined as no defects no larger than pinhole leaks or hairline cracks
- ISG-1 potential methods to determine if fuel is intact include:
 - Reactor records
 - Sipping
 - UT Exam

NRC Findings

Fuel Selection Criteria

- Visual inspections alone are not acceptable for to classify intact fuel assemblies
- Licensee planned to classify fuel as intact based on visual examinations and sister plant's fuel selection procedure
- Licensee planned to load fuel subject to stress corrosion cracking in top nozzle area.
- The fuel subject to stress corrosion cracking had not been analyzed for transport under Part 71

NRC Findings

Training for 10 CFR 72.48 Reviewers

- Inspector found several areas where the licensee had missed Technical Specification and FSAR requirements including:
 - Requirement for site specific fire hazard analysis
 - The station procedure exceeded the FSAR specified discharge pressure during the unloading process
 - The licensee's procedure did not include the torque values that were specified in the FSAR for lifting devices

NRC Findings

Training for 10 CFR 72.48 Reviewers

- Inspector discovered that the licensee had “grandfathered” the existing 10 CFR 50.59 reviewers without training to perform 10 CFR 72.48 reviews
- NCV issued for not providing indoctrination and training for personnel performing activities that affect quality - 10 CFR 72.144(d)



NRC Findings

- The Fire Protection Plan had not been expanded to include the ISFSI, the haul route or the fuel building
- A site specific analysis for explosives and combustibles along the transport route had not been addressed
- Technical Specification requirements for inspection of the air inlet and outlet screens had not been placed in the station procedures
- The required Technical Specification actions in the event of a fuel misloading had not been included in station procedures



Conclusions

- Know the cask licensing basis
- Spend the time to put a thorough inspection plan together during the preparation phase
- Use experienced inspectors for technical areas such as welding
- The regulator and the licensee should communicate early and often so the expectations are known