UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

September 29, 2005

Mr. Paul D. Hinnenkamp
Vice President - Operations
Entergy Operations, Inc.
River Bend Station
5485 US Highway 61N
St. Francisville, LA 70775

SUBJECT: INSPECTION REPORT 050-00458/05-011; 072-00049/05-003

Dear Mr. Hinnenkamp:

An NRC inspection was conducted on September 6-9, 2005, at your River Bend Station. The enclosed inspection report documents the results of that inspection which were discussed with members of your staff during an exit meeting on September 9, 2005. This inspection consisted of observing the wet operations segment of your Independent Spent Fuel Storage Installation (ISFSI) pre-operational testing program. The wet operations segment of the testing included preparation of the dry fuel storage system for fuel loading, moving the transfer cask from the cask washdown area to the cask pool, loading the dummy fuel assembly into the canister and removing it, installing the canister lid and drainpipe underwater, and moving the transfer cask from the cask pool back to the cask washdown area. Operation of the lift yoke extension and cask handling crane redundant drop protection features were an integral part of the sequence. Annulus seal effectiveness, radiological control effectiveness, procedure adequacy and training were also evaluated.

The inspection determined that you are conducting pre-operational testing activities in accordance with procedural and regulatory requirements. No violations were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction.

Should you have any questions concerning this inspection, please contact the undersigned at (817) 860-8191 or Mr. Scott Atwater at (817) 860-8286.

Sincerely,

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle and Decommissioning Branch

Docket Nos.: 50-458
72-049
License No.: NPF-47

Enclosure:
NRC Inspection Report
050-00458/05-011; 072-00049/05-003

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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	050-00458; 072-00049
License No.:	NPF-47
Report No:	050-00458/05-011; 072-00049/05-003
Licensee:	Entergy Operations, Inc.
Facility:	River Bend Nuclear Generating Station 5485 U.S. Highway 61 St. Francisville, Louisiana
Dates:	September 6-9, 2005
Inspectors:	S.P. Atwater, Health Physicist R.L. Kellar, P.E., Health Physicist
Approved By:	D.B. Spitzberg, Ph.D., Chief Fuel Cycle and Decommissioning Branch
Attachments:	1. Supplemental Information 2. Inspector Notes

EXECUTIVE SUMMARY

River Bend Nuclear Generating Station
NRC Inspection Report 050-00458/05-011; 072-00049/05-003

License Condition 10 of Holtec Certificate of Compliance 72-1014, Amendment 2, required the licensee to conduct pre-operational testing of the loading, closure, handling, unloading, and transfer of the HI-STORM 100 cask system prior to first use of the system to load spent fuel assemblies. License Condition 10 consisted of ten subsections numbered a. through j.

On September 6-9, 2005, River Bend conducted pre-operational testing activities required by License Conditions 10.a, b, d, e, and j using the transfer cask, an MPC-68 canister, and the cask handling crane. The activities included preparation of the dry fuel storage system for fuel loading; moving the transfer cask from the cask washdown area to the cask pool; loading the dummy fuel assembly into the canister and removing it; installing the canister lid and drainpipe underwater; and moving the transfer cask from the cask pool back to the cask washdown area. Operation of the lift yoke extension and cask handling crane redundant drop protection features were an integral part of the sequence. Annulus seal effectiveness, radiological control effectiveness, procedure adequacy and training were also evaluated.

Details related to the activities observed are provided in Attachment 2 to this report. The following provides a summary of the findings of this inspection.

Pre-Operational Testing of an ISFSI (60854, 60854.1)

- The cask handling crane operator performed the main hoist safety checks prior to the first lift each day, as required by the American National Standards Institute (ANSI) standard for overhead gantry cranes (Attachment 2, Page 1).

- NUREG-0612 required a minimum operating temperature for the cask handling crane to preclude brittle fracture under load. At the time of the inspection the licensee's proposed minimum operating temperature of 70 degrees F was under review by the NRC (Attachment 2, Pages 1-2).

- Annual and initial testing had been performed on the lift yokes and lift yoke extension in accordance with the ANSI standard for special lifting devices. The testing found no evidence of abnormal stress or degradation (Attachment 2, Pages 2-3).

- The licensee had analyzed drops of heavy loads onto the 113' elevation fuel building floor, the cask pool upper shelf and the cask pool lower shelf in accordance with NUREG-0612. Based on the load drop analyses, impact limiters were installed in the cask pool and cask washdown areas; redundant drop protection features were added to the cask handling crane; and lift height restrictions were established for all heavy load movements. The licensee had submitted the load drop analyses to the NRC under a License Amendment Request (LAR). At the time of the inspection, the LAR was under NRC review (Attachment 2, Pages 3-4).

- Rigging diagrams and procedural guidance for handling dry fuel storage system components had been provided in accordance with the Holtec Final Safety Analysis Report (FSAR). The component weights were included in the rigging procedure (Attachment 2, Pages 4-5).

- The licensee had defined a safe load path for movement of heavy loads in accordance with NUREG 0612. The safe load path minimized the potential for heavy load drops to adversely impact irradiated fuel in the spent fuel pool or safe shutdown equipment (Attachment 2, Page 6).

- Annual and initial testing had been performed on the transfer cask lifting trunnions and receiving blocks in accordance with the ANSI standard for special lifting devices. The testing found no evidence of stress or abnormal degradation. Prior to each use, the trunnions were visually inspected for damage and tightened as necessary (Attachment 2, Pages 6-7).

- The licensee had developed and implemented an abnormal operating procedure as required by the Holtec FSAR for responding to inadvertent criticality, fuel bundle damage and uncontrolled lowering of spent fuel pool level (Attachment 2, Page 7).

- The licensee had clearly and visibly labeled the dry fuel storage system components as required to prevent inadvertent operations (Attachment 2, Pages 7-8).

- The licensee had applied their site ALARA program to the ISFSI operations in accordance with the Holtec FSAR to control personnel exposures, contamination and airborne radioactivity. ALARA pre-job briefings were conducted for craft personnel prior to the start of work (Attachment 2, Page 8).

- A criticality monitoring system which met applicable requirements was installed and operational in the spent fuel area (Attachment 2, Page 9).

- Radiation protection personnel monitored the transfer cask for hot particles prior to raising the cask above the pool surface in order to minimize exposures. Decontamination techniques used were effective in reducing transfer cask exterior contamination levels to below the Technical Specification limits (Attachment 2, Pages 9-10).

- Radiation protection personnel performed dose rate surveys on the transfer cask to ensure limits were not exceeded. Both the dose rate limits and the survey methodology met the requirements of the Technical Specifications (Attachment 2, Page 10).

- Sling selection and the configuration in which they were to be used were consistent with applicable requirements (Attachment 2, Page 11).

- The licensee had established inspection criteria for the slings used during the dry fuel storage operations. The conditions under which slings were required to be removed from service were consistent with the American Society of Mechanical Engineers (ASME) code (Attachment 2, Pages 11-13).

- The licensee had established procedural controls to ensure slings would be used within the ASME code requirements for surface temperature (Attachment 2, Pages 13-14).

- During the pre-operational testing, the riggers and the Person-In-Charge (PIC) were qualified in accordance with the ASME code (Attachment 2, Page 14).

- During the pre-operational testing, the fuel handling platform was operated by a Fuel Handler/Spotter and the operation was supervised by a Fuel Movement Supervisor. The training and certification records indicated that both individuals were qualified and certified to operate the fuel handling platform (Attachment 2, Pages 14-15).

- During this inspection, the licensee effectively demonstrated preparation of the dry fuel storage system for fuel loading, moving the transfer cask and canister from the cask washdown area to the cask pool, loading the dummy fuel assembly into the canister, returning the dummy assembly to the spent fuel pool, installing the canister lid and drainpipe underwater, and moving the transfer cask and canister from the cask pool back to the cask washdown area (Attachment 2, Page 15).

Followup (92701)

- Discussions with the licensee were conducted concerning Inspection Follow-up Item (IFI) 72-49/0401-01 related to welding program requirements for conducting ASME code year reconciliation. The licensee had elevated the issue to the corporate level and issued Program Change Notice CEP-WP-PCN-35. This IFI will remain open pending corporate resolution.

ATTACHMENT 1

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

R. Biggs, Coordinator, Safety and Regulatory Affairs
J. Campbell, Senior Project Manager
R. Clardy, Stone and Webster
E. Clevenger, Engineering Support
K. Davis, Stone and Webster
C. Drude, Maintenance Repairman
P. Ellis, Radiation Protection Technician
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P. Scott, Stone and Webster
B. Smith, Nuclear Superintendent
G. Smith, Stone and Webster
K. Suhrke, Technical Assistant
F. Wilson, Senior Project Manager

INSPECTION PROCEDURES USED

60854	Preoperational Testing of an Independent Spent Fuel Storage Installation (ISFSI)
60854.1	Preoperational Testing of ISFSIs at Operating Plants
92701	Followup

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

None

Discussed

72-049/0401-01	IFI	Welding Program Requirement for Conducting ASME Code Reconciliation

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
CoC	Certificate of Compliance
FME	Foreign Material Exclusion
FSAR	Final Safety Analysis Report
HEPA	High Efficiency Particulate Airborne
IFI	Inspection Follow-up Item
ISFSI	Independent Spent Fuel Storage Facility
LAR	License Amendment Request
MPC	Multi-Purpose Canister
NDE	Non-Destructive Examination
NRC	U.S. Nuclear Regulatory Commission
PIC	Person-In-Charge
RWP	Radiation Work Permit

Attachment 2
RIVER BEND WET OPERATIONS

(INSPECTOR NOTES)

Category: Cranes *Topic:* Hoist Limit Switch Tested Each Shift

Reference: ANSI B30.2, Chap 2-3.2.4

Requirement: Prior to the initial use of any hoist during each shift, the operator shall verify operation of the primary upper limit switch under no-load conditions. Extreme care shall be exercised. The block shall be "inched" into the limit or run at a slow speed.

Finding: This requirement was implemented. Procedure EN-MA-119, Step 5.5.2.b required the crane operator to test the upper limit switches at the beginning of each shift and/or prior to lifting the load by slowly raising the hoist into the limit switch. Procedure MLP-7500, Step 8.2.12 required the crane operator to verify operability of the raise limit switch prior to lifting the load.

The main hoist was equipped with a primary upper limit switch, actuated electronically by a hoist drum revolution counter. If the primary upper limit switch failed, upward hoist travel would be stopped by the secondary upper limit switch. The secondary switch consisted of a mechanical bar mounted above the load block, which would mechanically interrupt power to the hoist motor when hit by the load block during upward travel. During the pre-operational testing the crane operator tested the main hoist primary upper limit switch in slow speed first and then in high speed. In both cases, the hoist stopped approximately 2" below the secondary upper limit switch.

Documents Reviewed: Procedure MLP-7500, "Operation of the Spent Fuel Cask Crane," Revision 15
Procedure EN-MA-119, "Material Handling Program," Revision 1

Category: Cranes *Topic:* Temperature Limit for Crane Operation

Reference: NUREG 0554, Sect 2.4

Requirement: Minimum operating temperatures for the crane should be specified to reduce the possibility of brittle fracture of the ferritic load-carrying members of the crane. The minimum temperature can be determined by: 1) a drop weight test per ASTM E-208; 2) a Charpy test per ASTM A-370; or 3) a 125% load test.

Finding: At the time of the inspection, the minimum operating temperature for the cask handling crane was under NRC review. The cask handling crane main hoist was load tested on October 6, 1983 using a test load of 312,500 pounds. The temperature at the time of the load test was not included in Stone and Webster documentation. To determine the recommended minimum operating temperature for the crane inside the fuel building, the licensee utilized guidance from NUREG 0612, Appendix C, which stated that for a modified crane in an operating plant, the cold-proof test was omitted because the minimum ambient temperature was 70 degrees F. As part of the License Amendment Request for the crane to support dry fuel loading operations, the NRC has asked River Bend for clarification of the minimum operating temperature for the crane. Any additional questions or clarifications of the minimum crane operating temperature will be

resolved during NRC review. In the interim, a minimum crane operating temperature of 70 degrees F had been established in Procedure DFS-0002, Step 6.13.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Revision DRAFT
NUREG 0612, Appendix C
Stone and Webster Test Certification Report #7 - Spent Fuel Cask Trolley 1-MHF-CRN-2

Category: Heavy Loads *Topic:* Lift Yoke Annual Testing

Reference: ANSI N14.6, Sections 7.3.1.a and 6.3.1

Requirement: A load test of the lift yoke (and lift yoke extension, if used) shall be performed annually, or prior to the next use if not used for greater than one year. The licensee may repeat the acceptance testing at 750,000 pounds (main beam assembly) and 135,000 pounds (sling pins) for 10 minutes as specified in ANSI N14.6, Section 7.3.1.a,
OR
The licensee may elect to perform; a) dimensional testing and visual inspection of the main beam assembly strongbacks, actuator plates, and lift arms; and b) dimensional testing and liquid penetrant or magnetic particle testing of the main pins, actuator pins and sling pins.

Finding: This requirement was implemented. The licensee disassembled and inspected lift yoke DFS-LY2 (Outside Lift Yoke) under Work Order 6555701 on May 26, 2005. Magnetic Particle testing was performed on the load bearing surfaces of the main beam assembly strongbacks, actuator plates and lift arms, and the results were documented in NDE Inspection Report BOP-MT-05-017. No indications were identified. Dimensional checks of the main beam assembly strongbacks, actuator plates, and lift arms were made and the results were documented within the work order. The dimensional checks were within acceptable tolerances. Liquid penetrant examinations were performed on all pins and on the lift point stress areas of the strongbacks. The results were documented in Inspection Reports BOP-PT-05-024 and BOP-PT-05-025. No indications were identified.

The licensee disassembled and inspected lift yoke DFS-LY1 (Inside Lift Yoke) under Work Order 6555806 on June 27, 2005. Magnetic Particle testing was performed on the load bearing surfaces of the main beam assembly strongbacks, actuator plates and lift arms. Magnetic Particle testing was also performed and on the main pins and actuator pins. The results were documented in NDE Inspection Report BOP-MT-05-022. No indications were identified. Dimensional checks of the main beam assembly strongbacks, actuator plates, and lift arms were made and the results were documented within the work order. The dimensional checks were within acceptable tolerances. Liquid penetrant examinations were performed on the sling pins and the results were documented in Inspection Report BOP-PT-05-036. No indications were identified.

The licensee disassembled and inspected lift yoke extension DFS-LIE1 under Work Order 6723101 on July 12, 2005. Magnetic particle testing was performed on the eight lifting pin holes, and the results were documented in NDE Inspection Report BOP-MT-05-024. No indications were identified. Dimensional checks were made of the lift yoke extension strongbacks and the results were documented within the work order. The dimensional checks were within acceptable tolerances. Liquid penetrant testing was

performed on the 4 lifting pins and the results were documented in NDE Inspection Report BOP-PT-05-041. No indications were identified.

Documents Reviewed: Lift Yoke DFS-LY2
Work Order 6555701
NDE Reports BOP-MT-05-017, BOP-PT-05-024, and BOP-PT-05-025

Lift Yoke DFS-LY1
Work Order 6555806
NDE Reports BOP-MT-05-022 and BOP-PT-05-036

Lift Yoke Extension DFS-LIE1
Work Order 6723101
NDE Reports BOP-MT-05-024 and BOP-PT-05-041

Category: Heavy Loads *Topic:* Lift Yoke Initial Testing

Reference: ANSI N14.6, Sections 7.3.1.a and 6.2.1

Requirement: Prior to initial use, the lift yoke shall be subjected to a test load of 750,000 pounds (3 times 125 tons) for a minimum of 10 minutes followed by non destructive testing of the critical areas. There are no load bearing welds in the Holtec lift yoke design. Visual testing shall be performed on the main beam assembly strongbacks, actuator plates, and lift arms. Liquid penetrant or magnetic particle testing shall be performed on the main pins and actuator pins. Each sling pin shall be load tested to 135,000 pounds (3 times 22.5 tons) for a minimum of 10 minutes, followed by liquid penetrant or magnetic particle testing.

Finding: This requirement was implemented. US Tool and Die (UST&D) performed load testing and non-destructive testing on both lift yokes on March 10, 2004 and March 11, 2004. The lift yoke main assemblies were load tested to 762,080 pounds. The lift yoke main pins and actuator pins were load tested to 375,000 pounds and the sling pins were load tested to 136,740 pounds. The lift yoke extension was load tested to 750,000 pounds on December 17, 2004. All loads were held for 10 minutes. Following load testing, liquid penetrant examinations were performed on all pins and on lift point stress areas. The results were documented in the Holtec Component Completion Records. No indications were identified.

Documents Reviewed: Holtec Component Completion Record Number 1027-702-1, Revision 1
Holtec Component Completion Record Number 1027-702-2, Revision 1

Category: Heavy Loads *Topic:* Load Drop Analyses

Reference: NUREG-0612, Section 5.1.4.2

Requirement: The Reactor Building in a BWR plant typically contains the reactor and spent fuel pool, as well as other safety-related equipment. The effects of a cask drop should be analyzed for non-single failure proof cranes in areas subject to a potential load drop including the spent fuel pool area, spent fuel cask loading area and any area under (or near) the load path where safe shutdown equipment could be damaged. The load drop analysis should

conform to the guidelines provided in NUREG 0612, Appendix A, and should indicate that following a load drop: a) radiation doses to the public will not exceed 25% of the 10 CFR Part 100 limits; b) Keff of the spent fuel will not exceed 0.95; c) spent fuel pool level will not lower to the point of uncovering fuel assemblies; and d) required safe shutdown functions will not be lost.

Finding: At the time of the inspection, the licensee's load drop analyses were under NRC review. The licensee had analyzed drops of heavy loads onto the fuel handling floor and into the cask pool (elevation 113') in accordance with NUREG-0612, Section 5.1.4.2. Based on the load drop analyses, the licensee established lift height restrictions for loads between 40 tons and 125 tons, and implemented them in Attachment 1 of Procedure MLP-7500. The maximum lift height for an unloaded transfer cask containing a full water jacket, a full annulus and a canister filled with water was approximately 40". The 40" lift height restriction for the transfer cask was enforced during the pre-operational testing. Although the other heavy loads weighed less than 40 tons and had essentially unrestricted lift heights, the licensee transported all loads as close to the floor as possible.

The licensee had also analyzed drops of a transfer cask fully loaded with spent fuel. These drops included: a) a 4" drop onto corner of cask pool upper shelf resulting in a tip-over into the cask pit south wall; b) a 7" drop onto cask pool upper shelf; c) a 42.5' drop onto cask pool lower shelf impact limiter; d) a 17.5' drop onto the cask washdown area impact limiter, and e) an 8.5" drop onto the storage cask mating device. These load drops were described in LAR 2004-06.

When lifting a fully loaded transfer cask from the cask pool, the impact of a load drop was mitigated by an impact limiter on the cask pool lower shelf. When moving the transfer cask horizontally from the cask pool to the cask washdown area, the crane redundant links and slings were required to be engaged. Use of these redundant drop protection features eliminated the need for impact limiters along the safe load path. When lowering the transfer cask in the cask washdown area, the impact of a load drop was mitigated by an impact limiter at the bottom.

Procedure DFS-0002, Steps 8.3.43, 8.6.22, and 8.6.38 limited transfer cask lift height to 2.5" when moving horizontally over the cask pool upper shelf. This restriction was within the limits established in LAR 2004-06 and was enforced during the pre-operational testing.

Documents Reviewed: Procedure MLP-7500, "Operation of the Spent Fuel Cask Crane," Revision 15
License Amendment Request (LAR) 2004-06, "Use of Fuel Building Cask Handling Crane For Dry Spent Fuel Cask Loading Operations"

Category: Heavy Loads ***Topic:*** Rigging Diagrams

Reference: FSAR 1014, Table 8.0.1

Requirement: Rigging diagrams and procedural guidance are provided for: a) upending the canister with the upending frame; b) vertical handling of an empty canister; c) handling the canister lid; d) handling the transfer cask lid; e) vertical handling of a loaded canister; and e) handling the storage cask lid.

Finding: This requirement was implemented. Procedure DFS-005 provided rigging diagrams and procedural guidance for:
1.) upending the canister with the upending frame, in Section 8.2.7 and Attachment 1, Figure 1.6;
2.) handling an empty canister with the canister lifting lugs, in Section 8.2.4 and Attachment 1, Figure 1.3;
3.) handling an empty canister with a strongback, in Section 8.2.5 and Attachment 1, Figure 1.4;
4.) lowering an empty canister into the transfer cask, in Section 8.7.6 and Attachment 7, Figure 1.2;
5.) handling the canister lid without leveling turnbuckles, in Section 8.2.9 and Attachment 1, Figure 1.8;
6.) handling the canister lid with leveling turnbuckles, in Section 8.2.10 and Attachment 1, Figure 1.9;
7.) handling the transfer cask lid, in Section 8.3.7 and Attachment 2, Figure 1.4;
8.) handling a loaded canister with a basket hitch configuration, in Section 8.9.3 and Attachment 9, Figure 1.1;
9.) handling a loaded canister with a vertical hitch configuration, in Section 8.9.3 and Attachment 9, Figure 1.2;
10.) handling the storage cask lid, in Section 8.4.2 and Attachment 3, Figure 1.1.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan," Revision DRAFT

Category: Heavy Loads *Topic:* Rigging Weights

Reference: FSAR 1014, Tables 8.1.1, 8.1.2, 8.1.3, 8.1.4

Requirement: The weights of the components handled during dry fuel storage operations should be contained in the licensee's lifting and rigging procedures.

Finding: This requirement was implemented. The licensee had incorporated the weights of components handled during dry fuel storage operations into Procedure DFS-0005, Section 5.3 and into Procedure MLP-7500, Attachment 5. Several of the component weights provided in these procedures were compared to the weights provided in the Holtec FSAR and found to be consistent. For example, the Holtec FSAR provided a weight of 10,194 pounds for the MPC-68 lid without the drain pipe. Procedure DFS-0006, Attachment 5 provided the same weight of 10,194 pounds and Procedure MLP-7500 provided a weight of 5.12 tons (10,240 pounds).

The Holtec FSAR provided a weight of 246,500 pounds for the transfer cask at its heaviest weight. Procedure DFS-0006, Attachment 5 provided a weight of 247,917 pounds and Procedure MLP-7500 provided a weight of 123.8 tons (247,600 pounds). The heaviest weight would occur when the transfer cask is removed from the cask pool following fuel loading. The neutron shield tank would be full, the lid would be installed on the canister, and the canister would be filled with spent fuel and water.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan", Revision DRAFT
Procedure MLP-7500, "Operation of the Spent Fuel Cask Crane," Revision 15

Category: Heavy Loads *Topic:* Safe Load Paths

Reference: NUREG 0612, Sect 5.1.1 (1)

Requirement: Safe load paths should be defined for the movement of heavy loads to minimize the potential for heavy loads, if dropped, to impact irradiated fuel in the reactor vessel and in the spent fuel pool, or to impact safe shutdown equipment. The path should follow, to the extent practical, structural floor members, beams, etc., such that if the load is dropped, the structure is more likely to withstand the impact.

Finding: This requirement was implemented. The spent fuel cask handling crane main hoist did not incorporate a trolley, and was therefore limited to bridge movement in the north-south direction only. Attachment 4 of Procedure MLP-7500 depicted the Safe Load Path over the cask pool and cask washdown area. Attachment 5 of Procedure MLP-7500 listed the individual heavy loads that were allowed in the Safe Load Path area.

Documents Reviewed: Procedure MLP-7500, "Operation of the Spent Fuel Cask Crane," Revision 15

Category: Heavy Loads *Topic:* Transfer Cask Trunnion Annual Testing

Reference: Holtec FSAR Sections 9.2.1; 9.1.2.1; Table 9.1.3

Requirement: A load test of the transfer cask trunnions shall be performed annually, or prior to the next use if not used for greater than one year. The licensee may repeat the initial testing at 750,000 pounds for 10 minutes as specified in FSAR section 9.2.1,
OR
The licensee may elect to test the trunnions in accordance with ANSI N14.6, as specified in FSAR Table 9.1.3. ANSI N14.6 - 1993 - Section 6.3.1 allows dimensional testing, visual inspection, and non destructive testing of the critical areas, in lieu of a load test.

Finding: This requirement was implemented. The licensee completed the annual inspection of the transfer cask lifting trunnions and trunnion receiving blocks under Work Order 6555201 on May 26, 2005. Magnetic Particle testing was performed on the trunnion receiving blocks and the results were documented in NDE Inspection Report BOP-MT-05-016. No indications were identified. Dimensional checks were made of the trunnions and the results were documented within the work order. The dimensional checks were within acceptable tolerances. Liquid penetrant examinations were performed on the trunnions and the results were documented in Inspection Report BOP-PT-05-023. No indications were identified.

Documents Reviewed: Work Order 6555201
NDE Reports BOP-MT-05-016 and BOP-PT-05-023

Category: Heavy Loads *Topic:* Transfer Cask Trunnion Initial Testing

Reference: Holtec FSAR Section 9.1.2.1

Requirement: Prior to initial use, the trunnions shall be tested at 750,000 pounds (300 percent of 125 tons) for 10 minutes, followed by a visual examination of the accessible parts of the trunnions and attachment areas. The acceptance criteria is no deformation, distortion or cracking.

Finding: This requirement was implemented. The transfer cask was load tested by US Tool and

Die (UST&D) to 761,992 pounds for 10 minutes on November 1, 2002. A visual examination performed after the load test confirmed that no visible damage was present.

Documents Reviewed: Trunnion /Support Lug Load Test Data Record for HI-TRAC Serial No. 05

Category: Heavy Loads ***Topic:*** Transfer Cask Trunnion Inspection Prior To Use

Reference: FSAR 1014, Sect 9.2.1

Requirement: Prior to each fuel loading, a visual examination in accordance with a written procedure shall be required of the transfer cask lifting trunnions. The examination shall inspect for indications of overstress such as cracking, deformation, or wear marks.

Finding: This requirement was implemented. Procedure DFS-0005, Step 8.5.5.2 required a visual inspection of the lifting trunnions for gouges, cracks, deformations or other indications of damage prior to engaging the lift yoke to the trunnions. This visual inspection did not apply when the transfer cask was seated in the cask pool. In addition, Procedure DFS-0002, Step 8.3.11 required the lifting trunnions to be tightened prior to lifting the transfer cask out of the cask washdown area.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Revision DRAFT
Procedure DFS-0005, "DFS Rigging Plan", Revision DRAFT

Category: Procedures ***Topic:*** Abnormal Event Response

Reference: FSAR 1014, Sect 8.0

Requirement: Response to abnormal events that may occur during normal loading operations are provided with the procedural steps.

Finding: This requirement was implemented. Procedure AOP-0027 provided the immediate and subsequent operator actions required for inadvertent criticality, fuel bundle damage and lowering of spent fuel pool level. The immediate action required for inadvertent criticality was to evacuate the area, without attempting to move the fuel bundle to a safe location. The immediate action required for fuel bundle damage was to place the spent fuel pool cleanup demineralizer in maximum flow. The immediate action required for a lowering spent fuel pool level was to begin makeup with demineralized water. An interview with the Superintendent of Reactor Engineering indicated that a Significant Event Response Team (SERT) would be staffed to provide recovery actions for these abnormal events.

Documents Reviewed: Procedure AOP-0027, "Fuel Handling Mishaps", Revision 19

Category: Procedures ***Topic:*** Operating Status

Reference: 10 CFR 72.168(b)

Requirement: The licensee shall establish measures to identify the operating status of structures, systems, and components of the ISFSI such as tagging valves and switches to prevent inadvertent operations.

Finding: This requirement was implemented. The dry fuel storage system components were

clearly and visibly labeled. The control boxes for the lift yoke air system and air shackle system were labeled with arrows indicating the proper direction of operation. Interfaces with the plant air and water systems were clearly labeled, were color coded and included direction of flow. The cask handling crane, remote control box, and rigging components were clearly labeled.

Documents Reviewed: None.

Category: Radiological ***Topic:*** ALARA Program

Reference: FSAR 1014, Sect 10.1.1

Requirement: Licensees using the HI-STORM 100 System will apply their existing site ALARA policies, procedures and practices to ISFSI activities, to ensure that the personnel exposure requirements of 10 CFR 20 are met. Pre-job ALARA briefings should be held with workers and radiological protection personnel prior to work on or around the system.

Finding: This requirement was implemented. Procedure DFS-0006 provided the radiological monitoring requirements for the dry fuel storage loading and transport operations. Dose rate surveys were required frequently and continuous monitoring was required during high dose rate evolutions such as cask removal from the cask pool, canister welding, canister blowdown and canister transfer into the storage cask. Temporary shielding was used when practical and criticality monitoring was required during cask loading.

Strippable coatings and effective annulus seal closure methods were used for minimizing contamination of the transfer cask, canister and handling equipment. Loose surface contamination surveys were performed frequently and contamination was removed whenever possible. Airborne contamination was minimized using HEPA filters and vacuums during welding and grinding operations.

During the pre-operational testing, the cask handling areas were posted as high contamination areas, within which RWP 2005-1072 required double sets of Anti-Contamination clothing. The following combinations met the requirement for double sets of Anti-Contamination clothing: a) one Cassidy suit made with cloth and Gore-Tex; b) two Orex suits made of paper; or c) one Orex paper suit with one plastic oversuit. The Cassidy suits and the Orex suits with plastic oversuits were used during the pre-operational testing.

The licensee conducted a pre-job briefing for craft personnel at the beginning of the shift on Wednesday September 7, 2005. The briefing topics included task assignments and responsibilities, procedure use, impact on other jobs, Foreign Material Exclusion (FME) and housekeeping, access control, Electronic Dosimetry alarm setpoints and actions, neutron monitoring and low dose waiting areas. The requirements of Radiation Work Permit (RWP) 2005-1072, Task 01 and Work Order 56988 were reviewed.

Documents Reviewed: Procedure DFS-0006, "Radiological Monitoring Requirements For The HI-STORM 100 Dry Fuel Storage System", Revision DRAFT

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Category: Radiological *Topic:* Criticality Control - BWR

Reference: 10 CFR 72.124.c; 10 CFR 50.68(b)

Requirement: A criticality monitoring system shall be maintained in each area where spent fuel is handled, which will energize clearly audible alarm signals if accidental criticality occurs. Underwater monitoring is not required.

Finding: This requirement was implemented. Criticality monitoring in the cask pool and spent fuel pool areas was provided by the plant Digital Radiation Monitoring System (DRMS). This permanently installed system consisted of two area monitors mounted on the wall, one on the north side of the spent fuel pool and one on the south side. Both monitors actuated audible and visible alarms. The alert alarm (amber light) was set at 2 mrem/hr and the high alarm (red light) was set at 100 mrem/hr. Both radiation monitors were calibrated under the plant calibration system and were within their calibration interval.

Due to the configuration of the building, the DRMS could not detect radiation levels in the cask handling area to the extreme north of the cask pool. In order to monitor this area, two Eberline RMS-3 / DA1-6CC criticality monitors were being procured, and will be placed in service prior to actual fuel loading. During the pre-operational testing an MGP AMP-100 portable area monitor was used to simulate the new criticality monitors.

Documents Reviewed: None.

Category: Radiological *Topic:* Hot Particle Control

Reference: FSAR 1014, Section 8.1.5.1.I

Requirement: Raise the transfer cask until the canister lid is just below the surface of the spent fuel pool. Survey the area above the canister lid to check for hot particles. Remove any activated or highly radioactive particles from the transfer cask or canister.

Finding: This requirement was implemented. Procedure DFS-0002, Steps 8.6.15 through 8.6.17 raised the transfer cask to just below the pool surface where a Radiation Protection survey for hot particles was required. If any hot particles were found, Radiation Protection was required to determine the most effective way to remove them. Once the transfer cask cleared the surface of the cask pool, excess water was removed from the lid in Step 8.6.20.3 of Procedure DFS-0002. During the demonstration, the survey for hot particles was performed using a teletector, and a deck brush was used to remove the bulk of the water from the top of the lid. A maslin mop was then used for the final water removal.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading", Revision DRAFT

Category: Radiological *Topic:* Transfer Cask Surface Contamination Limits

Reference: CoC 1014, Tech Spec A.3.2.2

Requirement: Removable contamination on the exterior surface of the transfer cask and accessible portions of the canister shall not exceed 1000 dpm/100 sq cm from beta and gamma and 20 dpm/100 sq cm from alpha sources. This Technical Specification is not applicable if canister transfer operations occur inside the fuel building.

Finding: This requirement was implemented. During the pre-operational testing, a contamination survey was performed on the transfer cask following initial decontamination and prior to removing the strippable coating and annulus seal. Twenty smears were taken, of which five showed contamination levels greater than 1000 dpm/100 square centimeters. These five were on the canister lid, drain tube hole and bottom of the transfer cask.

Another contamination survey was performed following annulus seal removal. Six smears were taken on the canister below the annulus seal and all six smears showed contamination levels of less than 1000 dpm/100 square centimeters beta gamma and 20 dpm/100 square centimeters alpha. This indicated the annulus seal had been effective in preventing contamination of the canister externals while submerged in the cask pool.

Following final decontamination and strippable coating removal, another survey was performed. Fourteen smears were taken on the canister lid and transfer cask, all of which showed contamination levels of less than 1000 dpm/100 square centimeters beta gamma and 20 dpm/100 square centimeters alpha. The results of all 3 surveys were documented on Contamination Survey No. 05-1072-1 dated September 14, 2005.

Documents Reviewed: Contamination Survey No. 05-1072-1

Category: Radiological *Topic:* Transfer Cask Surface Dose Rate Limits

Reference: CoC 1014, Tech Spec A.5.7.3, 5.7.8

Requirement: The licensee shall establish site specific surface dose rate (neutron + gamma) limits for the transfer cask top and sides, in order to maintain personnel exposures ALARA. The licensee shall measure the transfer cask surface dose rates in accordance with Section 5.7.8 a and b. The measured dose rates shall not exceed the site specific limits.

Finding: This requirement was implemented. Procedure DFS-0002, Step 8.24.1 required a combined gamma and neutron survey on the loaded transfer cask after the lid was installed. The dose rate survey was required to be performed in accordance with Procedure DFS-0006, Attachment 1 and the dose rates were not to exceed 97 mrem/hour at the top and 227.7 mrem/hour on the side. The survey methodology and dose rate limits were consistent with Technical Specification A.5.7.

Documents Reviewed: Procedure DFS-0002, "Dry Fuel Cask Loading, Revision DRAFT
Procedure DFS-0006, "Radiological Monitoring Requirements For The HI-STORM 100 Dry Fuel Storage System", Revision DRAFT

Category: Slings *Topic:* Dynamic Load Rating

Reference: NUREG 0612, Sect 5.1.1 (5)

Requirement: In selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating identified on the sling should be in terms of the "static load" which produces the maximum static and dynamic load.

Finding: This requirement was implemented. Procedure MLP-7500, Section 8.2 specified that the dynamic load factor used for rigging purposes for the main and auxiliary hoist was 15%. The procedure further required that the dynamic load on the rigging be calculated by taking the known weight of the load along with the dynamic load factor (15%). The dynamic load on the rigging was then compared to the selected rigging to ensure that an adequate size was used.

Documents Reviewed: Procedure MLP-7500, "Operation of the Spent Fuel Cask Crane," Revision 15

Category: Slings *Topic:* Load Rating Factors

Reference: ASME B30.9, Sections 9-6.5.2 and 9-6.5.5

Requirement: The rated load of synthetic round slings shall be determined based on size, hitch type, and horizontal angle in accordance with Table 24 and Figure 23 of ASME B30.9.

Finding: This requirement was implemented. Procedure DFS-0005 provided detailed instructions for handling heavy loads during dry fuel storage operations. Procedure steps specified the sequence for performing each lift and the tools and equipment required. Rigging diagrams illustrated the correct rigging configuration. Tables specified the minimum sling size, load rating, hitch type, and lifting angle to be used for each lift. The slings selected for dry fuel storage operations, and the configuration in which they were to be used, were consistent with Table 24 and Figure 23 of ASME B30.9.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan," Revision DRAFT
ASME B30.9 - 2003, Table 24 and Figure 23

Category: Slings *Topic:* Removal from Service - Synthetic Round Sling

Reference: ASME B30.9, Sect 9-6.9.4

Requirement: A synthetic round sling shall be removed from service if any of the following conditions are present: a) missing or illegible sling identification; b) acid or caustic burns; c) heat damage; d) holes, tears, cuts abrasive wear or snags that expose the core yarns; e) broken or damaged core yarns; f) weld splatter that exposes core yarns; g) round slings that are knotted; h) discoloration and brittle or stiff areas which may mean chemical or ultraviolet/sunlight damage; or i) fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken.

Finding: This requirement was implemented. The licensee was using synthetic round slings for lifting the transfer cask. Procedure DFS-0005, Step 8.1.6 authorized the use of Procedures EN-MA-119, GMP-0014 and DFS-005 for performing visual inspections of the slings, rigging and other devices used to make heavy lifts.

Procedures EN-MA-119 and GMP-0014 did not contain inspection criteria for synthetic

round slings. The licensee generated Condition Report RBS-2005-03221 to evaluate this condition. Procedure DFS-0005, Attachment 17 specified that synthetic round slings were to be removed from service when they exhibited: a) broken or worn stitching, holes, tears, cuts, abrasions, or snags that exposed the yarns; b) melting or charring of any part of the sling or attached fittings; c) damaged, stretched, cracked, worm, pitted or distorted fittings; d) one or both tell-tales not visible; e) fiber optic lines that do not transmit light; and f) indications of degradation due to ultra violet light. The removal from service criteria was generally consistent with the ASME B30.9 criteria for synthetic round slings.

The sling vendor had provided on-site training for inspecting the synthetic round slings. During the pre-operational demonstration, the slings were inspected daily in accordance with the vendor training and Attachment 17 of Procedure DFS-0005.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan," Revision DRAFT
Procedure EN-MA-119, "Material Handling Program," Revision 1
Procedure GMP-0014, "Control of Load Lifting Equipment," Revision 10
Training Attendance Record Dated August 11, 2000

Category: Slings ***Topic:*** Removal From Service - Synthetic Webbing Sling

Reference: ASME B30.9, Sect 9-5.9.4

Requirement: A synthetic webbing sling shall be removed from service if any of the following conditions are present: (a) missing or illegible sling identification, (b) acid or caustic burns, (c) melting or charring of any part of the sling, (d) holes, tears, cuts or snags, (e) broken or worn stitching in load bearing splices, f) excessive abrasive wear, g) knots in any part of the sling, (h) discoloration and brittle or stiff areas which may mean chemical or ultraviolet/sunlight damage, and (i) fittings that are pitted, corroded, cracked, bent, twisted, gouged or broken.

Finding: This requirement was implemented. The licensee was using a synthetic webbing sling for repositioning the lift yoke extension in the cask pool. Procedure DFS-0005, Step 8.1.6 authorized the use of Procedures EN-MA-119, GMP-0014 and DFS-005 for performing visual inspections of the slings, rigging and other devices used to make heavy lifts.

Procedure EN-MA-119, Step 5.7.8 specified that synthetic slings were to be removed from service when they exhibited fraying, cuts, tell-tale red thread, chemical or heat damage, or mildew. Procedure GMP-0014, Attachment 5 specified that synthetic slings were to be removed from service when they exhibited acid or caustic damage, melting or charring, snags, punctures, tears, excessive wear, makeshift weave, or an illegible identification number. Procedure DFS-0005, Attachment 17 mirrored the GMP-0014, Attachment 5 criteria for removing synthetic webbing slings from service.

The synthetic sling removal from service criteria contained in these procedures was generally consistent with ASME B30.9 criteria. During the pre-operational demonstration, the synthetic webbing slings were inspected in accordance with the Attachment 17 of Procedure DFS-0005.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan," Revision DRAFT
Procedure EN-MA-119, "Material Handling Program," Revision 1
Procedure GMP-0014, "Control of Load Lifting Equipment," Revision 10

Category: Slings *Topic:* Removal From Service - Wire Rope Sling

Reference: ASME B30.9, Sect 9-2.9.4.

Requirement: A wire rope sling shall be removed from service if any of the following conditions are present: a) missing or illegible sling identification; b) broken wires: c) severe localized abrasion or scraping: d) kinking, crushing, birdcaging, or any other damage to the rope structure; e) heat damage; f) end attachments that are cracked deformed or worn to the extent that the strength of the sling is substantially affected; or g) severe corrosion of the rope end attachments or fittings.

Finding: This requirement was implemented. The licensee was using stainless steel wire rope slings for installing the canister lid. Procedure DFS-0005, Step 8.1.6 authorized the use of Procedures EN-MA-119, GMP-0014 and DFS-005 for performing visual inspections of the slings, rigging and other devices used to make heavy lifts.

Procedure EN-MA-119, Step 5.7.8 specified that wire rope slings were to be removed from service when they exhibited broken wires, excessive wear, kinking and twisting, and chemical or heat damage. Procedure GMP-0014, Attachment 4 specified that wire rope slings were to be removed from service when they exhibited broken wires, distortion of the rope structure such as kinking, crushing and birdcaging, heat damage, including welding arc strikes, makeshift fasteners, excessive corrosion, or an illegible identification number. Procedure DFS-0005, Attachment 17 specified that wire rope slings were to be removed from service when they exhibited distortion of the rope structure such as kinking, crushing and birdcaging, heat damage, wear or scraping of one-third of the original diameter of the outside individual wires, corrosion of the rope or end attachments, broken wires, cracked, deformed or worn end attachments or an illegible identification stating the rated load and manufacturer.

The removal from service criteria contained in these procedures was generally consistent with the ASME B30.9 criteria for wire rope slings. During the pre-operational demonstration, the wire rope slings were inspected in accordance with the Attachment 17 of Procedure DFS-0005.

Documents Reviewed: Procedure DFS-0005, "DFS Rigging Plan," Revision DRAFT
Procedure EN-MA-119, "Material Handling Program," Revision 1
Procedure GMP-0014, "Control of Load Lifting Equipment," Revision 10

Category: Slings *Topic:* Temperature Limits

Reference: ASME B30.9, Sect 9-6.8.1

Requirement: Slings shall not be used in contact with objects that exceed the temperature limit of the sling.

Finding: This requirement was implemented. Holtec Purchase Specification #1211 required a

temperature rating for the slings of at least 300 degrees F. Procedures DFS-0003 and DFS-0004 both included a cautionary note that stated the uploading/downloading slings were rated for a maximum temperature of 300 degrees F and that the slings were not to be used at temperatures greater than 300 degrees F. The licensee had procedural controls in place to ensure that the slings were used within the allowed temperature ranges.

Documents Reviewed: Holtec Purchase Specification #1211, Revision 5
Procedure DFS-0003, "Dry Cask Transport and Storage," Revision DRAFT
Procedure DFS-0004, "MPC Unload Procedure," Revision DRAFT

Category: Slings ***Topic:*** User Training

Reference: ASME B30.9, Sect 9-6.1

Requirement: Sling users shall be trained in the selection, inspection, cautions to personnel, effects of environment and rigging practices.

Finding: This requirement was implemented. Procedure EN-MA-119, Section 4.4.1 required that anyone rigging a load must have completed basic rigging training, or be working under the direction of a lead that had completed basic rigging training. Section 5.4.5 required the Person-In-Charge (PIC) of the lift to have completed training in basic rigging, advanced rigging, overhead crane operator and mobile crane operator. Additionally, the PIC must have at least 5 years of experience in industrial maintenance or construction.

An interview with the Dry Fuel Storage Training Manager indicated that rigger and PIC training had been provided under the plant training programs prior to the dry fuel storage project. During the pre-operational testing observed by the NRC, the riggers and the PIC were qualified.

Documents Reviewed: Procedure EN-MA-119, "Material Handling Program," Revision 1

Category: Training ***Topic:*** Certification of Personnel

Reference: 10 CFR 72.190

Requirement: Operation of equipment and controls that have been identified as important to safety in the FSAR and in the license must be limited to trained and certified personnel or be under the direct visual supervision of an individual with training and certification in the operation. Supervisory personnel who personally direct the operation of equipment and controls that are important to safety must also be certified in such operations.

Finding: The fuel handling platform was operated by a Fuel Handler/Spotter during the pre-operational testing. The operation was supervised by a Fuel Movement Supervisor. The training and qualification records for both the Fuel Handler/Spotter and the Fuel Movement Supervisor were reviewed.

The Fuel Handler/Spotter successfully completed his On-The-Job Training and was certified on September 24, 2004. He had satisfactorily completed the knowledge and performance requirements contained in OJT Card No. R-QC-RF-FH.02. The performance items included: a) startup, shutdown and operation of the fuel handling platform; b) interpreting interlock status display indications for the bridge, trolley and

mast; c) moving spent fuel assemblies; and d) responding to fuel handling mishaps (simulated).

The Fuel Movement Supervisor successfully completed her On-The-Job Training and was certified on December 8, 2004. She had satisfactorily performed the duties of Fuel Movement Supervisor during new fuel receipt and during refueling operations, as documented on Reactor Engineering Tasks RB-100 and RB-101.

At the time of the pre-operational testing, both the Fuel Handler/Spotter and Fuel Movement Supervisor were qualified to operate the fuel handling platform.

Documents Reviewed: On-The-Job (OJT) Card No. R-QC-RF-FH.02, "Fuel Handler/Spotter"
Reactor Engineering Tasks RB-100 and RB-101

Category: Training ***Topic:*** Dry Run Exercise; Loading

Reference: CoC Condition 10 / FSAR 1014, Sect 12.2.2

Requirement: A dry run exercise of the loading, closure, handling, and transfer of the HI-STORM 100 System shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The dry run shall include the demonstrations described in CoC Condition 10.

Finding: The licensee conducted pre-operational testing activities required by License Conditions 10.a, b, d, e, and j. The activities included preparation of the dry fuel storage system for fuel loading, moving the transfer cask and canister from the cask washdown area to the cask pool, loading the dummy fuel assembly into the canister and returning the dummy assembly to the spent fuel pool, installing the canister lid and drainpipe underwater, and moving the transfer cask and canister from the cask pool back to the cask washdown area. Operation of the lift yoke extension and cask handling crane redundant drop protection features were an integral part of the sequence. Annulus seal effectiveness, radiological control effectiveness, procedure adequacy and training were also evaluated.

Documents Reviewed: None.