TROJAN ISFSI INSPECTION 72-17/2002-01
(INSPECTOR NOTES)

Category: Design Features **Topic:** Boral Testing

Reference: FSAR 72-12 Sect 9.2.2

Requirement The materials used specifically as neutron poison/shielding in the canister fuel basket (i.e. boral) will be tested to provide the necessary assurances that it will perform its intended function.

Finding: Test results for the boral were reviewed and found to adequately document that the material used for the neutron poison/shielding satisfied the acceptance criteria for use in the canisters. Documentation was reviewed that traced the boral fabrication used as the neutron poison for the fuel basket from raw material through fabrication of the boral plate to installation into the canister. Interviews were conducted with the Holtec Quality Assurance Manager related to the traceability of the boral fabrication records and records of material specification and testing results. The canisters were constructed by UST&D, under contract to Holtec, then delivered as a "turn-key" unit to Trojan. The documentation was kept on record by Holtec and delivered to Trojan as part of the canister data package. The canister data package for the MPC-24E Serial Number 015 lid basket and for shell PWRP 4801-7 was reviewed in detail during this inspection. This data package contained material specification and test results for the raw materials used in fabrication of the boral plate. Traceability of the boron carbide used in fabrication of the boral plate was provided by indicated boral serial number. For example B4C lot M-191 was used to fabricate boral plate serial number VT110807-1. Chemical testing of the raw material was performed by Elektroschmelzwerk Kempten GMBH. For B4C lot M-191, testing was also performed to determine the percent content of the B-10 and B-11 in the boron carbide powder. Records for the aluminum plate used in the fabrication of the boral plate were also reviewed. This included a sample review of the chemical testing results. The other "ingredient" used to fabricate the boral plate was an aluminum powder. Testing was conducted and documented for the chemical composition of the aluminum powder (per ASTM E1479 and ASTM B214 tests). Wet chemistry test results for the boral plate were not contained in the data package. A sample of the wet chemistry test result was obtained and reviewed for B4C lots M-191 and M-192, which constitute two of the four lots used in canister S/N 015 for the data package audited. Traceability for all ingredients was tracked independently by UST&D by the common fabrication number on each material specification sheet and test result.

Documents Reviewed: Data Package for MPC-24E Serial Number 015 - Lid Basket, and Shell PWRP 4801-7 to include: (a) UST&D Shop Bill of Material S/N 015 PWRP 4101-7 (basket#), (b) AAR Cargo Systems Receipt Inspection Record Checklists, (c) ESK GMBH Boron Carbide powder chemical analysis test results, (d) Mass Spec Services Boron Carbide powder test results, (e) Energy Steel and Supply Company Aluminum Plate PO, (f) Herron Testing Laboratories aluminum plate chemical composition test results, (g) Alcoa Primary Metals atomized aluminum powder PO, and (h) Bodycote Material Testing Met-Chem Laboratory aluminum powder chemical analyses test results

Category: Design Features **Topic:** Coatings in Canister

Reference: FSAR 72-17 Sect 4.2.4.2.8

Requirement No component in the MPC is coated.

Finding: No indications were found of coating on any of the canister surfaces. FSAR documentation regarding use of any coatings in, on, or around the canister container was reviewed. The FSAR does not identify any protective coatings used on the interior surfaces of the canister. The specific data package for MPC 24E Serial Number 015 was reviewed. The data package did not identify the use of any permanent coatings on materials used for interior surfaces of the canister, including the canister basket structure, the damaged fuel containers, failed fuel cans, boral plate, and the underside of the lid. Several of the components within the canister interior were visually examined to verify no coatings were present. The components/parts examined were those items in the holding/receiving area on the 93' level of the turbine building. The components examined included selected damaged fuel cans, damaged fuel can lids, canister lids, canister shells and baskets, vent pipes, and vent and drain port cover plates.

Documents Reviewed: Data package for MPC-24E Serial Number 015 - Lid, Basket, and Shell PWRP 4801-7

Category: Design Features **Topic:** Storage of Holtec MPC in TranStor Cask

Reference: FSAR 72-17 Sect 4.2.6.3.5

Requirement For accommodating the generic Holtec HI-STORM 100 MPC in a TranStor concrete cask as opposed to the HI-STORM cask, certain changes to the generic canister design were necessary. The changes are summarized in FSAR Section 4.2.6.3.5

Finding: Holtec Calculation HI-2012652 determined that no significant issues existed between the Holtec MPC24E and 24EF canisters fabricated for use at Trojan and the British Fuel Services TranStor concrete casks that Trojan had originally constructed for use with the TranStor canisters in 1999. The primary change made to the generic Holtec canister design was to reduce canister shell height. The Trojan Holtec canister had a nominal height of 181.3 inches. This was identical to the TranStor PWR canister design originally intended for loading at Trojan into the TranStor concrete casks. The Trojan Holtec canister had an outside diameter of 68 3/8". The inside diameter of the TranStor concrete cask was 74.0" +0.125/-0.25. Based on these dimensions, the Trojan Holtec canister will fit into the TranStor concrete cask. In addition to the dimensional differences between the two canister designs, the Holtec calculation evaluated the other design changes required including the modifications to the bottom flow holes in the basket wall, modifications to the positioning of the boral on the basket walls, evaluation of the fuel spacer lengths and evaluation of the failed fuel can and failed fuel. Trojan successfully inserted several Holtec canisters, both empty and loaded with weights to simulate a loaded canister, into and out of a TranStor concrete cask. No problems were encountered. The NRC inspectors witnessed one of the transfers of a Holtec canister from the transfer cask to and from a TranStor concrete cask.

Documents Reviewed: Holtec Calculation HI-2012652 "Evaluation of MPC Dimensions for the Trojan Nuclear Plant" dated May 10, 2001 (proprietary)

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Category: Design Features **Topic:** Transfer Station

Reference: FSAR 72-17 Sect 4.7.3.2

Requirement Since the Trojan spent fuel pool will not be available for canister transfer from a concrete cask to the transport cask at the time a permanent repository is available, the ISFSI is designed as a stand alone facility. The ISFSI is equipped with a transfer station to support dry transfer operations.

Finding: The transfer station at Trojan was originally designed for use with the TranStor canister. Modifications were required to use the transfer station with the Holtec cask system. The review of the necessary design changes for the transfer station did not identify any issues that precluded the use of the transfer station with the Holtec canisters and Holtec transfer cask. The safety evaluation checklist associated with the design changes for the transfer station was reviewed and no issues were noted with Trojan's conclusions. The ISFSI transfer station is designed and licensed for use in removing a canister from a concrete cask. The transfer station is located on the ISFSI pad. A concrete cask is placed under the transfer station. The transfer cask is placed on the transfer station above the concrete cask. The canister is pulled from within the concrete cask up into the transfer cask. The concrete cask is then replaced with the transportation cask and the canister lowered into the transportation cask. The concrete casks being used at Trojan were originally designed for the TranStor canisters and the British Fuel Services (BFS) transfer cask. The Holtec transfer cask is marginally larger in diameter than the BFS transfer cask necessitating modification of the upper restraint and modification of the shield ring (to include corner supports) on the transfer station. The transfer station is also required to structurally support the loaded canister and transfer cask. The lift height restrictions on the transfer station still apply to the Holtec canisters and have not changed. Necessary changes involved radial clearances only. The information contained in the FSAR was compared to design specifications delineated in the DPMR. Design drawings were reviewed in those areas where modification was necessary. Dimensional comparisons performed by Trojan and Holtec were reviewed. Additionally, Trojan calculation TI-058 was reviewed for any structural impact due to changes in weights between the BFS loaded transfer cask and the Holtec loaded transfer cask. The calculation concluded that the loaded Holtec canister and transfer cask weight (195,300 lbs) was bounded by the loaded BFS transfer cask (197,000 lbs). The new shield ring is also less in weight than the old ring (10,608 lb vs. 11,850 lb). The center of gravity changed but remained below the vertical limits of the transfer station upper restraints. The old analysis therefore remains bounding and no issues were identified.

Documents Reviewed: (a) NRC Inspection Report 50-344/99-01;72-17/99-01, date 2/19/99 (b) DPMR 2002-001/DCP 001 "Modify ISFSI Transfer Station to Fit Up with Holtec Equipment" (c) Maintenance Request No. 29292 "Transfer Station Pre-operational Checks" (d) PGE DWG NQI81523-14 "Shield Ring and Cask Adapter" (e) PGE DWG NQI81523-15 "Shield Ring and Cask Adapter" (f) PGE DWG NQI81523-26 "Upper Restraints" (g) PacTec DWG NQI81523-2 "Fuel Transfer Station" (h) PacTec DWG NQI81523-3 "Fuel Transfer Station" (i) PacTec DWG NQI81523-4 "Fuel Transfer Station" (j) PacTec DWG NQI81523-34 "Fuel Transfer Station" (k) TPP 18-1 "10 CFR 50.59/72.48 Screening Checklist for Transfer Station Modifications" (l) TI-058 -PacTec Calculation ED-22, "Trojan ISFSI Transfer Station Analysis," Rev 2

Category: Emergency Planning **Topic:** Emergency Action Level

Reference: 10 CFR 72.32 (a)(3)

Requirement The emergency plan must include a classification system for classifying accidents as "Alert." Note: Section 9.5 and 9.7.4 of the FSAR states that the Trojan ISFSI Emergency Plan complies with 10 CFR 72.32(a).

Finding: An "Alert" emergency classification was established for off-normal and accident conditions associated with the Trojan ISFSI. The Alert was defined as an incident that led or could lead to an inadvertent release to the environment of radioactive material stored within the ISFSI. Initiating conditions defined the threshold at which an Alert was declared. Each initiating condition formed the basis for one or more emergency action level (EAL). EALs were contained in the Emergency Plan Implementing Procedures. The emergency plan listed several events that would initiate an emergency declaration. These were 1) a severe natural phenomenon or incident, including fire or explosion, that compromised or affected the integrity of ISFSI structures or components containing the radioactive material stored within the ISFSI; 2) elevated radiation levels or removable contamination discovered within or around the ISFSI that indicated severe loss of control of radioactive material stored within the ISFSI; 3) a canister handling accident or other ISFSI related event resulting in detectable airborne contamination; 4) loss of security control of the ISFSI; and 5) any other condition that warranted increased awareness by offsite agencies or resulted in the activation of the onsite emergency response organization.

Documents Reviewed: (a) PGE 1075 "ISFSI Emergency Plan," Section 3.0 "Emergency Classification" (b) EPIP 72-01 "Emergency Classification and Notification" (c) EPIP 70-01 "Initial Response Actions," Rev 3 (d) EPIP 72-02 "Augmented Response Actions," Rev 1 (e) EPIP 72-03 "Emergency Preparedness Program Maintenance," Rev 5

Category: Emergency Planning **Topic:** Emergency Drills

Reference: 10 CFR 50 App. E Sect F.1

Requirement The emergency program shall provide for the training of employees and exercising, by periodic drills of radiation emergency plans to ensure that employees are familiar with their specific emergency response duties.

Finding: Three ISFSI emergency drills were successfully conducted between November 12 - 14, 2002, in preparation for the movement of spent fuel to the ISFSI pad. Each drill presented a different scenario to the emergency responders. Professional Communication Services was the only offsite organization that participated. Non-participating offsite agencies normally contacted in an emergency received the initial notification, notification of reclassification, and notification of drill termination. The drills were designed to test the adequacy of the implementing procedures, test emergency equipment and communications networks, and ensure that emergency response personnel were familiar with their duties. There were five drill objectives: to demonstrate the adequacy of the Trojan ISFSI emergency procedures and emergency response personnel to respond to an Alert; to demonstrate the ability of effective communications between the ISFSI Specialist on the pad and the Incident Coordinator in the Control Room; to demonstrate the ability to make offsite notifications in a timely manner; to demonstrate the capability to establish and maintain appropriate radiological controls; and to demonstrate the ability to assess the damage and recommend measures to mitigate or correct the condition to the Incident Coordinator. All five drill objectives were met. Four strengths were identified by the licensee during the drills. These were: (1) effectiveness of the participants response to the scenario, (2) interface and communications between the ISFSI Specialists and Control Room, (3) command and control of the overall response, and (4) emergency responder assistance provided to ISFSI staff. No drill weakness were identified.

Documents Reviewed: (a) PGE 1075 "ISFSI Emergency Plan" (b) EPIP 70-01 "Initial Response Actions," Rev 3 (c) EPIP 72-02 "Augmented Response Actions," Rev 1 (d) EPIP 72-03 "Emergency Preparedness Program Maintenance," Rev 5 (e) TCR 11-2002 "Drill Objectives" (f) TCR 11-2002 "Drill Scenarios Narrative Summaries" (g) TCR 11-2002 "Drill Comments" (h) Memorandum entitled "2002 Trojan ISFSI Drill Report," dated November 20, 2002 (i) Summary of Drill Performance

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Category: Emergency Planning **Topic:** Emergency Plan

Reference: FSAR 72-17 Sect 9.5

Requirement The Trojan ISFSI Emergency Plan (PGE-1075) meets the requirements of 10 CFR 72.32(a) for the ISFSI.

Finding: The ISFSI Emergency Plan was reviewed against the requirements of 72.32(a) and found to incorporate the required elements. This included information on facility description, types of accidents, classification of accidents, detection and mitigation methods, assessment, responsibilities, notifications, training, and drills/exercises. The ISFSI Emergency Plan included the Alert classification as required by 10CFR72.32(a). The emergency plan for the Part 50 decommissioned reactor license covered emergency classification of events for the casks while in the fuel building being loaded and during transport to the ISFSI. The elements in the Part 50 emergency plan were also consistent with the requirements in 72.32(a). Both Unusual Events and Alerts were described.

Documents Reviewed: (a) PGE 1075 "ISFSI Emergency Plan" (b) EPIP 70-01 "Initial Response Actions," Rev 3 (c) EPIP 72-01 "Emergency Classification and Notification" including Attachment 1 "ISFSI Emergency Action Levels" (d) EPIP 72-02 "Augmented Response Actions," Rev 1 (e) EPIP 72-03 "Emergency Preparedness Program Maintenance," Rev 5

Category: Emergency Planning **Topic:** Seismic Monitors

Reference: FSAR 72-17 Sect 4.3.12 & 5.1.3.4

Requirement Seismic monitoring instruments are provided for measuring earthquake intensity. The seismic monitoring instrumentation consists of peak recording accelerometers which are subject to periodic inspection and maintenance to ensure availability to record data from seismic events.

Finding: The NRC inspector was shown the seismic monitor located in the equipment/control shed on the ISFSI pad. Seismic monitoring instrumentation consisted of peak recording accelerometers (scratch plates SRI-A & SRI-B). The security guard checks the condition of the monitor daily. If any problems were found, the security guard would report the problem to the shift engineering technician. Surveillance records reviewed indicate daily inspections were being performed. The seismic monitors provide a record "after the fact" of the magnitude of the earthquake that occurred. The ISFSI Emergency Plan included a discussion in Section 2.1.2.5 related to seismic events. The emergency plan stated that a loaded concrete cask has been analyzed to determine the effects of a seismic event. The cask will not tip over and any damage during a seismic event would be negligible. Seismic events were not listed as a separate initiating event for declaring an emergency. Seismic events were included in the category of severe natural phenomenon. If the severe natural phenomenon, to include a seismic event, was severe enough to compromise or affect the integrity of a loaded cask, then an emergency would be declared based on damage to the cask and resulting high radiation levels or contamination levels on or near the cask. Procedure EPIP 72-01 "Emergency Classification and Notification" included the initiating condition and Emergency Action Levels (EAL 1.1 and EAL 1.2) for declaring an emergency based on damage to the cask resulting in radiological problems.

Documents Reviewed: (a) PGE 1075 "ISFSI Emergency Plan," Section 3.0 "Emergency Classification" (b) EPIP 1 "Classification of Emergencies" (c) EPIP 70-01 "Initial Response Actions," Rev 3 (d) EPIP 72-01 "Emergency Classification and Notification," Rev 3 (e) EPIP 72-02 "Augmented Response Actions," Rev 1 (f) EPIP 72-03 " Emergency Preparedness Program Maintenance Request Form," Rev 5 (g) selected equipment monitoring & calibration records, (h) selected security guard surveillance records

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Category: Fire Protection **Topic:** Fire Protection Plan

Reference: 10 CFR 50.48 (a)(1)

Requirement Each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A to this part. This fire protection plan must describe the overall fire protection program for the facility.

Finding: The ISFSI was included in the Trojan Pre-Fire Plans. Section 3.19 addressed fire plans for the utility building, the transfer station and the ISFSI storage pad. Section 3.20 addressed fire plans for the metal storage building, two small sheds housing air compressors and the ISFSI access control booth. The updated Pre-Fire Plans stated that during movement of a loaded cask, a 50 foot transient combustible clear zone is required. During storage on the ISFSI pad, a 40 foot combustible clear zone is required. All wood in the ISFSI area was required to be fire treated with the exception of 4' by 4' cribbing. Procedure TPP 13-7 included the cribbing exception.

Documents Reviewed: (a) "Trojan Pre-Fire Plans," Rev 5 (b) TPP 13-7 "Fire Protection Program," Rev 13 (c) TIP-08 "ISFSI Fire Protection Program," Rev 1

Category: Fire Protection **Topic:** Fire Protection Program

Reference: FSAR 72-17 Sect 2.2.3.3

Requirement A fire caused by a diesel fuel oil spill from a mobile crane or other diesel fuel oil tank at the ISFSI or in the immediate vicinity of the ISFSI would not affect the safe storage of the spent fuel. This type of fire, which is the only credible fire because of the limited number of fire hazards located at the ISFSI itself, would burn for only a few (6-7) minutes.

Finding: File No. M-FP-5.1 evaluated the consequences of a fire at the ISFSI and determined that a fully involved pool fire one inch deep would burn for 6.4 minutes and a spill fire occurring on a flat slab, sloped for rain removal like the Trojan ISFSI pad, would burn for less than 6.4 minutes. The fire sources included the diesel fuel in the front end loader, which will not exceed 25 gallons, and the diesel fuel in the mobile crane, which will not exceed 100 gallons. Both pieces of equipment have approximately 5-10 gallons of hydraulic fluid, which is also flammable.

Documents Reviewed: File No. M-FP-5.1 "Fire Protection Review of ISFSI," Rev 0

Category: Fire Protection **Topic:** Offsite Fire/Ambulance Support

Reference: 10 CFR 72.122 (g)

Requirement Structures systems and components important to safety must be designed for emergencies. The design must provide for accessibility to the equipment for onsite and available offsite emergency facilities and services such as hospitals, fire and police departments, ambulance services, and other emergency agencies.

Finding: The ISFSI is an outdoor pad with ready access for emergency vehicles. Provisions were established to allow for expedient access to the ISFSI by offsite emergency responders. Procedures for responding to fires during cask moving and storage were described in Trojan's Pre-Fire Plans. If employees determined that the fire cannot be extinguished by fire extinguishers, the Columbia River Fire and Rescue (CRF&R) department is called to extinguish the fire. The CRF&R employees attend Trojan's General Employee Refresher Training (GERT) annually and were issued Trojan badges and dosimeters. Copies of their training test results were maintained in the badge files. Four fire extinguishers were located in the fuel building and seven in the auxiliary building on level 93' for use during a fire.

Documents Reviewed: (a) Trojan Pre-Fire Plans," Rev 5 (b) Badge Files - training documentation forms of Columbia River Fire and Rescue department employees

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Category: Fuel Verification **Topic:** Canisters for Fuel Debris

Reference: Tech Spec 2.1.2.c

Requirement Fuel debris must be stored in failed fuel cans or damaged fuel containers in an MPC-24EF. Up to four failed fuel cans and/or damaged fuel containers containing fuel debris or damaged fuel assemblies may be stored in the MPC-24EF in the oversized corner fuel cell locations. Note: FSAR Sections 3.1.1.1 and 3.3.2.1 provide information on the failed/damaged fuel.

Finding: Trojan ensured that fuel debris was only placed in the correct locations in the MPC-24EF canister through procedural controls established in Procedure FHP 18. Technical Specification 2.1.2.c allowed fuel debris to be stored in either failed fuel cans or damaged fuel containers, however, fuel debris can only be placed in the MPC-24EF canister and must be placed in one of the oversized corner fuel cell locations. The technical specification requirement was incorporated into Procedure FHP 18, Step 4.8 which specifically stated that only the "EF" type canisters can be used to store fuel debris. A review of Procedure FHP 18 and the Trojan ISFSI Safety Analysis Report and discussions with licensee personnel determined that failed fuel cans or damaged fuel containers can only be inserted into cell location numbers 3, 6, 19 and 22 (4 per canister) which were all corner locations. Both the MPC-24E and MPC-24EF have these special cells. These cells were manufactured larger than the other cells (9.3" versus 8.75" ID) in order to accommodate Holtec's damaged fuel containers or failed fuel cans. Discussions with Trojan personnel and a review of Holtec Document HPP 1135-131 identified 22 failed fuel cans that will be loaded at Trojan. This included eight process can capsules containing fuel debris, 13 damaged fuel assemblies and an additional process can that will contain any left over debris found after all fuel is removed from the spent fuel pool and clean-up is performed. Exhibit 7.3.2 of Procedure FHP-18 assigned the failed fuel cans containing the eight process can capsules loaded with fuel debris plus the additional failed fuel can which will contain the process can for the material found during spent fuel pool clean-up to corner fuel cell locations in MPC-24EF canisters.

Documents Reviewed: (a) HPP 1135-131 "Trojan ISFSI Completion Project MPC Lid Fit Up and Transfer of MPC and Lid to Fuel Building Procedure," Rev 4 (b) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (c) CAR No. C-02-0002 (d) Trojan Memorandum "ISFSI/Spent Fuel Pool Weekly Surveillance" (e) Trojan Report "Spent Fuel Top Nozzle Inspection Program" dated August 5, 2002 (f) FHP 18 "Fuel Movement and Position Verification," Rev 9 (g) Holtec Report HI-2012652 "Evaluation of MPC Dimensions for the Trojan Nuclear Plant," dated May 10, 2001

Category: Fuel Verification **Topic:** Failed Fuel Can Storage Locations

Reference: FSAR 72-17 Sect 3.3.2.1 & 4.2.4.2.1

Requirement Section 3.3.2.1 states that the MPC-24E/EF fuel basket provides 24 storage locations. Fuel storage locations 3, 6, 19 and 22 are slightly larger to accommodate failed fuel cans or damaged fuel containers. Section 4.2.4.2.1 states that intact fuel assemblies, with or without inserts, may be stored in any of the locations.

Finding: Both the MPC-24E and MPC-24EF canisters have the four larger locations that are 9.3" inside diameter compared to the normal 8.75" inside diameter. Discussions with licensee personnel determined that intact, undamaged fuel assemblies can be placed in the four enlarged cells designated as storage cells for failed fuel cans or damaged fuel canisters. There were no provisions to insert spacers in these enlarged cells if intact fuel assemblies were placed in them.

Documents Reviewed: FSAR Sections 3.3.2.1 and 4.2.4.2.1

Category: Fuel Verification **Topic:** Fuel Loading Verification

Reference: FSAR 72-17 Sect 5.1.1

Requirement Fuel will be visually inspected during the loading process to ensure conditions have not changed since the previous inspection, which would cause the need for special handling of the component. In addition, item identification and/or serial numbers will be verified and recorded. Fuel loading operations will utilize videotape to record fuel assembly serial numbers and to provide an independent record of loading inventory.

Finding: Provisions had been incorporated into procedures requiring visual examination of the spent fuel, comparison of the condition of the fuel to the previous fuel examination conducted by Trojan and video taping of fuel assembly serial numbers. Procedure FHP 50-03 required a comparison of the latest fuel examination with previous evaluations.

Step 5.5.3 required the fuel to be visually inspected in accordance with Procedure FHP 15. Step 5.5.4 required a comparison of the new inspection results with previous inspection results. Step 5.5.5 stated that if the intact fuel assembly had changed since the last inspection, the fuel assembly was to be returned to its assigned spent fuel pool storage location, a corrective action request initiated and fuel loading activities suspended until authorization to continue was received from the Operations Manager. All fuel assembly serial numbers or contents of each cell in the canister will be recorded on videotape for future reference. Step 5.5.8 b required that the actual canister loading be checked to verify that the spent fuel had been placed in the assigned positions in accordance with Procedure FHP 18. During 1997, Trojan had performed an extensive evaluation of their spent fuel assemblies in accordance with criteria specified in the Department of Energy guidance. The results of the analysis were documented in NRC Inspection Report 50-344/97-01; 72-17/97-01 dated February 25, 1997, and Report 50-344/99-05; 72-17/99-04 dated May 7, 1999. A re-analysis was performed by Holtec and Trojan to verify that the Holtec canisters were adequately designed for the Trojan fuel. The results were documented in "Spent Fuel Top Nozzle Inspection Program," dated August 5, 2002 and Corrective Action Request Initiation/Evaluation No. C-02-0002 "Reevaluation and Reclassification of Damaged/Failed Fuel." The re-analysis included additional visual exams and a review of the original fuel examination documentation performed in 1997. During the 1997 analysis, Trojan had concluded that 20 failed fuel cans would be needed. Results of the new analysis concluded that Trojan would need 22 failed fuel cans for the fuel debris and damaged/failed fuel for storage in the Holtec canisters. During the loading of the first canister, visual inspection of the fuel assemblies by the certified fuel handler as it was moved to the canister was observed by the NRC. Video taping of the spent fuel placed in the canister was performed and an independent verification by two individuals of the location of each of the spent fuel assemblies compared to their assigned position by Procedure FHP 18 was completed.

Documents Reviewed: (a) HPP 1135-131 "Trojan ISFSI Completion Project MPC Lid Fit Up and Transfer of MPC and Lid to Fuel Building Procedure," Rev 4 (b) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (c) FHP 50-06 "ISFSI MPC 24E/24-EF Closure Welding and Lid Removal for Unloading," Rev 1 (d) "Spent Fuel Top Nozzle Inspection Program," dated August 5, 2002 (e) CAR C-02-0002 "Reevaluation and Reclassification of Damaged/Failed Fuel (f) HPP 1135-131 "Trojan ISFSI Completion Project MPC Fit Up and Transfer of MPC and Lid to Fuel Building," Rev 4 (g) FHP 15 "Irradiated Nuclear Fuel Inspection/Classification" (h) FHP 18 "Fuel Movement and Position Verification," Rev 9

Category: Fuel Verification **Topic:** Fuel Parameters

Reference: FSAR 72-17 Sect 5.1.1

Requirement Specific procedures will define and control classification criteria, loading sequence and individual canister/concrete cask inventory.

Finding: Trojan had developed procedures to classify the spent fuel, control the loading sequence and verify the inventory for each canister against the design parameters for the Holtec cask. Technical specifications had been reviewed and compared to the inventories planned for each canister in "Trojan ISFSI MPC Heat Load Calculation TI-059." Specifically, cooling times, fuel enrichment, maximum heat load and burnup values for each canister were verified as being in accordance with the limits in Table 2-1 of the technical specification. Holtec Report HI-2012666 calculated that the canister with the highest decay heat load would be 17.400 kWt, which was below the allowed technical specification thermal limit per canister of 24 kWt. This calculation was based on a loading date of January 1998. Holtec Report No. HI-2012676, Appendix C re-calculated the heat load based on December 1, 2002 and determined that the highest cask heat load would be 14.3 kWt. Trojan calculation TI-059 discussed the entire spectrum of fuel to be loaded in the canisters including information related to the fuel to be loaded into failed fuel cans and damaged fuel cans and the locations and content of the eight process can capsules. Loading procedures were reviewed by the NRC to determine how the fuel handlers verified loading of the correct fuel assembly in the mapped location within the canister. Visual inspection of the fuel assemblies was performed in accordance with Procedure FHP 15. Fuel loading into the canister and position verification was performed in accordance with Procedure FHP 18. Procedure FHP 18, Note 5.2.3.a, specified that at the completion of each fuel assembly move, the canister location was verified against the Fuel Movement Sequence Plan and confirmed as being placed in the proper basket cell location. Procedure FHP 50-03 provided instructions for confirmation of the contents of the canister after loading of each canister was completed. The procedure required the fuel assembly serial number for each assembly or the contents of each cell to be verified using an underwater video camera. Procedure FHP 18 identified which canisters contained the neutron startup sources (cask locations E24, E34, W21, W32, and W34). Trojan determined that due to the age of the neutron sources, no special radiological precautions were required for handling of the startup source. Holtec Report HI-2012662 also provided an evaluation of the various parameters of the Trojan fuel, included the damaged fuel, to verify that the spent fuel complied with the design parameters for the Holtec Hi-Storm cask. The Holtec report identified 780 intact fuel assemblies and 21 assemblies that may not be intact for storage at the Trojan ISFSI. Of the 780 intact assemblies, 732 are Westinghouse 17 x 17 fuel and 48 are Babcock and Wilcox fuel. One assembly, C18, will be classified as intact, despite the assembly having a removed fuel rod that had not been replaced by a dummy fuel rod. The assembly was determined to be structurally intact. The reactivity effect of the removed fuel rod was evaluated in a criticality analysis and found acceptable. The Holtec report included an evaluation of Trojan's rod cluster control assemblies (RCCA), burnable poison rod assemblies (BPRA), thimble plugs and sources. A total of 61 rod cluster control assemblies and 92 burnable poison rod assemblies will be stored at the Trojan ISFSI. Of the 21 non-intact fuel assemblies, A45 was classified as damaged due to several removed fuel rods. Nine of the 21 non-intact assemblies have had a majority of their rods removed, leaving only damaged rods in the fuel assembly skeleton. Some of the rods in these assemblies were ruptured or broken. Trojan also possessed eight fuel debris process can capsules that contain fuel pellets, fuel fragments, filters, etc that are classified as fuel debris due to the presence of fuel material in these capsules. Twenty three failed or suspect fuel rods are also classified as fuel debris. Fuel debris is required to be stored in failed fuel containers.

Documents Reviewed: (a) FHP 15 "Irradiated Nuclear Fuel Inspection/Classification," Rev 18 (b) FHP 18 "Fuel Movement and Position Verification," Rev 9 (c) FHP 50-03 "Loading and Placing Concrete Cask into Storage," Rev 1 (d) Trojan Reconstitution Campaign - Repaired Region 3 Assembly C18 Pre-Repair Fuel Pin Locations (e) Damaged Fuel Rod Storage

Racks Summary sheet (f) Holtec Report No. HI-2012666 "Trojan Cask Bounding Heat Load Evaluation," Rev 0 (g) Calculation "Trojan ISFSI MPC Heat Load Calculation TI-059," Rev 2 (h) Holtec Report No. HI-2012662 "Fuel Parameter Evaluation of TNP Fuel Stored at the Trojan ISFSI," Rev 1 (i) Holtec Report No. HI-2012676 "Thermal-Hydraulic Calculations for Trojan ISFSI Completion Project"

Category: Fuel Verification **Topic:** Interim Staff Guidance 11 Burnup

Reference: Interim Staff Guidance-11

Requirement Limitations are placed on the spent fuel that can be stored based on burn-up, clad temperature and hoop stress.

Finding: Trojan evaluated their spent fuel against the criteria in Interim Staff Guidance (ISG)-11, "Storage of Spent Fuel Having Burnups in Excess of 45,000 MWd/MTU" and found their spent fuel to be within the limits established in ISG-11. ISG-11 was issued by the NRC to provide guidance for the licensing of high burnup fuel. In general, ISG-11 provided guidance concerning minimizing the possibility of fuel clad failure due to fuel clad creep, minimizing the opportunities for hydride reorientation, and to clarify the definitions of intact and potentially failed spent fuel. ISG-11 established a new lower fuel clad temperature limit of 400 degree C for both normal (long term) and for loading (short term) spent fuel operations. Trojan complied with ISG-11 due to the Trojan spent fuel being less than 45,000MWd/MTU. The maximum calculated clad temperature for Trojan spent fuel under normal (long term) conditions was 287 degree C, which is less than the 400 degree C limit. The maximum calculated peak clad temperature for loading (short term) operations was 348 degree C, which is also less than the 400 degree C limit. Additionally, Trojan determined that the hoop stress for various regions of fuel assemblies was less than 90 MPa at the normal (long term) and peak (short term) fuel clad temperatures. Calculation TI-152 concluded that the hoop stresses were below limits defined in ISG-11, however the values listed in Table 1 of TI-152 differed from those values noted in the Trojan letter sent to the NRC on September 18, 2002 (VPN-051-2002). The values noted in the summary table in the Trojan letter were higher than those listed in calculation TI-152, however, the peak hoop stress values listed were still below the 90 MPa limit contained in ISG-11.

Documents Reviewed: (a) Trojan letter (VPN-051-2002) to NRC "Submittal of Additional Information in Support of License Change Application 72-02," dated September 18, 2002 (b) Trojan Nuclear Plant Calculation TI-152 "Trojan Nuclear Fuel Hoop Stress Calculation," dated October 14, 2002 (c) "PGE ISFSI Basis for Spent Fuel Clad Temperature Limits," Rev 0, dated February 2, 1998

Category: Heavy Loads **Topic:** Ambient Temperature for Transfer Cask

Reference: Tech Spec 3.2.1

Requirement The transfer cask shall not be used to lift or support a loaded MPC when the ambient temperature is less than or equal to 0 degree F. Within 1 hr prior to use of the transfer cask, verify ambient temperature does not exceed limit (SR 3.2.1.1). When ambient temperature is less than 5 degrees F, verify temperature every 4 hrs during use.

Finding: Procedure FHP 50-03, Step 4.32.3, and Procedure FHP 50-08, Step 4.32, specified the ambient air temperature limitation and surveillance requirements.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) FHP 50-08, "MPC Return to Pool and Unloading Procedure," Rev 1

Category: Heavy Loads **Topic:** Crane Maintenance

Reference: FSAR 72-17 Sect 4.7

Requirement Loading of the canister and concrete casks will be performed within the fuel building under the Part 50 license. The fuel building systems are operated under the Part 50 license and evaluations of the fuel building components and systems is within the scope of the Trojan Nuclear Plant FSAR

Finding: Operation of the crane for moving heavy loads to support the cask loading program was being performed under the requirements of the Part 50 license. Several aspects of the crane maintenance program were reviewed. The crane was being adequately maintained. Procedure FHP 50-03 Step 5.1.5 required personnel to confirm that the fuel building crane preventive maintenance tasks were up to date before the crane was used. The rigging plan required that the crane load test and daily crane checklist were completed prior to a heavy load lift. A crane readiness review had been conducted by Trojan during April 2002. The review concluded that the fuel building crane was well maintained and in good operating condition. A 125-percent crane load test was performed following replacement of the original bottom block sheave pins. The load test of the 125-ton main hoist was conducted on April 25, 2002. The 25-ton auxiliary hoist was load tested on April 24, 2002.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) HPP 1135-690 "Trojan ISFSI Completion Project ISFSI Rigging Plan," Rev 4 (c) Maintenance Request No. 29020, dated July 17, 2002

Category: Heavy Loads **Topic:** Dummy MPC Fully Loaded

Reference: FSAR 72-17 Sect 9.2.3.1.1

Requirement PGE is constructing a full weight dummy canister that will be loaded into the Transfer Cask to verify fit and suitability of the canister lift rigging. The lifting slings, cleats and crane used to lift the canister will be load tested to demonstrate the ability to safely lift a fully loaded canister.

Finding: Trojan had established a weighted dummy canister for use during the pre-operational tests that adequately simulated the weight of an actually loaded canister. ISFSI Safety Analysis Report, Table 4.2-4 "Nominal Weights and Centers of Gravity" listed the dry weight of a fully loaded canister as 78,700 pounds. The weight of a fully loaded canister removed from the spent fuel pool containing spent fuel and filled with water was 93,400 pounds. The dummy canister planned for use by Trojan weighed 87,700 pounds. Trojan considered the dummy canister weight to be sufficiently close to the actual weight of a canister to adequately demonstrate the ability to safely lift a fully loaded canister.

Documents Reviewed: Maintenance Request No. 29735

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Category: Heavy Loads **Topic:** Impact Limiters

Reference: FSAR 72-17 Sect 5.1.3.6

Requirement The evaluation and procedures will assure that the fuel building can withstand the loads from postulated drops and that the canister design decelerations are not exceeded. Impact limiters will be used to mitigate the effects of a drop accident.

Finding: The licensee utilized five impact limiters in the fuel building. Calculations were developed to confirm the effectiveness of the impact limiters in the unlikely event of a load drop accident. Step 5.1.8 of Procedure FHP 50-03 required confirmation that the impact limiters were either in place or available. The specific locations of the impact limiters were shown on floor layout drawings attached to the ISFSI Rigging Plan. The layout drawings also specified the safe load path for the transfer cask and canister. During the pre-operational test, the NRC observed that the loads were moved in strict compliance with the safe load paths as specified in the Rigging Plan. In addition, all five impact limiters were in the positions specified in the design drawings.

Documents Reviewed: (a) HPP 1135-690 "Trojan ISFSI Completion Project ISFSI Rigging Plan," Rev 4 (b) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (c) Trojan Calculation No. TI-044 "ISFSI Transfer Cask Hypothetical Impacts in the Fuel Building at Elevation 93 Foot," Rev 2 (d) Trojan Calculation No. TI-051 "Design Refinements for Fuel Building ISFSI Transfer Cask Impact Limiters," Rev 7

Category: Heavy Loads **Topic:** Lifting Trunnion Testing (300%)

Reference: FSAR 72-17 Sect 4.7.3.1

Requirement The two lifting trunnions on the transfer cask are fabricated in accordance with ANSI N14.6 requirements and tested to 300% of their maximum design load and meet the guidance of NUREG-0612.

Finding: Holtec successfully conducted a 300% trunnion load test on February 18, 2002. The equivalent load on the trunnions was 649,800 pounds. The FSAR ,Table 4.2-4, Nominal Weights and Centers of Gravity, calculated the maximum anticipated transfer cask weight with a loaded canister to be 204,900 pounds.

Documents Reviewed: HSP 113 Attachment 3.4 "Trunnion/Support Lug Load Test Data Record," Rev 2

Category: Heavy Loads **Topic:** Lifting Yoke Testing (150%)

Reference: FSAR 72-17 Sect 4.7.3.4

Requirement Prior to first use, the lifting yoke is tested to 150% of its maximum load.

Finding: U.S. Tool and Die, Inc. successfully conducted a load test of the lift yoke. The test was conducted on January 8-10, 2002 at their facility. The test load weight was 762,080 pounds. This test exceeded the 150% load requirement for the Trojan yoke test and was conducted to meet Holtec's standard 300% load test requirement for critical lift devices. During spent fuel cask loading operations at Trojan, the maximum yoke lift weight was anticipated to be 204,900 pounds per the FSAR Table 4.2-4, Nominal Weights and Centers of Gravity. This weight estimate was based on a transfer cask containing a canister loaded with spent fuel, full of water, with the lid in place. The water jacket would be empty. During the removal of the first loaded canister from the spent fuel on

January 2, 2003, the load cell recorded approximately 200,000 lbs as the weight of the load. This was the weight of the transfer cask with a loaded canister full of water with the shield lid in place. The transfer cask water jacket was empty.

Documents Reviewed: U.S. Tool and Die Procedure CSP 0177-1 "Lift Yoke Load Test," Rev 0

Category: Heavy Loads **Topic:** Load Cell

Reference: Occurrence Report 2001-OH-WVNS-011

Requirement Problems with a load cell occurred at Ginna on May 23, 2001 related to the load cell safety factor, lateral load limitations and side loading.

Finding: The licensee reviewed the Ginna event to verify that the problems that had occurred at that site would not occur at Trojan. The licensee concluded that the load cell(s) used at Trojan were not the same type of load cells that were used at Ginna. The load cells used at Trojan were not susceptible to lateral load failures such as those encountered at Ginna.

Documents Reviewed: Licensee Memorandum ISFSI-371-02M, "Industry Lessons Learned Event/Load Cell Failure," dated December 18, 2002.

Category: Heavy Loads **Topic:** MPC Maximum Weight

Reference: Tech Spec 2.1.2 (d)

Requirement The contents of a canister must not exceed 1680 lbs in any cell and the dry weight must not exceed 78,700 lbs.

Finding: Holtec Report No. HI-2012662 provided total weight values for intact fuel to confirm that the technical specification weight limits for the spent fuel would not be exceeded. Values provided in the Holtec report were: 1616 lbs for Westinghouse 17 by 17 fuel assemblies, 1580 lbs for B&W 17 by 17 fuel assemblies, 1467 lbs for damaged fuel containers, and 1111 pounds as a maximum weight of a failed fuel can. All weights were less than the design canister weight of 1680 lbs. Holtec Report No. HI-2012672 calculated the weight of a loaded canister as 78,644 lbs, which would be below the technical specification limit of 78,700 lbs. Procedure FHP-18 established which fuel assemblies and failed fuel/damaged fuel containers would be loaded in each canister. Based on this loading plan, no canister would exceed the dry weight limit of 78,700 lbs. Procedure FHP-18 stipulated that if a fuel assembly or failed/damaged fuel container was to be placed in a different canister or location than originally evaluated, then a safety assessment and heat load calculation was required to ensure that the original assumptions and design margins were maintained.

Documents Reviewed: (a) FHP 18 "Fuel Movement and Position Verification," Rev 9 (b) Trojan Calculation No. TI-059 "Trojan ISFSI MPC Heat Load Calculation," Rev 2 (c) Holtec Report No. HI-2012672 "Evaluation of Weights and Volumes for Components of the Trojan ISFSI," Rev 6 (d) Holtec Report No. HI-2012662 "Fuel Parameter Evaluation of TNP Fuel to be Stored at the Trojan ISFSI," Rev 3

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Category: Heavy Loads **Topic:** Spent Fuel Pool Load Restrictions

Reference: Part 50 Tech Spec 3.1.4

Requirement Defueled TS 3.1.4 "Spent Fuel Pool Load Restrictions" specifies restrictions on heavy load movement over the spent fuel pool racks.

Finding: The licensee controlled movement of heavy loads over the spent fuel pool in accordance with the Part 50 license requirement in Defueled Technical Specification 3.1.4. The licensee controlled heavy load activities over the spent fuel pool through the use of administrative controls, electrical interlocks and mechanical stops. The electrical interlocks and mechanical stops prevented movement of the overhead crane over the spent fuel pool. The mechanical stops were confirmed in place during the pre-operational test. Administrative controls included load height and load movement restrictions. These restrictions were provided in Procedure TPP 14-9. Movement of heavy loads over the spent fuel pool required prior engineering evaluation. Table 1 of Procedure TPP 14-9 listed the previously analyzed loads, such as fuel handling tools and equipment, that may be lifted over the spent fuel pool.

Documents Reviewed: TPP 14-9 "Control of Heavy Loads," Rev 7

Category: Heavy Loads **Topic:** Tests/Certifications for Slings/ Cables, etc

Reference: FSAR 72-17 Sect 5.1.3.6

Requirement The handling of heavy loads will be addressed in a NUREG-0612 evaluation and in heavy loads procedures. Tests and certifications (including cranes, hooks, slings, trunnions, straps, cables, etc.) will be completed before fuel handling activities begin.

Finding: The ISFSI Rigging Plan incorporated the guidance provided in NUREG-0612 "Control of Heavy Loads at Nuclear Power Plant," including safe load paths and design safety factors. Several straps and wires were examined to ascertain whether the equipment was properly certified. The licensee produced documentation of the equipment ratings and design requirements for each of the straps/wires. The straps/wires in use met or exceeded the minimum ratings.

Documents Reviewed: HPP 1135-690 "Trojan ISFSI Completion Project ISFSI Rigging Plan," Rev 4

Category: Heavy Loads **Topic:** Visual Exam of Lifting Trunnions

Reference: ANSI N14.6

Requirement In accordance with ANSI N14.6, the licensee is required to perform a visual examination of special lifting devices for indications of damage or deformation prior to use.

Finding: Step 6.3.4 of Procedure HPP 1135-690 provided instructions to visually inspect the lifting trunnions when the transfer cask is in the decontamination and assembly station or the cask wash pit when the trunnions are accessible for visual examination. These visual examinations occur just prior to lift yoke engagement to the transfer cask lifting trunnions.

Documents Reviewed: HPP 1135-690 "Trojan ISFSI Completion Project ISFSI Rigging Plan," Rev 4

Category: <u>Hydro/Drying/Helium</u> **Topic:** <u>Blowdown</u>

Reference: FSAR 72-17 Sect 5.1.1.2

Requirement Blowdown of the MPC with helium results in the water being transferred to the spent fuel pool or a suitable holding tank. Additionally, helium is blown through the MPC vent line (max pressure 75 psig) and out the drain line until no water is visible coming from the drain line.

Finding: Procedure HPP 1135-650 had incorporated the commitments from the FSAR concerning the blowdown of the canister. In particular, Step 3.7.6, Step 6.5.11, the note that followed Step 6.5.11, and Exhibit 7.1, Blowdown System Piping Diagram, Sheets 1 and 2 provided directions for the blowdown activity. During the loading of the first cask, the NRC inspector observed the blowdown process. Helium was injected into the canister thru the vent port to drive water out of the canister thru the drain line. The water was drained to the spent fuel pool. The helium pressure did not exceed 75 psig as noted on the system gauge. The blow down continued until no more water was observed in the drain line.

Documents Reviewed: HPP 1135-650 "Trojan ISFSI Completion Project MPC Blowdown System Operating Procedure," Rev 3

Category: <u>Hydro/Drying/Helium</u> **Topic:** <u>Drying Time Limit</u>

Reference: Tech Spec 3.1.2

Requirement The canister dryness test must be completed within 96 hours after verifying the helium leak rate is within the limit. If the 96 hour limit cannot be satisfied, then LCO 3.1.2, Condition A allows the licensee 48 hours to fix the equipment and meet the dryness criteria. In the event the canister does not meet the dryness criteria within the 48 hrs, the licensee has 72 hrs by LCO 3.1.2, B.1.1 or B.1.2 to establish cooling or establish a helium atmosphere. If the dryness criteria cannot be met within 30 days, the canister must be unload per LCO 3.1.2, B.2.

Finding: Trojan had incorporated the requirements established in Technical Specification 3.1.2 into Procedure FHP 50-03. Procedure FHP 50-03, Step 5.10.5 specified that the canister cavity dryness must be demonstrated by maintaining a vacuum of less than 2.79 torr for greater than 30 minutes. The 2.79 torr value considered instrument error to ensure the 3 torr limit in the technical specification was met. Technical Specification 3.1.2 required the dryness limit to be achieved within 96 hours. Procedural Step 5.10.5.b established the technical specification limiting condition of operation (LCO) requirements if the 96 hour limit was not met. This included a 48 hour limit to establish the required dryness or enter into a second LCO which required establishing cooling to the canister within 72 hours and unloading the canister within 30 days. During the loading of the first canister, the helium leak rate test was successfully completed on January 5, 2003 at 10:50 pm. On January 9, 2003 at 10:50 pm, the licensee entered LCO 3.1.2 Condition A when the 96 hours limit was exceeded. On January 11, 2003 at 1:54 pm, the licensee achieved meeting the vacuum dryness limit. This was a total of 135 hours, only 9 hours prior to entering the next LCO which would require that cooling be established within the next 72 hours. The dryness limit was achieved by reaching a level of 2.631 torr before isolating the system for the 30 minute test. At 30 minutes, the value was slightly below the 2.79 torr limit. The vacuum gauge continued to trend upward and exceeded the 2.79

torr value at 33 minutes. After the dryness test was completed, the vacuum gauge calibration was re-verified. The post test calibration indicated the gauge was reading 0.11 torr too high. Since this was in the more conservative direction, the vacuum dryness test was declared a success. The second canister loaded at Trojan was dried in 133 hours and had a similar low heat load (4.7 kW) as the first canister. The third canister was the hottest canister planned for loading by Trojan at 14.3 kW and took only 46 hours to dry.

Documents Reviewed: FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1

Category: Hydro/Drying/Helium **Topic:** Dryness Limits (3 torr)

Reference: Tech Spec 3.1.2

Requirement Adequate dryness of the canister cavity shall be demonstrated by vacuum drying. The canister vacuum drying final pressure shall be less than or equal to 3 torr for greater than or equal to 30 minutes.

Finding: Procedure FHP 50-03, Step 5.10.5 specified that the canister cavity dryness must be demonstrated by maintaining a vacuum of less than 2.79 torr for greater than 30 minutes. The value of 2.79 torr considered instrument error to ensure the 3 torr limit in the technical specifications was met.

Documents Reviewed: FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1

Category: Hydro/Drying/Helium **Topic:** Helium Backfill Requirements

Reference: Tech Spec 4.2.1

Requirement The canister will be backfilled with helium and pressurized between 29.3 and 39.3 psig at a reference temperature of 70 degree F. FSAR Section 5.1.1.2 specifies the helium purity to be to be 99.995% pure helium

Finding: Procedural requirements to backfill the canister to the limits specified in the technical specifications with high purity helium were established in the procedures. Procedure FHP 50-03, Step 5.10.7 specified the 29.3 to 39.3 psig pressure values. Procedure FHP 50-03 referenced Procedure HPP 1135-610 which included Exhibit 7.3 "MPC Helium Backfill Requirements." Exhibit 7.3 provided calculated values for the amount of helium to be backfilled into the canister to achieve the required technical specification pressure values. The amount of helium needed ranged between 730 - 840 standard cubic feet (SCF) depending on which canister was being backfilled. Determination that the correct amount of helium had been backfilled into the canister was by a calibrated mass flow meter. Controls for ensuring that only high purity helium was used for backfilling operations was reviewed and found acceptable. Procedure HPP 1135-610, Step 6.7.3 and Sheet 2 of Exhibit 7.2 of the procedure required a quality inspector to verify and document that the helium gas to be used for the helium backfill was verified prior to use to be a minimum of 99.995% pure helium. On January 11, 2003, during preparations for the helium backfill of the first canister, the NRC inspector observed that a quality inspector verified that the bottles to be used had certificates indicating that they contained 99.999% helium. The NRC inspector traced the gas line leading from the helium bottle skid to the canister to verify the bottles being checked were actually the bottles that would be providing helium to the canister during the backfilling operation.

The high purity helium bottles used for the helium backfill were stored in a closed cabinet. No other gas bottles were observed in their vicinity. The effect of backfilling the canister with helium is to provide an efficient heat transfer process between the spent fuel and the canister shell to reduce the temperature of the spent fuel during storage. Temperature measurements were taken at various stages during the loading of the first canister. Temperature readings were taken on contact with the lid. Prior to the start of vacuum drying of the first canister, with air in the canister and the water removed, the temperature was 107 degree F. At the completion of vacuum drying, the temperature was 134 degree F. After the helium was inserted into the cask, minimal temperature increase was seen and the temperature remained at 134 degree F. This cask had a 4.1 kW heat load. The second cask loaded was also a low heat load cask at 4.7 kW. This cask went from 114 degree F prior to vacuum drying to 131 degree F at the completion of vacuum drying. After the helium backfill was completed, the cask measured 133 degree F. The third cask loaded was the hottest cask that will be loaded at Trojan at 14.3 kW. This cask measured 154 degree F prior to vacuum drying. After vacuum drying was completed, the cask measured 194 degree F. After the helium backfill was complete, the cask temperature was 212 degree F.

Documents Reviewed: (a) FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1 (b) HPP 1135-610 "Trojan ISFSI Completion Project Vacuum Drying and Backfill Operating Procedures," Rev 3

Category: Hydro/Drying/Helium **Topic:** Helium Leak Test After Hydro

Reference: FSAR 72-17 Sect 5.1.1.2

Requirement After successful hydro and lid weld dye penetrant testing, approximately 20 gallons of water is removed from the canister and replaced with helium during the draining. The helium is pressurized to a nominal test pressure of 90 psig and the MPC lid weld is helium leak tested. The maximum permissible MPC leak rate is less than or equal to 5x10(-6) atmosphere-cubic cm/sec based on a differential pressure of one atmosphere across the confinement boundary. Procedures for leak testing will be prepared using the guidance in ANSI N14.5

Finding: Procedure HPP 1135-640 had incorporated the requirements from the FSAR. In particular, Step 3.10.1 committed to ANSI N14.5 for the leak test and Step 3.10.3 committed to a "nominal" test pressure of 90 psig and a maximum leak rate of less than or equal to 5 x 10(-6) atmosphere-cubic cm/sec. Procedural Step 6.2.3 required that the pressure be greater than 86 psig and maintained for 30 minutes prior to conducting the leak test. The 86 psig was determined by Trojan to meet the FSAR requirement for a "nominal" pressure of 90 psig. Step 6.2.4 required that the helium probe tip "speed of travel" be in accordance with ANSI N14.5. During the loading of the first cask the NRC inspector observed implementation of this procedure. After the hydrostatic and dye penetrant tests were completed, approximately 20 gallons of water was removed from the canister. Helium was added thru the vent port and a pressure greater than 86 psig was maintained for 30 minutes before the start of the helium leak test. The probe tip speed of travel was in accordance with the procedure and ANSI N14.5. The helium leak rate was measured at less than 9.2 x 10(-7) atmosphere-cubic cm/sec.

Documents Reviewed: HPP 1135-640 "Trojan ISFSI Completion Project MPC Closure Weld Helium Leakage

Testing," Rev 3

Category: Hydro/Drying/Helium **Topic:** Hydrostatic Test

Reference: FSAR 72-17 Sect 3.3.2.2 & 5.1.1.2

Requirement Once the MPC lid is welded, the MPC is refilled with borated water and hydrostatically tested to at least 1.25 times the maximum normal design pressure of 100 psig. The pressure is to be held for 10 minutes with no observable leakage as the acceptance criterion. After successful hydro testing, the MPC lid weld is dye penetrant examined. The hydro test will be performed per ASME Section III, NB 6000.

Finding: Procedure HPP 1135-630 described the actions required for the hydrostatic testing of a loaded MPC-24E/EF prior to final closure. The requirements in the procedure were consistent with the requirements described in the FSAR. The overview section of the procedure stated that the hydro testing was performed in accordance with ASME Coded Section III, Subsection NB-6000 for pressure vessels except for the code deviations explained in the Trojan ISFSI SAR Table 4.2-1a. During the loading of the first canister, the NRC inspector observed that the procedure was followed and that the canister successfully passed the hydrostatic test. Subsequent to the hydrostatic test, a dye penetrant test was successfully performed with no additional weld repairs required.

Documents Reviewed: HPP 1135-630 "Trojan ISFSI Project Completion Project Hydrostatic Test Procedure for the MPC-24E/EF," Rev 5

Category: Pre-Operational Tests **Topic:** Pre-Operational, Startup and Other Tests

Reference: FSAR 72-17 Table 9.2-1

Requirement Table 9.2-1 specifies the required pre-operational, startup and other tests the licensee will perform as part of their license commitments. (Note: some activities listed in the table are performed prior to the pre-operational testing that is observed by the NRC.)

Finding: Demonstrations covering all 17 topical areas described in FSAR Table 9.2-1 were performed by Trojan. Through direct observation by the NRC inspection team and/or review of documents provided by Trojan, all required activities were successfully demonstrated. Key activities observed by the inspection team included heavy loads, movement of a dummy assembly into the canister, operations of the helium system and vacuum dry system, hydrostatic testing, and cask welding and verification of the weld using non-destructive examination techniques.

Documents Reviewed: (a) CTL 44840 "Conduct MPC Lifting Equipment Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (b) CTL 44841 "Conduct MPC Automated Welding System and Cutting Equipment Testing per ISFSI Table 9.2-1," dated December 1, 2002 (c) CTL 44842 "Conduct MPC Lid Retention System Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (d) CTL 44843 "Conduct MPC Basket Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (e) CTL 44845 "Conduct Transfer Cask Lifting Crane Load Test per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (f) CTL 44846 "Conduct Transfer Cask Lifting Trunnion, Lifting Yoke and Bottom Door Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (g) CTL 44849 "Conduct Concrete Cask Air Outlet Temperature Monitoring System Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (h) CTL 44851 "Conduct Transfer Station Side Members

Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (i) CTL 44852 "Conduct Startup Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (j) CTL 44853 "Conduct Heat Transfer Validation Testing per ISFSI FSAR Table 9.2-1," dated December 1, 2002 (k) FHP 50-03 "Loading and Placing Concrete Cask into Storage," Rev 1

Category: Procedures & Tech Specs **Topic:** Air Pad Limits

Reference: Tech Spec 3.3.1

Requirement The air pads shall not be installed under a concrete cask containing a loaded canister for more than 20 hours or when the ambient temperature exceeds 100 degree F. Technical Specification (TS) 3.3.1.1 requires the licensee to verify that the pads are not installed > 20 hrs by performing a surveillance every 10 hours. TS 3.3.1.2 requires the licensee to verify temperatures within one hour before installation of the air pads and hourly after installation when the ambient temperature is greater than 90 degrees F.

Finding: The licensee established procedural controls to ensure these limits were not exceeded. Procedure FHP 50-03, Step 4.32.4 and Procedure FHP 50-10, Step 5.3.7 included the air pad limitations and surveillance requirements from TS 3.3.1.1 and 3.3.1.2.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) FHP 50-10 "Air Pad System Operation," Rev 3

Category: Procedures & Tech Specs **Topic:** MPC and Associated Equipment

Reference: FSAR 72-17 Sect 9.2.3.1.1

Requirement The canister lid retention system will be tested to demonstrate the capability to keep the canister lid on the canister when subjected to forces equivalent to those experienced during and after a crane mishandling event or a postulated transfer cask tip over.

Finding: Holtec conducted a technical evaluation of the canister lid retention system and Trojan successfully conducted a test of the system. The Holtec calculation determined that the lid retention system, as designed and fabricated, would remain in place during a postulated transfer cask tip-over event or crane mishandling event. The retention system design included four retainer clips and associated hold-down bolts. The force per retainer clip was calculated to be 6574 foot-pounds during the worst case scenario tip-over event. Under Maintenance Request 30662, Trojan conducted a sheer test of one clip and six bolts. The bolts were subjected to a force of 6735-6757 pounds, confirming the ability of the bolts to resist the calculated tip-over force without failing. The licensee tested only one clip instead of all four because the clips were identical solid blocks of stainless steel, the clips did not have any structural welds and the clips were provided by a vendor that was previously qualified by the licensee’s quality assurance program.

Documents Reviewed: (a) Holtec Report HI-2012767 "Trojan MPC Lid Retention Analysis," Rev 2, dated January 2, 2002 (b) Maintenance Request No. 30662, dated October 17, 2002

Category: Procedures & Tech Specs **Topic:** Notification of Incorrect Fuel Loading

Reference: Tech Spec 2.2.1

Requirement If the approved contents as listed in Tech Spec 2.1 are violated, within 24 hrs notify the

NRC Operations Center and within 30 days submit a special report which describes the causes of the violation and actions taken to restore compliance and prevent recurrence.

Finding: Procedure TPP 18-15, Attachment 5, "Special Reports," incorporated the Technical Specification 2.2.1 requirements. The Operations Manager stated that a reportability determination would be made using the Trojan corrective action report process if a canister were to be incorrectly loaded.

Documents Reviewed: TPP 18-15, "Determining Reportability of Events or Conditions," Rev 12

Category: Procedures & Tech Specs **Topic:** Procedure Controls

Reference: FSAR 72-17 Sect 9.4.1

Requirement The review and approval process for ISFSI procedures and changes will be procedurally controlled. The ISFSI Manager or his designee will approve ISFSI procedures and changes prior to implementation.

Finding: A procedural process had been established by Trojan to review and approve ISFSI procedures and changes. Approval was by the ISFSI Manager or designee. The master index list for the ISFSI procedures listed all quality-related procedures. All fuel handling procedures (designated as FHP-series procedures) were considered quality-related. Procedure TPP 12-4 provided requirements for the control of licensee procedures related to 10 CFR Part 50 operations, while Procedure TIP 04 provided control of licensee procedures related to 10 CFR Part 72 operations. Procedures TPP 16-1, HPP 1135-220, and HQP 5.3 provided administrative control of Holtec procedures. Procedure TIP 01, Step 6.2.5, stated that the ISFSI Manager was responsible for approval of ISFSI programs and procedures. Procedure TIP 04 specified that procedure changes, procedure corrections and temporary changes required ISFSI Manager approval.

Documents Reviewed: (a) Master Index for ISFSI Procedures (b) TIP 01 "Trojan ISFSI Management Organization and Responsibility," Rev 1 (c) TIP 04 "Trojan ISFSI Procedure Control Program," Rev 7 (d) TPP 12-4 "Nuclear Division Procedure Control Program," Rev 12 (e) TPP 16-1 "Material/Service Procurement and Control Process," Rev 6 (f) HPP 1135-220 "Trojan ISFSI Completion Project Field Procedure Change Procedure," Rev 0 (g) HQP 5.3 "Standard and Project Procedures," Rev 4

Category: Procedures & Tech Specs **Topic:** Speed Limit on Moving Concrete Casks

Reference: FSAR 72-17 Sect 5.1.1.4

Requirement Administrative controls will limit the transport speed to less than or equal to 2 ft/sec while moving the concrete cask with inflated air pads from the fuel building to the ISFSI pad.

Finding: A transport speed limitation was incorporated into step 4.5 of Procedure FHP 50-10. The procedure stipulated a conservative speed limit of 1 foot per second.

Documents Reviewed: FHP 50-10 "Air Pad System Operation," Rev 3

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Category: Procedures & Tech Specs **Topic:** Stuck Fuel Assembly During Loading

Reference: None

Requirement During the loading of the fuel assemblies into the canister, it is possible that a fuel assembly could become stuck. Removing the fuel assembly requires establishing a lifting limit to prevent damaging the fuel assembly.

Finding: Trojan had developed contingency plans for a stuck fuel assembly. Instructions were provided in Procedure FHP 13, Section 5.2, for freeing a fuel assembly if it were to become stuck in a canister. Procedure FHP 13 established a maximum load limit, as displayed on the load cell, of 2346 lbs. The calculation for the maximum load limit was based on information provided in Westinghouse Specification F-5. Section 5.2 of Procedure FHP 13 provided instructions to initiate a corrective action report and to perform an engineering evaluation to determine the best method for removal if a fuel assembly remained stuck in place. In order to minimize the possibility of sticking a fuel assembly during insertion, Trojan performed a verification of the dimensions of the cells in the canister during receipt inspection using a dummy gage that was inserted into the cell. If problems were encountered fully inserting the dummy gage, a site nonconformance report was issued and a more precise test was performed on the cell to verify the cell dimensions. Failure of this second test resulted in the vendor being notified and repairs requested. During the NRC review of the drag test results for canister MPC #7, documentation generated during the test indicated that cell #8 had not passed the test and the gage had stopped 48" from the top of the cell. However, when the site nonconformance report description was written, the description referenced cell #12 as the problem cell instead of cell #8. In addition, two versions of the forms being used to document the problems with the cells were also found. The disposition for the site nonconformance report on the problem with canister MPC #7 was to "use as is" since the re-test looked at the wrong cell and did not find a problem. The disposition was signed off by the Holtec Fuel Load Manager and by the Quality Engineer. Neither had caught the error with the wrong cell being re-tested. Corrective action request CAR C-02-0030 was generated by Trojan due to the NRC finding the problem with the wrong cell being re-tested . Trojan initiated a review of all drag test results. One additional failure to re-test the correct cell was found. Re-examination of the problem cells and verification of their dimensions against the minimum design allowances found the cells to be acceptable.

Documents Reviewed: (a) FHP 13 "Fuel Handling Emergency Procedure," Rev 25 (b) "Contingency Plan For Stuck Fuel Assembly," dated October 21, 2002 (c) Westinghouse Specification F-5, "Instructions, Precautions, and Limitations for Handling New and Partially Spent Fuel Assemblies," dated August 26, 1991 (d) CAR No. C-02-0039 "The NRC identified a discrepancy with the drag test documentation for MPC S/N 007 which had been accepted by QC and issued for use," dated December 18, 2002

Category: Procedures & Tech Specs **Topic:** Thermal Validation Test for Cask

Reference: FSAR 72-17 Sect 9.2.3.2

Requirement Following the loading of the first concrete cask placed in service, the heat transfer will be confirmed by measuring the temperature difference between the concrete cask air inlets and air outlets and comparing the average measured temperature difference against a calculated temperature difference that is based on the canister loading. This test will confirm the predicted thermal behavior of the cask. The validation test will be repeated for the highest heat load cask. Any measured temperature differences that are higher than the calculated difference by more than the uncertainty specified in the test procedure will be evaluated.

Finding: A thermal validation test requirement had been established in Procedure TPT 50-03. Section 5.2 of the procedure provided instructions to ensure that the heat transfer validation temperature readings were performed on the first loaded concrete cask and the third cask (highest heat load cask). In accordance with Step 5.2.11, if the differential temperature limit was exceeded by more than the temperature uncertainty, then a corrective action report was required to be written to identify, document, and evaluate the adverse condition. Calculations were completed for the thermal differential temperature for the first and third casks based on their respective heat loads of 4.1 kW and 14.3 kW. For the first cask, the differential temperature between the air inlets and air outlets compared to the ambient temperature was calculated to be 34.8 degree F. Measurements were taken while the cask was inside the fuel building bay to avoid the effects of wind on the measurements. The temperature differential was measured as 35.2 degree F. After the cask was moved to the ISFSI, the average outlet temperature was 72 degree F with an ambient temperature of 52 degree F. The differential temperature would then be 20 degree F, 15 degree F less than that measured in the fuel building bay. Trojan issued Corrective Action Report No. C03-0004 to evaluate the temperature findings. The calculated temperature differential for the third cask was determined to be 77 degree F. The measured temperature differential in the fuel building bay was 70.3 degree F. After placement on the ISFSI pad, the average outlet temperature was 110 degree F with a differential temperature above background of 58 degree F.

Documents Reviewed: TPT 50-03 "Concrete Cask Startup and Heat Transfer Validation Test," Rev 1

Category: Procedures & Tech Specs **Topic:** Time to Boil Limit

Reference: FSAR 72-17 Sect 5.1.1.2

Requirement The calculated "time to boil" limit is administratively controlled to ensure that water does not boil prior to removal of the water from the MPC. Should the time-to-boil limit be approached, procedures will address methods to establish required canister cooling.

Finding: Calculations for determining the time to boil limit were incorporated into procedures and provisions were established for initiating cool down of the canister if the time to boil limit was approached. Procedure 50-03, Attachment 1 "Time to Boil Calculation Sheet" provided a method for determining the limit for the time water could remain in the canister without cooling. The time limit considered the heat load of the spent fuel in the canister and the water temperature of the spent fuel pool. Typical time to boil limits for the Trojan fuel would range from 60 to 160 hours. Procedure HPP 1135-660 provided instructions for cooling the canister if the "time-to-boil limit" was projected to be exceeded. The procedure provided detailed steps for establishing cooling of the canister by circulating spent fuel pool water through the canister and monitoring water temperature.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask into Storage," Rev 1 (b) HPP 1135-660 "Trojan ISFSI Completion Project Water Circulation Procedure for the MPC-

24E/EF," Rev 2

Category: Procedures & Tech Specs **Topic:** Unloading Operations

Reference: FSAR 72-17 Section 5.1.1.3

Requirement FSAR Section 5.1.1.3 provides a detailed description of the licensee's operations in the event it is necessary to unload an MPC.

Finding: Trojan had developed Procedure FHP 50-08 for unloading a canister and had incorporated the information and methodology described in FSAR Section 5.1.1.3.

Documents Reviewed: FHP 50-08 "MPC Return to Pool and Unloading Procedure," Rev 1

Category: Procedures & Tech Specs **Topic:** Written Procedures

Reference: Tech Spec 5.4

Requirement Written procedures shall be establish, implement and maintain covering the important to safety activities related to storage operations described in the ISFSI SAR.

Finding: The master list for ISFSI procedures was reviewed and compared to various selected sections from the FSAR including procedural steps related to loading and unloading a cask. The information reviewed in the FSAR was found to be incorporated into the procedures. In particular, procedures required by Technical Specification 5.4.1 and loading sequences specified in Figures 5.1-1 through 5.1-4 of the FSAR were adequately described in the procedures.

Documents Reviewed: Master Index for ISFSI Procedures

Category: QA **Topic:** Control of Measuring and Test Equipment

Reference: 10 CFR 72.164

Requirement The licensee shall establish measures to ensure that tools, gauges, instruments and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specific periods to maintain accuracy within necessary limits.

Finding: Provisions had been established to ensure equipment and tools used for activities affecting safety were properly controlled and calibrated. The master Meter & Test Equipment (M&TE) index for the Holtec controlled equipment related to ISFSI operations was reviewed. Vendor manuals for selected test equipment and leak test equipment operating procedure were also reviewed. Documentation was reviewed for the hydrostatic test pressure gauges, helium backfill flow meters and totalizers and the vacuum drying pressure gauges to confirm that uncertainty values established in document HI-2022936 were accounted for. The adequacy of the documentation for the four helium leak sources was also reviewed and found acceptable. Specific tools and equipment were selected and physically confirmed to be properly maintained with current calibration stickers. Calibration documentation was compared with the calibration stickers to ensure that the dates on the stickers were correct.

Documents Reviewed: (a) HPP 1135-260 "Trojan ISFSI Completion Project M&TE Calibration Procedure" (b) HI-2022936 "Evaluation of Uncertainties in Meter/Test Gauge Sets" (c) Holtec M&TE Index and Calibration Logs (d) Procurement Log (e) Vendor Manuals Binder (f)

Reviewed the following M&TE records and physically located the following: (Holtec Control Number in parentheses): Torque wrench: 100 - 600 ft. lb (HI-TW-006), Temperature gauge: (HI-TG-003), Pressure gauges: 0-200 psig (HI-PG-001 and HI-PG-003), Vacuum gauges: (HI-VG-001, 002, 003 and 004), Flow meters/totalizers: (HI-FM-001, 003 and 005), Relief valve: 160 psig set (HI-RV-006), Tape measure: (HI-G-005), Calipers: 0-6 inches (HI-G-014), Helium calibrated leaks: LLK2094 and TP1731

Category: QA **Topic:** Control of Purchased Material

Reference: 10 CFR 72.154

Requirement The licensee shall establish procedures to ensure that purchased material, equipment, and services whether purchased directly or through contractors and subcontractors, conform to the procurement documents prior to installation or use.

Finding: Trojan's quality assurance program required receipt inspection of material delivered to the Trojan site and required periodic audits to verify that purchased material conformed to procurement documents. The receipt inspection program applied to material purchased by Trojan as well as contractors and subcontractors. Tours of material storage areas were conducted to verify that tagging, documentation and markings were present to indicate that the material had undergone receipt inspection.

Documents Reviewed: (a) PGE 8010 "PGE Nuclear Quality Assurance Program for the Trojan Nuclear Plant," Rev 25 (b) Audit/Surveillance Schedule for 2002/2003 (c) HPP 1135-120 "Trojan ISFSI Completion Project Holtec Receiving Inspection Procedure" (d) QIP 16-1 "Receipt Inspection of Quality Related Materials, Parts, and Components," Rev 4

Category: QA **Topic:** Corrective Actions

Reference: 10 CFR 72.172

Requirement The licensee shall establish measures to ensure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures must ensure that the cause of the condition is determined and corrective action taken to preclude repetition. This must be documented and reported to appropriate levels of management.

Finding: Trojan was using their site corrective action program (CAR) to document ISFSI conditions adverse to quality. Holtec was using its site nonconformance report (SNR) system to document cask-related conditions adverse to quality. A review was performed of the Trojan CAR Log and the Holtec SNR Log. Selected CARs and SNRs were reviewed in detail to verify that resolution of the issues was appropriate to the nature of the concern. There was no formal requirement for Trojan to notify the cask vendor, Holtec, of problems identified and documented in every CAR, however, the cask vendor will be on site through the loading of all the casks and would be aware of adverse cask conditions through daily interaction with the Trojan staff and would have access to Trojan's CAR system.

Documents Reviewed: (a) PGE ISFSI Corrective Action Report (CAR) Log (b) Holtec Site Nonconformance Report (SNR) Log (c) CAR C-02-0002 "Apparent Discrepancy Between ISFSI Technical Specifications for Determining Fuel Integrity and the Requirements that were in place when the Fuel Inspection was Performed" (d) CAR C-02-0010 "Approximately 50 Completed M&TE Records from August 1-15, 2000 Cannot be Located" (e) CAR C-02-0018 "Holtec MPC Materials not per Design" (f) CAR C-02-0022 "Important-to-Safety ISFSI Related Materials are Being Inappropriately Issued from the Warehouse Based on Incorrect ITS Classification"

Category: QA **Topic:** Design Change Controls

Reference: 10 CFR 72.146 (c)

Requirement The licensee shall subject design changes, including field changes, to design control measures commensurate with those applied to the original design

Finding: Trojan had adequately applied design change controls to two major design packages that were reviewed during this inspection. The two defueled plant modification requests (DPMR) reviewed covered a period spanning 5 years. The DPMR index sheet listed all potential documents or procedures that might be affected by the proposed design change. The referenced documents and procedures were checked by the Action Engineer to determine if any changes were needed. It was the responsibility of the Action Engineer to make the determination of which referenced areas needed to also be reviewed and/or modified. Completed forms contained within the package become QA records under the Part 50 approved QA program. Applicability of QA requirements for design changes was determined based on procedural elements of Procedure TPP 30-5. Where QA approval was required, QA signoff was typically incorporated when the design change was implemented, such as when a maintenance request was initiated. Each package reviewed contained the reason for the change, an assessment of the effect of the change on the original design, and a determination of whether the original design analysis was still valid. Where the old analysis was not still bounding, additional analysis was performed. For example, the fuel transfer station shield ring required changes in the dimensions in order to accommodate the new Holtec canister. Additional analysis was performed. For the two DPMRs reviewed, the design changes were approved by the same organization that approved the original design. In interviews with the Trojan engineering staff, it was determined that a tracking system comprised of computer records and paper records was adequate for tracking the progress toward completion of each design change package. Independent safety reviews and signatures were noted for each key analysis and review step completed for the packages reviewed.

Documents Reviewed: (a) DPMR 2002-1 "Modify ISFSI Transfer Station to Fit up to Holtec Equipment," Rev 0 (b) DPMR 97-028 "Erect ISFSI Transfer Station," Rev 0 (c) TPP 30-5 "Quality Assurance Program"

Category: QA **Topic:** Handling, Storage and Shipping Control

Reference: 10 CFR 72.166

Requirement The licensee shall establish measures to control, in accordance with work and inspection instructions, the handling, storage, shipping, cleaning and preservation of material and equipment to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere and specific moisture content and temperature levels must be specified and provided.

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Finding: Based on observations of the storage of ISFSI equipment during tours of the facility, provisions had been adequately established by Trojan for storage of components and equipment related to the ISFSI project. Storage areas included the turbine building, warehouse and a designated Holtec materials and test equipment storage area. Tours of the areas were conducted and all material was found to be in good condition. Components were properly marked as to status. Appropriate measures were being taken for canisters, lids and other associated hardware stored in the turbine building to provide protection from physical damage and deterioration. Chemicals for performing non-destructive examinations were stored in appropriate environmental conditions. Trojan's receipt inspection and status log for components associated with the canister was reviewed. The status of a selected number of components was observed in the field and compared to the status log to verify the accuracy of the log. The receipt inspection process for a canister and its related components for a newly arrived canister was observed in the truck bay. The components were handled properly and had been appropriately weather proofed for the trip from the fabricator's facility to Trojan.

Documents Reviewed: (a) HPP 1135-120 "Trojan ISFSI Completion Project Holtec Receiving Inspection Procedure" (b) PGE Maintenance Request #28136 "ISFSI MPC Receipt Inspection, Handling and Storage Requirements" (c) QIP 16-1 "Receipt Inspection of Quality Related Materials, Parts, and Components," Rev 4 (d) QP 17-10 "Control and Use of QC Hold Tags," Rev 1

Category: QA **Topic:** Important to Safety Equipment

Reference: FSAR 72-17 Sect 3.3.3.1

Requirement Equipment and components Important to Safety are listed in Section 3.3.3.1

Finding: During review of various records and documents, including several procurement and testing documents, designation of components as being important to safety were found to be consistent with the listings in the FSAR. No cases were observed during the inspection where components identified as important to safety were being handled in a way that was not consistent with Trojan's quality assurance program requirements.

Documents Reviewed: PGE 8010 "PGE Nuclear Quality Assurance Program for the Trojan Nuclear Plant," Rev 25

Category: QA **Topic:** Independent Safety Reviewer Qualifications

Reference: FSAR 72-17 Sect 9.6.1

Requirement Independent safety reviews will be performed by qualified safety reviewers knowledgeable in the subject area being reviewed. The independent safety reviewer will not have direct involvement in the performance of the activities under review. The reviewer will have 5 years professional level experience and either a Bachelors degree in Engineering or Physical Sciences or equivalent in accordance with ANSI/ANS 3.1-1981. The Chairman of the Safety Review Committee will designate the reviewers in writing.

Finding: An independent safety review program with assigned qualified personnel had been established consistent with the FSAR requirements. The licensee's list of qualified independent safety reviewers and 50.59/72.48 reviewers and the qualification records summary for the designated independent safety reviewers was reviewed. Several reviewers were found to not have the required Bachelors degree in Engineering or Physical Sciences. Insufficient documentation was provided in the qualification record summary to demonstrate equivalency in accordance with ANSI/ANS 3.1-1981. The licensee provided additional documentation demonstrating their compliance with the requirements. Training and work history was reviewed for four independent safety reviewers. All required training had been completed. The qualifications were also verified as current in the area of performance of 50.59 and 72.48 reviews. A sampling of the licensees electronic training database was reviewed against paper records to verify consistency between the two records. Satisfactory completion of the safety reviewer qualification requirements and "appointment" as an independent safety reviewer was verified as properly documented on the inspector qualification record sheets audited.

Documents Reviewed: (a) "Independent Safety Reviewer Training and Qualification Forms," Rev 6 (b) S. Quennoz Memo "Joint Independent Review and Audit Committee (IRAC) and ISFSI Safety Committee (ISRC) Membership (IRAC-016-98), dated September 18, 1998 (c) Committee Membership and Training and Qualification Requirements (d) TPP 10-9 "Trojan Nuclear Plant and Trojan ISFSI Independent Safety Reviewer Charter," Rev 8

Category: QA **Topic:** Inspection and Testing Status

Reference: 10 CFR 72.168 (a)

Requirement The licensee shall establish measures to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items. These measures must provide for the identification of items which have satisfactorily passed required inspections or tests where necessary to preclude inadvertent bypassing of the inspection or test.

Finding: A program had been established to indicate the status of inspections and tests performed on ISFSI components and equipment. Requirements were established in Procedures HPP 1135-120, QIP 16-1 and QP 17-10 for tagging or marking equipment to designate status. Equipment required to be marked or tagged had been identified and included not only the canister and ancillary components, but also other items such as weld wire, NDE chemicals, crane slings and calibrated test equipment. During tours of the various storage areas, the adequacy of tagging and marking of equipment was confirmed.

Documents Reviewed: (a) HPP 1135-120 "Trojan ISFSI Completion Project Holtec Receiving Inspection Procedure" (b) PGE Maintenance Request #28136 "ISFSI MPC Receipt Inspection, Handling and Storage Requirements" (c) QIP 16-1 "Receipt Inspection of Quality Related Materials, Parts, and Components," Rev 4 (d) QP 17-10 "Control and Use of QC Hold Tags," Rev 1

Category: QA **Topic:** ISFSI Safety Review Committee

Reference: FSAR 72-17 Sect 9.6.2

Requirement Section 9.6.2 of the FSAR describes the ISFSI Safety Review Committee and lists the role, qualifications and function of the committee.

Finding: An ISFSI Safety Review Committee (ISRC) had been established and had held several meetings. The ISRC was composed of five active members. A chairman was assigned and two alternates were designated. An alternate chairman was also designated. A review of resumes and records confirmed that the ISRC membership had experience in the five required functional areas delineated in the FSAR to include: spent fuel handling and storage, engineering, radiation protection, quality assurance, and physical security and safeguards information. The ISRC had met prior to the initial loading campaign for the spent fuel. The ISRC charter stated that the committee shall meet at least annually. Recent ISRC meetings were documented for September 18, 2002 and December 16, 2002. The meeting minutes for the September 18, 2002 meeting were reviewed. A quorum was present with a chairman. Information reviewed and discussed by the committee during the meeting was consistent with the role and responsibilities assigned to the committee by the FSAR.

Documents Reviewed: (a) TPP 10-8 "Independent Review and Audit Committee and ISFSI Safety Review Committee Charter," Rev 9 (b) Memo from S. Quennoz "Joint Independent Review and Audit Committee (IRAC) and ISFSI Safety Review Committee (ISRC) Membership - to include Membership qualifications" (c) Memo from S. Quennoz "Formation of ISFSI Review Committee," dated January 4, 2000 (d) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2002-03"

Category: QA **Topic:** QA Audits

Reference: 10 CFR 72.176

Requirement The licensee shall carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the QA program and to determine the effectiveness of the program.

Finding: Both Trojan and Holtec have developed and were implementing quality assurance program surveillances and audits. The Trojan audit and surveillance schedule for 2002 was reviewed to verify that an adequate audit program was being implemented for the oversight of activities being conducted by the cask vendor, Holtec. The Holtec surveillance schedule was also reviewed to verify the adequacy of their surveillance program. Several selected audits and surveillances were reviewed in detail. The scope and extent of the audits as well as resolution to issues identified during the audits were appropriate.

Documents Reviewed: (a) PGE Memorandum "2002-2003 Integrated Audit and Surveillance Schedule," Rev 3 (b) Draft PGE ISFSI/Spent Fuel Pool Weekly Surveillance checklists and associated matrix (c) Holtec Internal Surveillance Schedule for "Random Surveillance," Rev 0 (d) Audit # 01-09 "ISFSI Fabrication Oversight: Jorgensen Forge in Seattle for MPC Lids," conducted January 7-14, 2002 (e) Audit # 02-04 "Hopper Elmore and Associates," conducted March 20, 2002 (f) Audit # 02-05 "Holtec International’s Oversight of Subcontractors," conducted April 17-29, 2002

Category: QA **Topic:** QA Organization

Reference: FSAR 72-17 Sect 9.1.1.1.1

Requirement The Manager, Nuclear Oversight, reports to the Trojan Site Executive and is responsible for evaluating the effectiveness of the QA program, auditing vendor activities, coordinating the corrective action program, providing QA coverage for site activities, and maintaining the PGE QA program. The Nuclear Oversight Dept. has the authority and independence to identify quality problems and to initiate stop work orders for any condition adverse to quality

Finding: The reactor quality assurance program for Trojan was also being applied to the ISFSI activities. An acceptable quality assurance organization had been established at Trojan to support the additional activities associated with the ISFSI project. PGE 8010 described the quality assurance program and included an organizational chart as Figure 1.0-1 which showed the Manager of Nuclear Oversight (QA Manager) reporting directly to the Trojan Site Executive. Step 1.2.3.1.1 of PGE 8010 described the responsibilities of the QA Manager. Responsibilities included stop work authority as specified in Step 1.2.3.1. The responsibilities assigned to the QA Manager were consistent with those identified in the ISFSI FSAR. Adequate resources had been assigned to the quality assurance organization for both Trojan and Holtec to conduct planned audits and surveillances.

Documents Reviewed: (a) PGE 8010 "PGE Nuclear Quality Assurance Program for the Trojan Nuclear Plant," Rev 25 (b) PGE Memorandum "2002-2003 Integrated Audit and Surveillance Schedule," Rev 3 (c) Draft PGE ISFSI/Spent Fuel Pool Weekly Surveillance checklists and associated matrix (d) Holtec Internal Surveillance Schedule for "Random Surveillance," Rev 0

Category: QA **Topic:** QA Program

Reference: FSAR 72-17 Sect 11

Requirement PGE's QA Program is described in PGE 8010 and complies with 10 CFR Part 50 App. B. FSAR Chapter 11states that PGE 8010 is applicable to activities covered by 10 CFR 72, Subpart G.

Finding: The quality assurance program implemented at Trojan was described in PGE 8010 and was being applied to both the reactor program and the ISFSI program. PGE 8010 had been reviewed on numerous occasions during reactor decommissioning inspections over the past several years and documented as being in compliance with 10 CFR 50 Appendix B. The requirements of 10 CFR 50 Appendix B are consistent with 10 CFR 72 Subpart G. PGE 8010 had also been reviewed against the requirements of 10 CFR 72 Subpart G during the site specific approval process for Trojan's ISFSI license. In addition, Trojan was maintaining a Part 71 QA program approval certificate issued by the NRC per NRC letter dated March 13, 1996.

Documents Reviewed: (a) PGE 8010 "PGE Nuclear Quality Assurance Program for the Trojan Nuclear Plant," Rev 25 (b) NRC letter dated March 13, 1996 from Kokajko to PGE approving their Part 71 QA Program

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Category: Radiological **Topic:** ALARA

Reference: FSAR 72-17 Sect 7.5.3.2

Requirement Personnel radiation exposure is maintained ALARA by a combination of shielding, access control, contamination control, surveys and monitoring, work planning, training and sound radiation practices implemented by procedures.

Finding: An effective ALARA program had been developed by Trojan using procedures and radiation work permits (RWP) to establish radiological controls for work activities. Shielding had been designed into the cask system to reduce exposures. Trojan also used temporary and portable shielding to further reduce exposures. Specific training was provided to the health physics staff concerning expected radiological conditions that would be encountered during various cask loading activities. Pre-job briefings were conducted prior to each major work activity. The pre-job briefings included information presented by radiation protection personnel concerning the expected radiological conditions that would be encountered and any special radiation protection instructions for dealing with problems. During the pre-operational testing, the health physics staff performed numerous demonstrations of health physics controls that would be implemented during the actual loading of the casks. These demonstrations included use of temporary shielding, access control, contamination control, surveys and monitoring. Good controls were established for all potentially contaminated areas. Access control points were adequately set up with proper posting. The health physics staff demonstrated good radiological practices and followed procedures during the demonstrations. The demonstrations were consistent with good ALARA practices. Interviews were conducted with selected health physics personnel to assess the adequacy of their training and knowledge of the various radiological hazards that may be encountered during the cask loading operations. The health physics staff demonstrated a good understanding of the radiological aspects related to cask loading and ISFSI operations. Workers were observed throughout the pre-operational testing complying with radiation protection requirements. This included complying with entry requirements into the radiologically controlled areas of the plant. For entry, workers were required to log onto a computer terminal by entering their badge number and the specific RWP that they planned to work under. The computer verified that the individuals radiological training was current and assigned a Digital Analog Dosimeter (DAD) to the individual. During the loading of the first cask, the health physics staff was observed completing numerous activities to establish health physics controls including performing radiological surveys and contamination surveys, placement of barricades, use of temporary shielding, and posting of radiation areas and access control points. All individuals entering radiologically controlled areas were observed to be properly badged. The NRC inspectors observed workers during the first cask loading implementing good ALARA practices. Access control points were adequately set up with proper posting. The licensee maintained control of all posted contamination areas. The health physics staff demonstrated good radiological control practices and followed procedures. Workers willingly followed instructions from the health physics staff to reduce exposures and showed a good attitude toward keeping exposures low. ALARA estimates for work activities were realistically developed and tracked. The original estimate for the accumulated dose to load the first cask was 0.328 manrem. The actual dose for the first cask loading was 0.236 manrem. This cask had a 4.1 kW heat load. The second cask was 4.7 kW and resulted in 0.238 manrem exposure. The third cask was the hottest cask to be loaded at Trojan at 14.3 kW and resulted in 1.145 manrem exposure.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RPP 102 "Survey Techniques," Rev 33 (c) RWP 200220 "ISFSI Facilities Preparation" (d) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities" (e) RWP 200224 "ISFSI Decontamination Support"

Category: <u>Radiological</u> **Topic:** <u>ALARA Training</u>

Reference: FSAR 72-17 Sect 7.5.3.2.9

Requirement The need for specialized ALARA training is evaluated during work planning in accordance with radiation protection implementing procedures. Specialized ALARA training may include dry runs, pre-job briefings and other special training classes.

Finding: Training to implement ALARA practices for the cask loading and ISFSI operations was achieved through a combination of pre-job briefings prior to work activities, performing the pre-operational test demonstrations incorporating simulated radiological conditions and providing training to workers on radiological conditions that would be encountered during the various phases of the loading campaign. The specialized training was provided by Holtec, the cask vendor. Procedures also alerted the workers at certain points in the loading process to consider special engineering controls and practices such as temporary shielding, remote surveillance equipment, multi-discipline input regarding ALARA goals, pre-job briefings, in-progress and post job briefs, and considerations related to adequate lighting, ventilation, work space and work accessibility.

Documents Reviewed: (a) Trojan Nuclear Plant "General Employee Training" (b) Health Physics Study Guide (c) GET Category I Modules (d) GET Category II Modules (e) Learning Management Data Base (f) Selected worker training files and records (g) Training Material Review and Approval Form

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Category: <u>Radiological</u> **Topic:** <u>Annual Radiological Report</u>

Reference: 10 CFR 72.44 (d)(3)

Requirement An annual report is to be submitted to the Commission specifying the quantity of each of the principal radionuclides released to the environment in liquid or gaseous effluents during the previous 12 months of operation and such other information as may be required to estimate maximum potential radiation dose commitment to the public from effluent releases. The report must be submitted within 60 days after the end of the 12-month monitoring period.

Finding: The annual radiological environmental monitoring report for 2001 for the ISFSI was submitted by Portland General Electric Company to the NRC on February 26, 2002, within the 60 requirement . Since no spent fuel had been stored at the ISFSI during 2001, the report accurately stated that no effluents had been released to the environment.

Documents Reviewed: (a) "PGE Annual Radiological Environmental Monitoring Report for 2001," dated February 26, 2002 (b) Trojan ISFSI Procedure 14 "Radioactive Effluent Control Program and Radiological Environmental Monitoring Program," Rev 0

Category: <u>Radiological</u> **Topic:** <u>ARM in Fuel Building</u>

Reference: FSAR 50-344 Sect 5.6.1.3.1

Requirement When fuel is in the spent fuel pool or fuel building, ARM-12 and ARM-13 shall be operable with their alarm trip points set at less than or equal to 15 mR/hr. The 2 ARMs shall be channel checked once per 12 hours, a channel calibration once per 18 months, and a channel functional test once per 31 days.

Finding: Area Radiation Monitors, ARM-12 and ARM-13, were verified as being in good operating condition and functioning properly. The NRC inspector observed the meter readouts for the two monitors in the control room and inspected the condition of the two detectors in the fuel building. The operational status of the meter readouts in the control room was confirmed by the control room operator who performed a system check. Records for 2002 were reviewed to confirm that tests had been successfully performed in accordance with the FSAR requirements. The alarm panel was last tested on December 2, 2002, to ensure failure of the ventilation system and radiation alarms would trigger an alarm on the control room panel. The ARMs were last monthly source checked on December 8, 2002. The last functional test was performed on December 10, 2002. All tests were completed successfully. Because movement of a loaded canister near the ARMS would cause the ARMs to alarm, the licensee would temporarily turn off the ARMs until after the canister had moved by. Procedure FHP 50-08, Step 5.7.23 disabled the audible alarms. Step 5.7.34(c) reactivated the alarms and Step 5.7.34(d) verified operability of the alarms. The provisions for disabling and reactivating the alarms was appropriate for the conditions and the procedural controls were adequate to ensure operability of the alarms was re-established.

Documents Reviewed: (a) FHP 50-08 "MPC Return to Pool and Unloading Procedure," Rev 1 (b) Test records for ARM-12 and ARM-13 for 2002

Category: Radiological **Topic:** Contamination Limits on Canister

Reference: FSAR 72-17 Sect 7.2.2.1

Requirement The exterior of the canister will be checked for loose surface contamination while the canister is in the transfer cask to the extent possible because the canister surface is not readily accessible while in the transfer cask. As a second check, the interior of the transfer cask will be checked after the canister is removed. Loose surface contamination limits are 10(-4) microcurie per square cm beta-gamma and 10(-5) microcurie per square cm alpha uniformly distributed on the top and side external surfaces of the canister. These values will be used during the loading of the canisters as a "trigger" for further evaluation to determine if decontamination is necessary.

Finding: Procedure FHP 50-03 incorporated the requirements to check for loose contamination on the canister and established limits of 22,000 disintegrations per minute (dpm) per 100 square cm beta-gamma and 2,200 dpm/100 square cm. The value of 22,000 dpm/100 square cm equates to 10(-4) microcuries per square cm and 2,200 dpm/100 square cm equates to 10(-5) microcuries per square cm. Step 5.8.11(e) of Procedure FHP 50-03 required a contamination survey of the canister lid top surface and the accessible areas of the top three inches of the canister shell. Procedure RP-ISFSI-5 was to be used to document the results. The note to Step 5.8.12 of Procedure FHP 50-03 stated that if the 22,000/2,200 values were exceeded, an evaluation was required to determine if decontamination of the canister was necessary. Step 5.8.13 required notifying the radiation protection manager if the levels exceeded 15,000 dpm/100 square cm beta-gamma or 1,500 dpm/100 square cm alpha. Approval by the radiation protection manager was required by Note 5.8.13 in order to leave the canister contaminated to the levels of 22,000/2,200. After the canister was removed from the transfer cask, contamination surveys were required of the interior of the empty transfer cask per Step 5.13.13 of Procedure FHP 50-03. If contamination was found above the 22,00/2,200 level, an evaluation was required by Step 5.13.15 and the radiation protection manager notified in accordance with Step 5.13.16. If the radiation protection manager decided that decontamination should be performed, Step 5.13.16 directed the use of Attachment 2 "Contingency Plans." Attachment 2, Contingency Plan F "Contamination Levels Not Accepted by Radiation Protection Manager" required the canister to be returned to the decontamination and assembly station in accordance with Procedure FHP 50-08.

Documents Reviewed: (a) FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1 (b) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (c) RP-ISFSI-5 "Transfer Cask Internal Limits-Pre Decon Post Decon" (e) RP-ISFSI-10 "Transfer Cask Internal Limits-Post Decon" (f) RP-ISFSI-13 "Concrete Cask Limits" (g) RP-ISFSI-18 "Transfer Cask At End of Loading" (h) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities," Sections 5.2.14 thru 5.2.17 (i) RWP 200222 "Movement of Transfer Cask To/From Cask Load Pit" (j) RWP 200223 "Spent Fuel Movement (MPC Loading)" (k) RWP 200224 "ISFSI Decontamination Support" (l) RWP 200225 "ISFSI Related Welding and NDE Activities" (m) FHP 50-08 "MPC Returned to Pool and Unloading Procedure"

Category: Radiological **Topic:** Contamination Limits on Concrete Cask

Reference: Tech Spec 5.5.4 c

Requirement As part of transport and storage operations, radiation monitoring of the concrete cask and radiation monitoring of the transfer cask, prior to its relocation to the ISFSI, will be performed to ensure the loose surface contamination levels do not exceed 1000 dpm/100 square cm beta-gamma and 50 dpm/100 square cm alpha.

Finding: Provisions had been incorporated into Procedure FHP 50-03 requiring contamination surveys of the concrete cask. Step 5.15.29 required a contamination survey of the concrete cask exterior prior to movement to the ISFSI pad. The survey was to be performed and documented in accordance with Procedure RP-ISFSI-13. Procedure RP-ISFSI-13 required both gamma-beta and alpha surface contamination wipe surveys. Specific locations for taking the smear surveys on the concrete cask surface were identified in Procedure RP-ISFSI-13. The contamination limits of 1000 dpm/100 square cm beta-gamma and 50 dpm/100 square cm alpha were specified in Procedure RP-ISFSI-13. If these limits were exceeded, the radiation protection manager would be notified and decontamination of those areas performed. On January 13, 2003, a contamination survey of the first concrete cask loaded with a canister was performed. All survey results were below the 1000 dpm/100 square cm beta-gamma and 50 dpm/100 square cm alpha and were properly documented on a survey record form.

Documents Reviewed: (a) FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1 (b) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (c) RP-ISFSI-5 "Transfer Cask Internal Limits-Pre Decon Post Decon" (d) RP-ISFSI-10 "Transfer Cask Internal Limits-Post Decon" (e) RP-ISFSI-13 "Concrete Cask Limits" (f) RP-ISFSI-18 "Transfer Cask At End of Loading" (g) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities," Sections 5.2.14 thru 5.2.17 (h) RWP 200226 "Concrete Cask Loading and Startup Testing" (i) RWP 200227 "Transport of Loaded Concrete Cask from Fuel Building Crane Bay to ISFSI Storage Pad"

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Category: Radiological **Topic:** Contamination Survey

Reference: FSAR 72-17 Sect 7.2.2.1

Requirement The transfer cask/MPC annulus will be injected with filtered water to prevent contamination of the outside surface when the MPC is submerged in the cask loading pit. The transfer cask will be washed down after being removed from the spent fuel pool. The exterior of the MPC will be checked for loose contamination while in the transfer cask. Additionally, the interior of the transfer cask will be checked for loose surface contamination after the MPC is removed.

Finding: Provisions had been established in procedures to perform contamination surveys and to reduce the contamination of the canister by injecting clean water in the annulus between the canister and the transfer cask. Procedure FHP 50-03, Steps 5.4.13 and 5.4.15 directed the connection of the gap flush system to the annulus between the canister and the transfer cask to inject clean water to prevent the spent fuel pool water from contaminating the canister. Instructions for connecting and operating the gap flush system were provided in Procedure FHP 50-09. The transfer cask, containing the canister, will be rinsed with demineralized water as it is being removed from the cask loading pit in accordance with Step 5.7.24(f). After the transfer cask is removed from the spent fuel pool, the exterior surface will be decontaminated in accordance with Step 5.8.7. Step 5.8.11(e) required a contamination survey of the canister lid top surface and the accessible areas of the top three inches of the canister shell. After the canister was removed from the transfer cask, contamination surveys were required of the interior of the empty transfer cask per Step 5.13.13 of Procedure FHP 50-03. Monitoring and surveying during cask loading activities was accomplished through portable radiation instrumentation. The health physics staff demonstrated good radiological practices and followed procedures during the various pre-operational demonstrations. A review of selected survey equipment records was completed to verify that required calibrations and source checks had been completed. During the first cask loading, the health physics staff performed numerous contamination surveys of the cask loading area. Monitoring and surveying on the 93' level was accomplished through portable radiation instrumentation. A Geiger Mueller and a zinc sulfide scintillation detector were used to quantify removable beta, gamma and alpha contamination. Survey instruments being used had current calibration stickers.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RPP 102 "Survey Techniques," Rev 33 (c) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities" (d) RPP 140 "Temporary Field Source Check Locations for Portable Survey Instruments," Rev 2 (e) FHP 50-03 "Loading and Placing Concrete Cask into Storage," Rev 1 (f) FHP 50-07 "Water Transfer System Operation" (g) FHP 50-09 "Gap Flush System Setup and Operations"

Category: Radiological **Topic:** Controlled Area Around ISFSI

Reference: 10 CFR 72.106 (a)/(b)/(c)

Requirement For each ISFSI, a controlled area must be established. Minimum distance from the ISFSI to the nearest boundary of the controlled area must be 100 meters. The controlled area may be transversed by a highway, railroad or waterway as long as appropriate and effective arrangements are made to control traffic and to protect public health and safety

Finding: The controlled area around the Trojan ISFSI is 300 meters. Once all the spent fuel is moved to the ISFSI, the controlled area will be reduced to 100 meters. A railroad line traverses the 300 meter controlled area. Procedure EPIP 3, Attachment 1, Step B.6.c included instructions to contact the railroad with directions to close the tracks if conditions warranted. Contact would be made through the State of Oregon.

Documents Reviewed: (a) PGE 1075 "ISFSI Emergency Plan," Figure 1-3 "ISFSI Controlled Area Boundary"
(b) EPIP 3 "Response Organization Checklist," Rev 9

Category: Radiological **Topic:** Dose Rate Calculations for Cask

Reference: Tech Spec 5.5.4.a

Requirement As part of the loading and transport operations, radiation monitoring of the concrete casks will be performed to ensure the surface dose rates are within analyzed values. Calculated dose rates are provided in the FSAR in Figure 7.3-2 and Table 7.4-1 for the concrete cask.

Finding: A surface dose rate survey of the concrete cask was required by Procedure FHP 50-03 prior to moving the concrete cask to the ISFSI. The dose rate values provided in Table 7.4-1 of the FSAR (and Figure 7.3-2) were referenced in Procedure FHP 50-03, Caution 5.15.17. If these FSAR dose rate limits were exceeded, the cask would not be moved to the ISFSI pad and an analysis would be performed to verify that compliance with 10 CFR 20 and 10 CFR 72.104 radiological requirements would still be met with the cask located in the ISFSI. On January 13, 2003, Trojan completed the surface dose rate survey of the first loaded concrete cask. Contact radiation levels on the shield ring were 2 mR/hr gamma and 4 mrem/hr neutron. The limits for the contact dose rate on the shield ring from Table 7.4-1 and Figure 7.3-2 were 200 mR/hr gamma and 132 mrem/hr neutron. Without the shield ring in place, dose rates of up to 3,000 mR/hr on contact were measured. During the lowering of the canister from the transfer cask into the concrete cask, a survey instrument was positioned adjacent to the gap between the two casks. The survey instrument's range was 0-200 R/hr. The instrument went off-scale as the canister passed by.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) (c) RWP 200227 "Transport of Loaded Concrete Cask from Fuel Building Crane Bay to ISFSI Storage Pad"

Category: Radiological **Topic:** Environmental Monitoring Program

Reference: FSAR 72-17 Sect 7.5.3.1

Requirement The licensee will monitor, analyze and report radiation levels in the environment in accordance with the Radioactive Effluent and Environmental Monitoring Program. Radiation monitoring will be accomplished by posting Thermoluminescent Dosimeters (TLDs) at the perimeter of and in the controlled area near the concrete casks and reading the TLDs quarterly.

Finding: The licensee had developed an environmental monitoring program for the ISFSI controlled area. The program was described in ISFSI Procedure #14. The environmental monitoring program included placement of seven TLDs within the controlled area around the ISFSI. An additional eight controlled area TLDs were being considered as additional monitoring locations once all the spent fuel was removed from the spent fuel pool and placed into the ISFSI. The licensee currently monitored the environment around the Trojan site to meet environmental monitoring requirements for the Part 50 decommissioned reactor license. There were 15 TLD locations identified as part of this program. The TLDs were replaced quarterly. Records for the 15 TLDs were reviewed for calendar year 2001, as reported in Trojan's annual report submitted to the NRC. Average daily gamma radiation levels were 0.08 +/- 0.02 mR/day for the Trojan site. This was consistent with previous years and was consistent with radiation levels that were measured at offsite locations in Oregon.

Documents Reviewed: (a) PGE Annual Radiological Environmental Monitoring Report for 2001 (b) Trojan ISFSI Procedure 14 "Radioactive Effluent Control Program and Radiological Environmental Monitoring Program," Rev 0

Category: Radiological **Topic:** Exhaust of Air from Canister

Reference: FSAR 72-17 Sect 7.2.2

Requirement The gaseous waste from the canister during drying and sealing will be passed through a local HEPA filter.

Finding: Procedure HPP 1135-665 required any gaseous waste being released from the canister during drying and sealing to pass through a HEPA filter. A 125 cfm HEPA filter had been installed on the exhaust lines coming from the canister. The exhaust air was then vented to the stack which also included a HEPA filter. Air being released up the stack was monitored by a radiation monitor (PRM-2). During the loading of the first canister, no alarms were received on the stack radiation monitoring system.

Documents Reviewed: HPP 1135-665 "MPC Sample System Attachment to the MPC," Rev 2

Category: Radiological **Topic:** Fuel Building Ventilation System

Reference: FSAR 50-344 Sect 5.2.3

Requirement The fuel and auxiliary building ventilation system provides a means of ventilating the fuel and auxiliary buildings and maintaining a negative atmosphere. A list of components of the system are provided in Sect 5.2.3.2. The system is monitored by PRM-2.

Finding: The ventilation system for the auxiliary and fuel building were fully operational. The components listed in the Part 50 FSAR were part of the system. Radiation monitor PRM-2 was operational and calibrated. The plant ventilation system HEPA filters and PRM-2 were checked and documented as operational on the daily shift check sheet. The control room operator demonstrated how the ventilation system and radiation monitor was checked for operability from the control room panel. Testing of the alarm panel was last completed on December 2, 2002, to verify that a failure of the ventilation system or radiation alarms would trigger an alarm in the control room panel. Records of checks, verification sign-offs and calibrations related to the ventilation system and radiation monitor were maintained by the control room operator.

Documents Reviewed: FHP 50-08 "MPC Return to Pool and Unloading Procedure," Rev 1

Category: Radiological **Topic:** Liquid Waste Collection

Reference: FSAR 72-17 Sect 5.1.1.2

Requirement The decontamination and assembly station on the 93-foot fuel building level will be curbed and sealed to collect drainage and rinse water and liquid waste will be routed to the plant liquid radwaste system.

Finding: The decontamination and assembly station area was curbed and sealed to collect water during decontamination efforts of the transfer cask. Water collected was returned to the spent fuel pool. Two large poly tanks were positioned near the decontamination and assembly station area for collecting any waste water removed from the canister. Water from these tanks could be routed to a liquid radwaste cleanup system.

Documents Reviewed: (a) FHP 50-03 "Loading and Unloading Concrete Cask Into Storage," Rev 1 (b) HPP 1135-670 "Water Pump down Procedure for MPC-24E/EF"

Category: Radiological **Topic:** Neutron Spectrum

Reference: FSAR 72-12 Table 7.2-3

Requirement Table 7.2-3 provides the neutron spectrum from the fuel region. Section 7.2.1.2 discusses the neutron sources (isotopes) in the spent fuel. Section 7.2.1.6 discusses the Trojan start-up sources of Cf-252 and antimony-beryllium.

Finding: Neutron energy spectrums predicted by the FSAR for the spent fuel and the startup sources were evaluated by Trojan to verify that energy calibration for the neutron detection equipment to be used during cask loading was appropriate and survey instruments would respond properly. The licensee used an Eberline Model PNR-4 for conducting neutron surveys. According to an evaluation completed by Trojan, the PNR-4 was determined adequate for measuring any high energy or moderated neutron radiation encountered from the ISFSI operations. The radiation protection equipment calibration records were reviewed for the Eberline Model PNR-4s at Trojan. The PNR-4s were calibrated quarterly in-house using an Am-Be neutron source. The calibrations were performed in accordance with Procedure RPP 006. Neutron surveys were periodically performed around the loaded transfer cask during the loading of the first cask. Surveys found very low levels of neutron doses in the work areas.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RPP 006 "Portable Neutron Rem Counter Model PNR-4"

Category: Radiological **Topic:** Personnel Contamination Control

Reference: FSAR 72-17 Sect 7.5.3.2.4

Requirement Surveys for contamination at the concrete cask air inlets and outlets are routinely performed to confirm that contamination is not present. If contamination was discovered by a survey, protective clothing is available. Respiratory protective equipment is available if by evaluation it was determined that use of respiratory equipment would result in exposures that are ALARA.

Finding: Requirements for routine contamination surveys of the cask inlets and outlets were incorporated into Procedure RP 114. Personnel protective clothing was readily available onsite. Site access training included training on the use of protective clothing and personnel were familiar with the process to suit-up and to properly remove protective clothing. An active respiratory protection program was being maintained. Individuals assigned to the long term operations of the ISFSI had been initially trained and were meeting annual refresher training requirements to include fit testing and physical examinations. Selected training records were reviewed to verify that individuals assigned to support ISFSI activities met the licensee's respiratory protection program requirements for wearing respirators. All respiratory maintenance was performed onsite. This included any cleaning, surveying and decontaminating of the equipment.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RPMP 7 "Instructions for Respirator Issue and Use," Rev 8

Category: Radiological **Topic:** Personnel Monitoring

Reference: FSAR 72-17 Sect 7.5.3.2.6

Requirement Thermoluminescent dosimeters (TLDs) are worn by personnel within the radiological controlled area (RCA) when radiation levels are greater than 0.25 mrem/hr and as required by applicable Radiation Work Permits (RWPs).

Finding: TLDs and digital alarming dosimeters (DADs) were required for entry into radiologically controlled areas. These requirements were incorporated into applicable radiation work permits (RWP). All ISFSI personnel were issued thermoluminescent dosimetry approved by the national voluntary laboratory accreditation program (NVLAP) capable of monitoring beta, gamma and neutron dose. A DAD was also worn by each ISFSI worker to track exposure on a real time basis and to alarm in the event dose rates were encountered exceeding the RWP alarm points. Requirements for ring badges were specified in applicable RWPs. Neutron doses of individuals entering areas where neutron exposure could occur were tracked on the neutron dose tracking sheet. Radiological exposures were maintained on the plants radiological management system (RIM) data base. During the first cask loading, all personnel involved with the cask loading operations were wearing NVLAP approved thermoluminescent dosimetry capable of monitoring beta, gamma and neutron dose and a DAD. Interviews with health physics staff and craft personnel verified they were knowledgeable of the specific areas around the transfer cask where the potential existed for radiological problems or high dose rates.

Documents Reviewed: (a) RPP 205 "Dosimetry Records and Reports," Rev 1 (b) RPP 200 "External Dosimetry," Rev 4 (c) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (d) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities"

Category: Radiological **Topic:** Quarterly Surveys of the ISFSI

Reference: FSAR 72-17 Sect 7.5.3.2.5

Requirement Quarterly surveys are performed in the accessible areas of the ISFSI and will consist of contamination surveys and external radiation measurements.

Finding: The requirement to conduct quarterly surveys of the ISFSI, including both contamination surveys and radiological surveys, was incorporated into Procedure RPP 114. After the Part 50 license is terminated, the quarterly survey program will be contracted to an outside service.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RP-ISFSI-13 "Concrete Cask Limits"

Category: Radiological **Topic:** Radiation Protection Facilities

Reference: FSAR 72-17 Sect 7.5.2.3

Requirement Due to minimal radiological hazards introduced by ISFSI operations, the ISFSI will not have radiation protection facilities onsite. Decontamination services, bioassay services, protective clothing, respirators and additional instrumentation are available, if required.

Finding: Decontamination services, bioassay services, protective clothing and additional instrumentation were currently available for ISFSI operations as part of the Part 50 decommissioning program. Once decommissioning is completed at the site, offsite contracts for these services will be established. The contracts will be administered by the ISFSI Manager.

Documents Reviewed: PGE 1072 "Certified ISFSI Specialist Training Program"

Category: Radiological **Topic:** Radiological Records and Reports

Reference: FSAR 72-17 Sect 9.3.1

Requirement PGE will maintain records of the radiation protection program, surveys, and individual monitoring results as well as records that show compliance with the dose limits for individual members of the public. PGE will submit reports of individual monitoring as required by 10 CFR 19 and 10 CFR 20.

Finding: Procedures TPP 1815, TPP 18-4, RPP 400 and RPP 114 listed required records that would be maintained for the ISFSI. The listings included records and reports related to the radiation protection program, surveys and individual monitoring results, as well as records that show compliance with the dose limits for individual members of the public. The ISFSI Manager was responsible for ensuring the required documentation was completed and maintained.

Documents Reviewed: (a) TPP 1815 "Attachment 1 & 9: Determining Reportability of Condition on Events Matrix" (b) TPP 18-4, "Quality Assurance Records Management Program," Rev 5 (c) RPP 400 "Annual Radioactive Effluent Release Report Preparation Guide," Rev. 3 (d) RPP 114 "Radiological Protection Routine Schedule," Rev. 67

Category: Radiological **Topic:** Sampling Internal Atmosphere During Unloading

Reference: FSAR 72-17 Section 5.1.1.3

Requirement If it is necessary to unload a canister, a sample of the canister internal atmosphere is obtained by connecting a sample rig and opening the installed vent connection valve.

Finding: Unloading a canister is performed using Procedure FHP 50-08. Procedure FHP 50-08 included a requirement to collect a sample of the atmosphere inside the canister for analysis to determine the radiological concentration of the gases. Procedure HPP 1135-665 described the sampling process for collecting the gas sample. Gases vented from the canister would pass through a coil of tubing immersed in ice water before running through a particulate filter on the gas sample rig. The gases pass through a marinelli canister for collection. The gases are then directed to a drain manifold which is vented through a local HEPA filter, then to the Aux/Fuel building ventilation system.

Documents Reviewed: (a) RPP 143 "Postings of Radiologically Controlled Areas," Rev 10 (b) HPP 1135-665 "MPC Sample System," Rev 2 (c) FHP 50-08 "MPC Return to Pool and Unload Procedure," Rev 1

Category: Radiological **Topic:** Shielding Tests

Reference: FSAR 72-17 Sect 9.2.2

Requirement Material used specifically for shielding will be tested for shielding effectiveness.

Finding: The shielding tests for the transfer cask were performed and documented at the manufacture.

Documents Reviewed: No documents included in review

Category: Radiological **Topic:** Temporary Shielding

Reference: FSAR 72-17 Sect 7.1.3 & 7.5.3.2.1

Requirement Radiation protection procedures provide for evaluation of the use of temporary shielding for activities involving high dose rates.

Finding: The licensee had incorporated into procedures and radiation work permits for the use of temporary shielding for ISFSI activities involving high dose rates. Temporary shielding included lead shot annulus shields and paraffin shields. Procedure FHP 50-03, Step 5.9.1 included directions to use temporary shielding during welding operations to ensure doses were consistent with FSAR Table 7.4-3. The lead shielding was effectively used during the loading of the first canister and resulted in very low dose rates around the work areas.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask into Storage," Rev 1 (b) RWP 200221 "Facilities Preparation Related to FHP 50-30 Activities," Sections 5.2.14 thru 5.2.17 (c) RWP 200222 "Movement of Transfer Cask To/From Cask Load Pit"

Category: Radiological **Topic:** Work Planning in Rad Controlled Areas

Reference: FSAR 72-17 Sect 7.5.3.2.7

Requirement Work in radiologically controlled areas (RCAs) is planned prior to performance. Consideration is given to dosimeter, personnel protective equipment, monitoring requirements, and special cautions pertinent to the work. The planning also considers the maximum radiation levels that will be encountered.

Finding: The licensee provided for radiological controls of work activities through the use of radiation work permits (RWP). The RWPs were developed to cover specific work activities associated with the ISFSI project. The RWPs required workers to receive job specific ALARA briefings prior to entering the radiologically controlled area to perform work. The RWPs contained specific information related to expected dose rates. Trojan had estimated doses for the various activities during fuel loading for each of the work groups including craft, engineering, labor and health physics support. These estimates were the basis for the exposure limits incorporated into the RWPs. Several RWPs were reviewed during the pre-operational inspection. The RWPs were found to include reasonable dose estimates for the various types of work covered under the RWP. During the first cask loading, the licensee established good radiological controls around the spent fuel pool and cask work areas by implementing the RWPs. The workers were provided specific pre-job ALARA briefings prior to entering the radiologically controlled area. High radiation areas as defined in 10 CFR Part 20 were identified and access was controlled in accordance with 10 CFR 20.1601. The loaded transfer cask was barricaded and conspicuously posted as a radiation area. Entrance into this area around the loaded transfer cask was effectively controlled by the radiation protection technicians. Radiation levels encountered for the first cask were low when measurements were made after the cask was removed from the spent fuel pool. This cask had a 4.1 kW heat load. The dose rates on the lid ranged from 5 mR/hr to 50 mR/hr on contact, averaging 10 mR/hr. Dose rates around the side of the transfer cask were 0.6 mR/hr. No neutron radiation was detected. On top of the canister, the gap between the canister and the transfer cask was reading 30 mR/hr without the lead snake installed. When the led snake was placed in the gap, dose rates dropped to 0.5 mR/hr. The highest dose rate was 180 mR/hr contact with one of the bolt holes in the lid.

Documents Reviewed: (a) RPP 114 "Radiological Protection Routine Schedule," Rev 67 (b) RWP 200220 "ISFSI Facilities Preparation" (c) RWP 200221 "ISFSI Facilities Preparation Related to FHP 50-30 Activities"

Category: Records **Topic:** Administrative Procedures

Reference: FSAR 72-17 Sect 9.4.2

Requirement Administrative procedures will be established and maintained to ensure quality assurance records are identifiable and retrievable. In addition to QA records, the following will be maintained in accordance with 72.174: 1) operating records including maintenance & modifications, 2) off-normal occurrences, 3) radioactive releases, 4) environmental surveys, 5) personnel training and qualifications, 6) 72.48 design changes, 7) receipt, inventory, disposal, acquisition and transfer of spent fuel per 72.72(a) and 8) material control and inventory records per 72.72. Storage of the above records will be in accordance with the Trojan QA program (PGE-8010).

Finding: Procedure TPP 18-4 established the requirement to maintain certain ISFSI related records as quality assurance records maintained in accordance with the Trojan quality assurance program. Procedure TPP 18-4, Attachment 2 "Determination and Protection of ISFSI Related Records," included a list of the required records to be maintained. The list in Attachment 2 was consistent with the list in FSAR Section 9.4.2. As required in 10 CFR 72.72, Procedure TPP 18-4 also established the requirement for the records to be kept in duplicate in an alternate location.

Documents Reviewed: (a) TPP 18-4 "Trojan QA Records Management Program," Rev 5 (b) Records Coordination Manual (RCM) (c) Plant Support Manual, Volume 4: Plant Support Procedures

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Category: Records **Topic:** Design Changes

Reference: 10 CFR 72.48

Requirement Records of changes shall be maintained for the facility or storage cask design, procedures, and of tests and experiments . These records must include a written evaluation which provides the bases for the determination that the change does not require a license of CoC amendment. The licensee shall submit a report to the Commission containing a brief description of any changes, tests and experiments, including a summary of the evaluation of each at intervals not to exceed 24 months. The records of facility or design changes shall be maintained until spent fuel is no longer stored onsite or the license is terminated. Records of changes in procedures, tests and experiments shall be maintained for a period of 5 years.

Finding: Procedure TPP 18-1 established the requirement for conducting written evaluations of the changes made to the ISFSI program to provide a basis for the determination that a change did not require a license amendment. Procedures TPP 18-4 and TPP 18-15 established record retention requirements and reporting requirements for these records consistent with 10 CFR 72.48 requirements. Procedure TPP 18-4, Attachment 2 listed the records generated for the 10 CFR 72.48 facility change evaluations of the ISFSI as records required to be retained for the duration of the ISFSI license. Attachment 2 identified records related to ISFSI procedure changes performed under 10 CFR 72.48 as records required to be retained for 5 years. Procedure TPP 18-15, Steps 2.1 and 4.5 established a "Required Reports List" which provided a complete list of all reporting requirements applying to Trojan. Requirements for the 24 month report describing changes, tests and experiments for the ISFSI was listed on page 6 of the Required Reports List.

Documents Reviewed: (a) TPP 18-1 "10CFR50.59, 10CFR72.48, and Other Regulatory Evaluation," Rev 17 (b) TPP 18-4 "Trojan Quality Assurance Records Management Program," Rev 5 (c) TPP 18-15 "Determining Reportability of Events and Conditions," Rev 12 d) Required Reports List

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Category: Records **Topic:** Material Inventory and Records Requirements

Reference: 10 CFR 72.72

Requirement The licensee shall establish written material control and accounting procedures to account for material in storage. The licensee shall keep records of inventory, disposal and transfer of all special material in quantities as specified in 74.13(a)(1). The records must be kept in duplicate in a separated location sufficiently remote from the original records that a single event would not destroy both sets of records. Records must include as a minimum, the estimated quantity of radioactive material per item, identification and seal number, and storage location. Inventory must be conducted at intervals not to exceed 12 months.

Finding: Procedure TIP 11 included the 10 CFR 72.72 requirements for material inventory and records. Records for the past 3 years were reviewed. The records listed the inventory for each 12 month interval and included the estimated quantity of radioactive material per item, identification and seal number, and location. Procedure TIP 11 also required duplicate records to be maintained at a separate location.

Documents Reviewed: (a) TIP 11 "Control and Accounting of Spent Nuclear Fuel in ISFSI Storage," Rev 2 (b) Material inventory records for the past 3 years

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Category: Records **Topic:** Material Status Reports

Reference: 10 CFR 72.76

Requirement The licensee shall submit to the NRC a material status report in accordance with the instructions in NUREG/BR-0007 and NMSS Report D-24. The reports must be completed by March 31 and September 31 of each year and filed within 30 days to the NRC.

Finding: For the past three years, Trojan had submitted the required material status reports to the NRC, in accordance with the required dates in 10 CFR 72.76. Records reviewed included submittals to the NRC on October 17, 2002, April 24, 2002, October 10, 2001, April 23, 2001, October 11, 2000, and April 12, 2000.

Documents Reviewed: Spent Nuclear Material (SNM) Status Reports for the past 3 years

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Category: Records **Topic:** Other Records and Reports

Reference: 10 CFR 72.80

Requirement Each licensee shall furnish a copy of its annual financial report, including the certified financial statements, to the Commission. Section 72.80(g) requires the licensee to notify the NRC within 90 days prior to the first storage of spent fuel.

Finding: The licensee submitted their annual financial reports to the NRC on September 25, 2002 and August 8, 2001. The licensee submitted the required 90-day notice to load fuel on July 31, 2002. Fuel load did not begin until December 2002.

Documents Reviewed: (a) Financial Reports for to the NRC on September 25, 2002 and August 8, 2001 (b) PGE Letter to NRC entitled "90-Day Notification of Readiness to Begin Operation," dated July 31, 2002

Category: Records **Topic:** SAR Updates

Reference: 10 CFR 72.70 (a) & (c)(6)

Requirement The licensee shall update periodically, the FSAR report to assure that the information included in the report contains the latest information developed. The updates shall be filed every 24 months from the date of the issuance of the license.

Finding: Procedure TPP 18-2 established the requirement for updating information in the FSAR including the 24 month requirement. The licensee had created a database of required reports to facilitate updates to the FSAR.

Documents Reviewed: TPP 18-2 "Operating License, ISFSI License, and Licensing Document Revisions," Rev 8

Category: Safety Reviews **Topic:** Helium Flow Meter Calibration Error

Reference: Holtec SNR #51

Requirement Procedure HPP 1135-610 required the helium flow meters used for the backfilling of helium into the canister prior to sealing to be calibrated. During preparations for the pre-operational tests, a calibrated flow meter indicated incorrect total flow.

Finding: Problems were recognized during the preparations for the NRC observed pre-operational test with the calibration of the Aalborg flow meters used to measure the amount of helium backfilled into the canisters after drying. The flow meters were re-calibrated and worked properly during the subsequent tests. The problem was recognized when Holtec conducted a validation test of a flow meter by connecting the flow meter to five bottles of helium with the intent to measure approximately 700-800 cubic feet of flow through the meter. The 700-800 cubic feet of helium was the approximate amount to be backfilled into the canisters based on Procedure HPP 1135-610, Exhibit 7.3 "MPC Helium Backfill Requirements." Since each helium bottle contained approximately 260 cubic feet of gas, the five bottles would provide 1300 cubic feet for the test. However, the bottles ran dry and the flow meter only recorded 587 cubic feet of gas. Holtec issued Site Nonconformance Report SNR #51 on December 30, 2002. The flow meter was returned to the manufacturer, who identified that the electronic calibration factor for the flow meter was incorrectly set for helium. The manufacturer reset the electronic calibration, checked the instrument for proper operations and returned the flow meter to Trojan. The flow meter was then sent to the calibration lab used by Holtec and re-calibrated. Upon return to the Trojan site, the flow meter was connected to a bottle of helium certified at 261 cubic feet. After emptying the bottle through the flow meter, the reading was 266 cubic feet, which was within the error values for the test. The other three flow meters maintained onsite were also re-calibrated. Holtec subsequently issued a 10 CFR Part 21 notification on March 6, 2003 related to the calibration problem with the Aalborg flow meters.

Documents Reviewed: (a) Site Nonconformance Report #51 "Helium Flow Meter and Totalizer Calibration," dated December 30, 2002 (b) HPP 1135-610 "Trojan ISFSI Completion Project Vacuum Drying and Backfill Operating Procedures," Rev 3

Category: Safety Reviews **Topic:** Independent Review and Audit Committee

Reference: FSAR 72-17 Sect 9.1.1.1.2

Requirement The Independent Review and Audit Committee is responsible for advising the Trojan Site Executive on matters relating to safe storage of spent fuel. This function is independent of the operations and maintenance organization. The committee is composed of five members and alternates designated in writing by the Site Executive. The committee has collective experience and knowledge in fuel handling and storage, chemistry/radiochemistry, engineering, radiation protection, and QA.

Finding: The Independent Safety Review Committee at Trojan was described in Procedure TPP 10-8. The safety review committee was composed of five active members, designated in writing by the site executive, including the chairman. There were two designated alternates as well as a designated alternate chairman (the vice chairman). The current chairman was the Quality Assurance Manager who did not have any direct responsibility for operation or maintenance of the ISFSI. Resumes of the safety review committee members demonstrated their collective experience in the areas of irradiated fuel handling and storage, chemistry and radiochemistry, radiation protection, engineering, and quality assurance. This was consistent with the required areas of expertise described in the FSAR. The safety review committee charter established annual meetings. The last safety review committee meeting was held December 16, 2002. A sampling of the meeting minutes for the prior two year period was reviewed to verify committee involvement with plant issues. The types of information reviewed and discussed by the committee were pertinent to ISFSI operations.

Documents Reviewed: (a) TPP 10-8 "Independent Review and Audit Committee and ISFSI Safety Review Committee Charter," Rev 9 (b) Memo from S. Quennoz "Joint Independent Review and Audit Committee (IRAC) and ISFSI Safety Review Committee (ISRC) Membership - to include Membership Qualifications" (c) Memo from S. Quennoz "Formation of ISFSI Review Committee," dated January 04, 2000 (d) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2002-03" (e) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2002-14" (f) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2002-15" (g) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2001-03" (h) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2001-12" (i) Memo from J. D. Westvold to S Quennoz "Minutes of IRAC/ISRC Meeting No. 2001-01"

Category: Safety Reviews **Topic:** Nitrogen (heated) for Drying Canister

Reference: Trojan Evaluation 2003-03

Requirement Proposed change to the Trojan FSAR would allow the use of pre-heated nitrogen for recirculation through the canister to expedite the drying process.

Finding: Trojan and Holtec had evaluated the use of pre-heated nitrogen for recirculation through a loaded canister to expedite the drying process, particularly for low kW casks. The analysis had determined that the process would be an acceptable means of reducing the drying time for the canister and would not adversely effect the canister or it's contents. Trojan had identified changes for incorporation in the next revision to the FSAR that would be made to incorporate the nitrogen drying process. Holtec issued Position Paper DS-275 concerning the use of nitrogen in the canisters. The Holtec analysis reviewed the issue of potential acid formation due to the use of nitrogen and determined that the potential for an adverse impact on the cask and spent fuel was minimal. A copy of the safety evaluation performed by Trojan and the Holtec Position Paper DS-275 document was forwarded to NRC Spent Fuel Project Office (SFPO) for evaluation. SFPO performed an independent evaluation, including review of the potential thermal aspects as well as the potential for development of nitric acid, including the effects of the nitric acid on the canister welds. It was determined that it would take several days for even a small amount of nitric acid to develop. The small amount of mild nitric acid that could develop would have minimal adverse effects on the canister or the fuel cladding.

Documents Reviewed: (a) "Screening Checklist for the Use of Nitrogen in MPC Loading Operations," dated January 30, 2003 (b) Holtec Position Paper DS-275 "Use of Nitrogen in MPC Loading Operations at Trojan," Rev 1 (c) Meeting Minutes No. 2003-12 of the Independent Review and Audit Committee and ISFSI Safety Review Committee, dated January 30, 2003

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Category:	Safety Reviews **Topic:** Ultrasonic Testing Not Performed
Reference:	Trojan CAR C02-0018
Requirement	Material for the canister confinement boundary components/material are to be procured in accordance with ASME Section III, Subsection NB-2000. Holtec purchased ISFSI containment boundary material under Purchase Orders 904E7 and 1022U1 as ASME Section III, NG rather than NB. The NG material did not receive the required ultrasonic testing.
Finding:	CAR 02-0018 documented the purchase of ISFSI containment boundary material for several canisters under purchase order 904E7 and 1022U1 as ASME Section III, NG rather than NB. Ultrasonic testing is not required for material purchased as NG material. The issue was discovered by Trojan during the receipt inspection process and affected a number of Trojan's closure rings, plates for the top of the canister and cover plates. These components were confinement boundary components/material and were required by Holtec purchase specification PS-101 to be purchased as NG components and thereby ultrasonically tested. Trojan placed hold tags on the affected components and notified Holtec, who in turn notified other potentially affected users. U.S. Tool and Die came to Trojan and performed the required ultrasonic tests. No problems were found during the testing. CAR 02-0018 was closed September 23, 2002.
Documents Reviewed:	CAR 02-0018 "Containment Boundary Material Purchased as ASME Section III NG Rather than NB," dated August 8, 2002

Category:	Security **Topic:** Access Controls
Reference:	10 CFR 73.51 (d)(7)
Requirement	A personnel identification system and a controlled lock system must be established and maintained to limit access to authorized individuals.
Finding:	Access controls, including a personnel identification system and a controlled lock system, had been established for the ISFSI utilizing Procedures SPIP 02 and SOI 2. Individuals, including ISFSI specialists granted unescorted access to the ISFSI and central alarm station protected areas, were required to undergo security screening prior to access being granted. Access to the protected area was controlled to ensure that only authorized personnel, vehicles and materials were allowed in. Entry was based on a need for access and required approval by the ISFSI Manager or designee. Personnel having a need to enter the ISFSI protected area, but not authorized unescorted access, would be escorted while in the protected area. Keys, padlocks, and combinations used to control access into the protected area were issued only to authorized personnel. Key logs were maintained indicating to whom keys were issued and the date and time of issue and return. Security keys to the ISFSI protected area were only issued to security personnel. A review was performed of the lock and key procedures and records. Lock and key inventories were found to be current. Records indicated that locks and keys had been rotated annually or changed when employees, who had access to the security keys and locks, were terminated.
Documents Reviewed:	(a) SPIP 02 "Security Screening for Access Authorization," Rev 1 (b) SOI 2 Roving Patrol/Key Control/Secondary Alarm Station/ISFSI Protected Area (PA) Access Control, Rev 4

Category: Security **Topic:** Changes to the Security Program

Reference: 10 CFR 72.186 (b)

Requirement The licensee shall maintain records of changes to the physical security plan, guard training plan or the first four categories of information contained in the safeguards contingency plan for a period of three years from the date of the change.

Finding: Records of changes to the ISFSI security plan for the past three years were reviewed against the requirements of NUREG 1619. Documentation of the changes was readily available. A review of changes incorporated into Revision 1 and Revision 2 of the ISFSI Security Plan were found to be consistent with the regulatory requirements of 10 CFR 73.51 and the guidance in NUREG 1619. When required, changes had been submitted to the NRC for review and comment. None of the changes reduced the overall effectiveness of the plan, the performance of the security systems or security force or adversely impacted public health and safety.

Documents Reviewed: (a) "Licensing Document Change Request ,"Rev 1, dated January 8, 1999 (b) Licensing Document Change Request Rev 2, dated October 30, 2002 (c) NUREG-1619 "Standard Review Plan for Physical Protection Plan for the Independent Storage of Spent Fuel and High Level Radioactive Waste," dated July 1998

Category: Security **Topic:** Communications System

Reference: 10 CFR 73.51 (d)(8)

Requirement Redundant communications capability must be provided between onsite security force members and designated response force or LLEA.

Finding: The central alarm station was equipped with redundant communications capable of communicating with onsite security force members and Local Law Enforcement Agencies (LLEA). A review of randomly selected daily activity reports confirmed that communication checks with security force members and LLEA were conducted at least daily.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SOI 107 "Alarm Station Operator," Rev 33 (c) Daily Activity Report Documentation of Radio Checks

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Category: Security **Topic:** Compensatory Measures

Reference: 10 CFR 73.51 (d)(11)

Requirement Timely compensatory measures must be taken after discovery of inoperability of a detection system to ensure the effectiveness of the security system is not reduced.

Finding: The ISFSI Security Plan included provisions for compensatory measures for total or partial failure of the security system for the ISFSI and central alarm station protected areas. Effectively compensatory measures had been identified for each failure including when maintenance and repairs on security equipment shall be accomplished. Adequate provisions for deployment of the compensatory measures had been established.

Documents Reviewed: PGE 1073 "Trojan ISFSI Security Plan," Rev 2

Category: Security **Topic:** Detection Systems

Reference: 10 CFR 73.51 (d)(11)

Requirement All detection systems and supporting subsystems must be tamper indicating and line supervision.

Finding: The ISFSI Security Plan had established a commitment for the testing of tamper switches installed on detection systems and equipment. The tamper switch test records for the year 2002 were reviewed. Required testing had been conducted and documentation was current and correct.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) Tamper Test Records for the Year 2002

Category: Security **Topic:** Local Law Enforcement Agency

Reference: 10 CFR 73.51 (d)(6)

Requirement Documented liaison with a designated response force or local law enforcement agency (LLEA) must be established to permit timely response to unauthorized penetration or activity.

Finding: Coordination with the Columbia County Sheriff Department had been established and documented in a letter of agreement. The letter of agreement specified the response time and number of armed responders available to respond to the ISFSI. The offsite response capabilities met the requirements of the security plan. Selected records of daily communication checks were reviewed and found to document that required communications were being completed. In addition to a primary communications capability, the central alarm station had two additional backup means of communicating with the sheriff's department.

Documents Reviewed: Letter of Agreement between Trojan ISFSI Facility and the Columbia County Sheriff, dated May 22, 2002

Category: Security **Topic:** On-site Transport of Spent Fuel

Reference: 10 CFR 72.180

Requirement The physical protection plans must describe how the licensee will provide physical protection during on-site transportation to and from the proposed ISFSI.

Finding: Specific plans and procedures for the protection of spent fuel during movement between the fuel building and the ISFSI had been established. This was confirmed through interviews with selected members of the security force and review of licensee documents. Escort requirements was outlined in Procedure SOI 4. Security escort was required from the time the cask left the fuel building until it entered the ISFSI. Procedures were in place to limit vehicle traffic near the fuel movement route by controlling access to plant roadways at specific locations manned by security personnel. An appropriate number of security force personnel had been committed to accompany the spent fuel during movement.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Appendix B, Rev 2 (b) SOI 4 "Security of Cask Transportation," Rev 3

Category: <u>Security</u> **Topic:** <u>Physical Protection Design</u>

Reference: 10 CFR 72.182

Requirement The design for the physical protection must show the site layout and the design features provided to protect the ISFSI from sabotage. It must include a) the design criteria for the physical protection of the proposed ISFSI b) the design basis and the relation of the design bases to the design criteria, and c) information related to materials of construction, equipment, general arrangement and proposed QA program sufficient to provide reasonable assurance that the final security system will conform to the design basis.

Finding: The ISFSI Security Plan contained a description of the physical protection systems that were installed around the ISFSI and central alarm station protected areas. The systems consisted of closed circuit television cameras, monitors, microwave, video intrusion detection and an uninterruptible power source. On December 17, 2002 the inspector, accompanied by two members of the security force, verified by observation and testing that the systems installed conformed to the design basis. All systems performed as required.

Documents Reviewed: PGE 1073 "Trojan ISFSI Security Plan," Rev 2

Category: <u>Security</u> **Topic:** <u>Protected Area</u>

Reference: 10 CFR 73.51 (d)(1)

Requirement Spent nuclear fuel must be stored within a protected area so that access to this material requires passage through two physical barriers, one at the perimeter of the protected area and one offering substantial penetration resistance. The physical barrier at the perimeter of the protected area must be as defined in 73.2. Isolation zones, typically 20 feet wide each on both sides of this barrier must be provided to facilitate assessment. The barrier offering substantial resistance can be the storage cask or a building wall.

Finding: Access to the spent fuel required passing through three security barriers that met the requirements in 10 CFR 73.2. The protected area fence was topped with barbed wire and had an overall height of not less than 8 feet. The bottom of the fence fabric had been stabilized. There were no openings that would allow an individual to gain undetected access. Interior and exterior isolation zones of at least 20 feet were provided on both sides of the protected area fence. The inspector and two security personnel walked the isolation zones on December 17, 2002, and verified that there were no obstructions that could affect assessment.

Documents Reviewed: PGE 1073 "Trojan ISFSI Physical Security Plan," Rev 2

Category: <u>Security</u> **Topic:** <u>Protected Area Illumination</u>

Reference: 10 CFR 73.51 (d)(2)

Requirement Illumination must be sufficient to permit adequate assessment of unauthorized penetrations of or activities within the protected area.

Finding: During the hours of darkness on the morning of December 17, 2002, an inspection was conducted of the exterior and interior isolation zones and exterior areas within the protected area using cameras and monitors located in the central alarm station. Based on observations during the inspection, it was determined that there was a sufficient level of illumination to adequately assess unauthorized penetrations or activities within the protected area.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SOI 2 "Roving Patrol/Key Control/Secondary Alarm Station/ISFSI Protected Area (PA) Access Control," Rev 4

Category: Security **Topic:** Protected Area Patrols

Reference: 10 CFR 73.51 (b)(4)

Requirement The protected area must be monitored by daily random patrols.

Finding: It was determined, through reviews of records of protected area patrols and security officers interviews, that the ISFSI and central alarm station protected areas were patrolled/inspected in accordance with the ISFSI Security Plan and Procedure SOI 2. Patrols were random and not always conducted by the same security officer during the working shift.

Documents Reviewed: SOI 2 "Roving Patrol/Key Control/Secondary Alarm Station/ISFSI Protected Area (PA) Access Control," Rev 4

Category: Security **Topic:** Protected Area Surveillance/Alarms

Reference: 10 CFR 73.51 (d)(3)

Requirement The perimeter of the protected area must be subject to continual surveillance and be protected by an active intrusion alarm system capable of detecting penetrations through the isolation zone.

Finding: Closed circuit television (CCTV) coverage and an intrusion detection system that met the requirements of 10 CFR 73.2 and capable of detecting intrusions through the isolation zone were installed and operable at the ISFSI. Functional tests of central alarm station protected area zones was observed. All alarms annunciated in a continuously manned alarmed station as required.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SOI 5 "Central Alarm Station (CAS) Protected Area (PA) Search and Access Requirements," Rev 2 (c) SOI 107 "Alarm Station Operator," Rev 33

Category: Security **Topic:** Response Procedures

Reference: 10 CFR 73.51 (b)(10)

Requirement Written response procedures must be established and maintained for addressing unauthorized penetration of, or activities within, the protected area including Category 5 "Procedures" of Appendix C to Part 73.

Finding: Written response procedures had been developed and issued as SPIP 03 to address unauthorized penetrations and activities within the protected area. The procedure included the requirements from Category 5 of Appendix C to Part 73. The procedure described the security response actions required for the safeguards contingency events identified in the ISFSI Security Plan, Section 1.9. The systems and response actions incorporated in SPIP 03 would provide an effective response to events which could present a threat to the ISFSI.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SPIP 03 "Security Contingency Procedure," Rev 1

Category: Security **Topic:** Safeguards Contingency Plan

Reference: 10 CFR 72.184 (a)

Requirement The requirements of the licensee's safeguards contingency plan must be as defined in Appendix C to Part 73. This plan must include: background, generic planning basis, licensee planning basis.

Finding: The Safeguards Contingency Plan was reviewed and found to meet the requirements in Appendix C to Part 73. Discussions were held with security supervision concerning implementation of the plan. The plan included background information, generic planning basis, licensee planning basis, scope, response capabilities, events and objectives, and responsibilities.

Documents Reviewed: PGE 1073 "Trojan ISFSI Security Plan," Rev 2

Category: Security **Topic:** Safeguards Contingency Procedures

Reference: 10 CFR 72.184 (b)

Requirement The licensee shall prepare and maintain safeguards contingency procedures in accordance with Appendix C of Part 73 for effecting the actions and decisions contained in the responsibility matrix.

Finding: Security contingency procedures had been developed and issued as SPIP 03. The procedure was developed in accordance with Appendix C of Part 73 and included provisions for an effective and prompt response to a threat at the ISFSI. The procedure also addressed security force responses to natural disasters such as fire and or hazardous materials events.

Documents Reviewed: SPIP 03 "Security Contingency Procedure," Rev 1

Category: Security **Topic:** Searches

Reference: 10 CFR 73.51 (d)(9)

Requirement All individuals, vehicles, and hand carried packages entering the protected area must be checked for proper authorization and visually searched for explosives before entry.

Finding: Procedure SOI 2 provided instructions for conducting searches prior to entry into the ISFSI protected area. Protected area access was controlled to ensure only authorized personnel entered based on need to access the facility and approval by the ISFSI Manager or designee. Authorization for access was verified by picture ID and confirmation of the individuals name on the ISFSI Manager's access control list. The search procedure required all individuals, vehicles and hand carried packages entering the protected area to be properly authorized and visually searched for explosives prior to entry. Actual personnel searches were observed on several occasions during this inspection.

Documents Reviewed: SOI 2 "Roving Patrol/Key Control/Secondary Alarm Station/ISFSI Protected Area (PA) Access Control," Rev 4

Category: Security **Topic:** Security Alarm Station

Reference: 10 CFR 73.51 (d)(3)

Requirement The intrusion alarm system for the protected area shall be monitored in a continually staffed primary alarm station and in one additional continually staffed location. The primary alarm station must be located within the protected area, have bullet-resistant walls, doors, ceiling, and floor, and the interior of the station must not be visible from outside the protected area. A timely means for assessment of alarms must also be provided. Regarding alarm monitoring, the redundant location need only provide a summary of indication that an alarm has been generated.

Finding: The central alarm station (CAS) was a security controlled, stand alone protected area located within a hardened, bullet-resisting booth. The interior of the CAS could not be observed from outside the protected area. Closed circuit television (CCTV) coverage and an intrusion detection system that met the requirements of 10 CFR 73.2 were operational for monitoring the perimeter of the CAS. The CAS and secondary alarm station (SAS) were continuously manned security posts. The individual assigned to the CAS was dedicated to the security function and was assigned no other duties. A secondary alarm station with alarm annunciation capabilities was established at a separate location. Compensatory measures were established if the CAS or the SAS became inoperable.

Documents Reviewed: PGE 1073 "Trojan ISFSI Security Plan," Rev 2

Category: Security **Topic:** Security Officer Qualifications/Training

Reference: 10 CFR 73.51 (d)(5)

Requirement Members of the security organization must be trained, equipped, qualified and requalified to perform assigned job duties in accordance with Appendix B to Part 73, Sections I.A, (1)(a) and (b), B(1)(a) and applicable portions of Section II.

Finding: Trained and qualified security personnel were assigned to the ISFSI. Trojan's security training and qualification plan was included as Appendix C to the ISFSI Security Plan. Training records were reviewed for ten ISFSI security personnel to confirm that all required training in accordance with the approved training and qualification plan had been completed. Training was required every 12 months. ISFSI security personnel demonstrated good knowledge of the procedural requirements for the tasks being performing.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Training and Qualification Plan, "Appendix C, Rev 2 (b) Training records for ISFSI Security Officers.

Category: Security **Topic:** Security Organization

Reference: 10 CFR 73.51 (b)(5)

Requirement A security organization with written procedures must be established. The security organization must include sufficient personnel per shift to provide for monitoring of detection systems and the conduct of surveillances, assessment, access control, and communications to assure adequate response.

Finding: Procedures had been established to describe all aspects of security operations and response actions for the ISFSI. Examples of procedures developed included: cask transportation; alarm station operator; roving patrols; protection of safeguard material; uninterruptible power supply; key control; assessment; communications and access control. The procedures were comprehensive and covered all areas that required procedures. The staffing levels for the security shifts were evaluated to verify compliance with staffing commitments in the ISFSI Security Plan. Based on discussions with ISFSI personnel and a review of shift personnel rosters, Trojan had assigned an adequate number of security personnel to each shift to meet the numbers specified in the Physical Security Plan. All members of the security organization had a clear understanding of their duties and responsibilities. Personnel were found to be well trained and qualified on implementing the provisions of the security program.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SPIP- 01 "Security Operating Procedure," Rev 1 (c) SPIP 02 "Security Screening for Access Authorization," Rev 1 (d) SPIP 03 "Security Contingency Procedure" Rev 1 (e) SOI 2 "Roving Patrol/Key Control/Secondary Alarm Station/ISFSI Protected Area (PA) Access Control," Rev 4 (f) SOI 4 "Security of Cask Transportation," Rev 3 (g) SOI 5 "Central Alarm Station (CAS) Protected Area (PA) Search and Access Requirements," Rev 2 (h) SOI 6 "Protection of Safeguards Information," Rev 0 (i) SOI 7 "Quarterly Uninterruptible Power Supply (UPS) Test," Rev 2
(j) SOI 107 "Alarm Station Operator," Rev 33 (k) SOG-27A "Key Card Enrollment," Rev 14

Category: Security **Topic:** Security Plan

Reference: FSAR 72-17 Sect 9.7.5

Requirement The Trojan ISFSI Security Plan (PGE-1073) contains a detailed plan for security measures for physical protection of the ISFSI and complies with the requirements of 10 CFR 72, Subpart H.

Finding: Based on observations, discussions with security force members and a review of the ISFSI Security Plan and security procedures, the security measures for the Trojan ISFSI complied with the requirements specified in 10 CFR 72, Subpart H. This review included an evaluation of the following features: protected area barriers, intrusion detection system, isolation zones, closed circuit television cameras (CCTV), lighting, and search requirements for individuals, packages and vehicles entering the protected area.

Documents Reviewed: PGE 1073 "Trojan ISFSI Physical Security Plan," Rev 2

Category: Security **Topic:** Security Program Independent Review

Reference: 10 CFR 73.51 (d)(12)

Requirement The physical protection program must be reviewed once every 24 months by individuals independent of the security program. The review must include an evaluation of the effectiveness of the physical protection system and a verification of the liaison established with the LLEA.

Finding: The Trojan ISFSI Security Plan included a commitment to perform an independent audit of the physical security program every 24 months. The last audit completed was the ISFSI Readiness Audit conducted on December 4, 2002. The audit had been conducted by a team independent of the plant's ISFSI management. The audit was comprehensive and identified strengths, concerns and corrective actions taken.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) QA Audit AP-I-001, dated July 12, 2001 (c) Readiness Audit of ISFSI, SURV-02-010, dated December 4, 2002

Category: Security **Topic:** Security Record Retention Times

Reference: 10 CFR 73.51 (d)(13)

Requirement The following documentation must be retained as a record for 3 years after the record is made or until termination of the license: 1) log of individuals granted access to the protected area 2) screening records of members of the security organization 3) log of all patrols 4) record of each alarm received identifying the type of alarm, location, date and time when received, and disposition of alarm 5) physical protection program review reports.

Finding: Samples of each of the required category of records required by 10 CFR 73.51 (d)(13) were reviewed to confirm that the records were being created and retained. The ISFSI Security Plan required retention for the records until termination of the license.

Documents Reviewed: (a) SPIP 01 "Security Operating Procedure," Rev 1 (b) Key Control Logs, dated December 16, 2002 (c) ISFSI PA Sign-In Log, dated December 14, 2002 (d) Log of all Patrols Roving ISFSI, dated December 8, 2002 (e) Equipment Testing/Quarterly UPS 1st, 2nd, 3rd, and 4th quarters, 2002 (f) Daily Activity Report, Weekly Zone Testing, dated December 9, 2002 (g) PGE 1073 "Trojan ISFSI Security Plan," Rev 2

Category: Security **Topic:** Security Records

Reference: FSAR 72-17 Sect 9.4.2

Requirement Security records, including security training and qualification records, will be maintained in accordance with the Trojan ISFSI Security Plan (PGE-1073).

Finding: Provisions had been established in the ISFSI Security Plan for establishing and maintaining records. The ISFSI Security Plan identified 12 types of required records that must be maintained for a period of 3 years or more. Procedure SPIP 01 described how and when each record was required to be completed. A random selection of records related to weekly door alarms, key logs, protected area alarms, visitor forms, and ISFSI access logs were reviewed. All records were complete, current and maintained in accordance with the security plan.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) SPIP 01 Security Operating Procedure, Rev 1

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Category: Security **Topic:** Security Tests, Inspections & Audits

Reference: 10 CFR 72.180

Requirement The physical protection plan must lists tests, inspections, audits, and other means to be used to demonstrate compliance with the requirements of 73.51.

Finding: The ISFSI Security Plan established requirements for audits of the security program to be conducted every 24 months. The security plan also established a testing and maintenance program, which required that "Corrective maintenance on physical barriers shall be completed as soon as practical after failure of a component." The security plan further required repairs and maintenance on security equipment to be accomplished in accordance with PGE approved procedures. One QA audit and several testing and maintenance records on file were reviewed. Testing and maintenance support for security equipment was timely and was properly documented.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Plan," Rev 2 (b) QA Audit AP-I-001, dated July 12, 2001 (b) Readiness Audit of ISFSI, SURV-02-010, dated December 4, 2002

Category: Security **Topic:** Security Training

Reference: FSAR 72-17 Sect 9.3.1

Requirement Security training will be provided in accordance with the training and qualification requirements outlined in the Trojan ISFSI Security Plan (PGE-1073)

Finding: The ISFSI Security Plan included specific training and qualification requirements for security force personnel. Based on review of selected records and discussions with security force personnel, all ISFSI Specialists were found to be currently trained and qualified as armed security officers. ISFSI Specialists were required to pass an exercise electrocardiograph, audiogram, visual acuity, blood pressure and respirator exam. In addition, ISFSI Specialists were required to complete the tasks specified on the ISFSI training and qualification form. Selected individual records, included medical records, were reviewed and found to document the information required by the security plan.

Documents Reviewed: (a) PGE 1073 "Trojan ISFSI Security Training Plan," Rev 2 (b) Physicals for ISFSI Security Specialists

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Category: Training **Topic:** Certification for Fuel Handler & ISFSI Specialist

Reference: FSAR 72-17 Sect 9.3.1

Requirement Fuel Handlers will be certified in accordance with PGE-1057 "Certified Fuel Handler Training Program." After fuel and debris are safely transferred to the ISFSI, concrete cask handling and transfer is accomplished by Certified ISFSI Specialists trained and certified in accordance with PGE-1072 "Certified ISFSI Specialist Training Program."

Finding: Selected records for the certified fuel handlers were reviewed to verify required training and certification had been completed. Five individuals met the requirements as certified fuel handlers. Eight individuals met the certification requirements for certified ISFSI specialists.

Documents Reviewed: (a) ISFSI Specialists' personnel files (b) Matrix: "Certified Fuel Handler Retraining Status"

Category: Training **Topic:** ISFSI Manager Qualifications

Reference: FSAR 72-17 Table 9.1-1

Requirement The ISFSI Manager, at the time of appointment to the position, shall have a minimum of eight years of power plant experience, of which a minimum of three years shall be nuclear power plant experience. A maximum of two years of the remaining five years of power plant experience may be fulfilled by satisfactory completion of academic or related technical training on a one-for-one basis. The ISFSI Manager will be trained and certified in accordance with the Trojan Certified ISFSI Specialist Training Program (PGE-1072). In addition to the above, the ISFSI Manager will be qualified as an Independent Safety Reviewer as specified in Section 9.6.1 of the ISFSI FSAR.

Finding: The individual assigned as the Trojan ISFSI Manager met the requirements established in Table 9.1-1 of the FSAR and had the applicable prerequisites and required training. The ISFSI Manager had over eight years experience plus a bachelor's degree, including over three years of nuclear related experience. The individual selected as the ISFSI Manager was designated as such by Memorandum KJC-50-02.

Documents Reviewed: (a) Kelly Cox's personnel file (b) Memorandum KJC-50-02

Category: Training **Topic:** ISFSI Specialist Qualifications

Reference: FSAR 72-17 Table 9.1-1

Requirement ISFSI Specialists shall have a High School diploma or successfully completed the General Education Development (GED) test and two years of power plant experience of which a minimum of one year shall be nuclear power plant experience. ISFSI Specialists will be trained in accordance with the Trojan Certified ISFSI Specialist Training Program (PGE-1072) and the Trojan ISFSI Security Plan (PGE-1073).

Finding: A review of the training records for the assigned ISFSI Specialists confirmed that the required prerequisites and training requirements had been met by all individuals.

Documents Reviewed: T&Q 02 "Training and Certification of ISFSI Staff Personnel"

Category: Training **Topic:** Qualifications of ISFSI Personnel

Reference: FSAR 72-17 Sect 9.1.3

Requirement Each member of the construction and fuel loading organization shall meet or exceed the staff qualifications described in the Trojan Permanently Defueled Technical Specifications (PDTS), Section 5.3.1. PDTS Section 5.3.1 requires the staff to meet the requirements of ANSI N18.1-1971 except for the Radiation Protection Mgr which must meet Reg. Guide 1.8, Rev 2, April 1987. (Note that Section 9.1.3 of the ISFSI FSAR also requires ANSI N18.1-1971 qualifications)

Finding: The training matrix was reviewed, which listed the names of each person assigned to ISFSI activities and the status of completion for all the required training. Personnel assigned to the ISFSI activities had either completed the required training or were restricted from performing duties in areas that training was still required. Most individuals had completed the training. Completion of all required training for the remaining individuals was scheduled for completion prior to the first cask loading.

Documents Reviewed: Holtec Training Matrix

Category: Training **Topic:** Radiation Protection Training

Reference: FSAR 72-17 Sect 7.5.3.2.8

Requirement Individuals requiring unescorted access to the ISFSI receive training which includes radiological protection fundamentals. Individuals requiring access to radiological controlled areas (RCAs) will receive radiation protection training commensurate with their responsibilities in accordance with 10 CFR Part 19 "Notice, Instructions, and Reports to Workers: Inspections and Investigations."

Finding: All individuals requiring unescorted access to the ISFSI were required to completed general employee training (GET) category I and category II. A review of the training modules for category I and II GET training confirmed that training included radiological protection fundamentals consistent with 10 CFR Part 19 requirements. Successful completion of the training was measured by testing.

Documents Reviewed: (a) Trojan Nuclear Plant General Employee Training (b) Health Physics Study Guide (c) GET Category I Training Modules (d) GET Category II Training Modules

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Category: Training **Topic:** Training Program Records

Reference: FSAR 72-17 Sect 9.3.1

Requirement Records will be maintained on the status of trained personnel, training of new employees and refresher training of present personnel.

Finding: Completion of training by site personnel was documented in the computerized learning management system (LMS). This data base interfaced with the plant's access control badge system so that the individual's security access badge would be deactivated automatically if required periodic training was overdue. Training files and records for selected ironworkers, security guards and ISFSI radiation protection technicians were reviewed on the learning management system database. Records demonstrating that the required training had been completed by the individuals were easily located. The training office maintained a matrix of all individuals showing their required training based on their position in the organization. The matrix listed lesson plans, on the job check lists, test scores, qualification cards, and OJT mentor sign offs. Each supervisor was periodically provided a copy of the matrix for his workers so that he was always aware of the training status of his staff.

Documents Reviewed: Learning Management System - Database

Category: Training **Topic:** Training Programs for Unescorted Access

Reference: FSAR 72-17 Sect 9.3.1

Requirement Individuals requiring unescorted access to the ISFSI will receive training in the following areas: radiation protection, security, radiological emergency plan, quality assurance, fire protection, chemical safety, OSHA compliance, and the policy statement on worker responsibility for safe operation of the ISFSI. Individuals well receive refresher training on these topics annually.

Finding: Individuals with unescorted access to the ISFSI were required to complete general employee training (GET) category I and category II. A review of the GET training modules for category I and II confirmed that the training topics listed in FSAR Section 9.3.1 had been incorporated into the training modules. Successful completion of the training was measured by testing. Workers received general employee re-training on an annual basis. The initial GET training was 2.5 days in duration. Re-training was 4 hours.

Documents Reviewed: (a) Health Physics Study Guide (b) OSHA training (c) Trojan Nuclear Plant "General Employee Training" (d) GET Category I Training Module (e) GET Category II Training Module

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Category: Welding/NDE **Topic:** Closure Welds

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement Extensive weld procedure qualification testing to meet the requirements of ASME Section IX will be performed to develop welding procedure specifications for both automated and manual welding.

Finding: Barrett Welding Robotic Services, Inc. (BWRS) had been contracted by Holtec International to provide welding services for the sealing of the multipurpose canisters at Trojan. Over the last few years, BWRS had developed and successfully qualified both a manual welding process and a flux core arc welding (FCAW) process for use on a single head, robotic welding machine. The development process included extensive weld procedure qualification testing on coupons to demonstrate compliance with ASME Section IX. Procedure qualification records PQR-BRWS-HI-001, PQR-BRWS-HI-002 and PQR-BRWS-HI-003 and welding procedure specifications WPS-BRWS-HI-001, WPS-BRWS-HI-002 and WPS-BRWS-HI-003 were reviewed against the ASME requirements. ASME Code Section XI, Article II stated that each manufacturer or contractor shall be required to prepare a procedure qualification record (PQR) of the welding data used to weld a test coupon. ASME Code Sections III and IX contained the required specifics that must be evaluated and incorporated into the procedure qualification record and welding procedure specification for qualification purposes. Specific variables categorized as essential, supplemental or nonessential including: applicable base metals, welding wire, weld thickness, shielding and backing gases, amperage, voltage, welding travel speed etc., must be qualified for each procedure qualification record and subsequently incorporated into the welding procedure specification. Additionally, as part of the qualification process, coupons must be welded to test the integrity of the welding in conjunction with the base metal. BWRS had performed an extensive coupon welding test program and provided numerous welding coupons for review by the NRC inspectors. Barrett Welding Robotic Services, Inc. contracted the services of an independent laboratory to perform the ASME Section IX required tensile testing and guided bend testing analysis of the welding coupons. The Barrett Welding Robotic Services, Inc. welding process was determined to be well documented with all required testing completed to demonstrate the adequacy of the welding procedures and processes.

Documents Reviewed: (a) ASME Sections II, III and IX, 2001 Edition (b) PQR-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 0 (c) PQR-BRWS-HI-002 "Flux Core Arc Welding Automatic/Robotic," Rev 0 (d) PQR-BRWS-HI-003 "Gas Tungsten Arc Welding

Manual," Rev 0 (e) WPS-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 1 (f) WPS-BRWS-HI-002 "Flux Core Arc Welding Auto/Robotic Welding Process," Rev 1 (g) WPS-BRWS-HI-003 "Gas Tungsten Arc Welding Manual," Rev 1

Category: Welding/NDE **Topic:** Helium Leak Test Time Limit

Reference: Tech Spec 3.1.1

Requirement The canister lid weld helium leak rate shall be less than or equal to 5 x 10(-6) atm-cc/sec. The licensee has 72 hrs after the canister is removed from the spent fuel pool to meet the Tech Spec. If the 72 hour limit cannot be satisfied, then LCO 3.1.1 Condition A allows the licensee 48 hrs to fix the problem and meet the criteria. In the event the criteria cannot be met after the 48 hrs, the licensee has 24 hrs per Condition B to establish cooling and 30 days to unload the canister.

Finding: Procedure FHP 50-03 had incorporated the helium leak test time limit requirements into the correct sections of the procedure. Step 5.7.24 c stated "Determine helium leak test expiration date and time by adding 72 hours to the recorded time subsequent to the removal of the transfer cask and canister from the cask loading pit (spent fuel pool). Step 5.9.14 b stated that if the helium leak rate test cannot be satisfied within the calculated time as specified in Step 5.7.24 c, then "establish canister lid weld helium leak rate within the limit within the next 48 hours." Step 5.9.14 c stated that if the 48 hour criterion cannot be met, then establish cooling to the canister in accordance with Procedure HPP 1135-660 within 24 hours and unload the fuel within the next 30 days.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) HPP 1135-660 "Water Circulation Procedure for the MPC-24E/EF".

Category: Welding/NDE **Topic:** Hydrogen Mitigation During Welding

Reference: FSAR Sect 5.1.1.2

Requirement Prior to initiating welding and during the welding process, the space beneath the canister lid is evacuated and/or purged with an inert gas to provide assurance that a combustionable gas mixture will not develop in this area. In addition, monitoring for a combustionable gas mixture is performed prior to and during the canister welding operations to verify that a combustionable gas mixture is not present.

Finding: The requirements for hydrogen mitigation and monitoring had been incorporated into Procedure FHP 50-06. Steps 2.1.12 and 2.1.15 stated that the space under the canister lid will be evacuated and/or purged with an inert gas and monitored for combustible gas mixtures before and during canister lid to shell welding operations to ensure that a combustible gas mixture was not present. Trojan monitored for combustionable mixtures using an oxygen analyzer. Attachment 2 of Procedure FHP 50-06 described how to attach the oxygen analyzer and purging apparatus. Attachment 8 of Procedure FHP 50-06 contained the instructions for purging the area under the lid with Argon and directions for the start-up and use of the oxygen analyzer. The lower explosive limit (LEL) for oxygen is 5 percent. The alarm set point for the oxygen analyzer was established at 2.5 percent. Observation during the pre-operational testing and during the loading of the first canister confirmed that Barrett Welding Robotic Services, Inc. personnel followed the requirements in Attachment 8 of Procedure FHP 50-06 to ensure adequate monitoring for an explosive condition was performed prior to and during lid to shell welding. Each time the analyzer was used, Attachment 8 included steps to verify that the analyzer was functioning correctly. Requirements in the owner's manual for the oxygen analyzer were reviewed and compared to the requirements incorporated into the attachments to Procedure FHP 50-06. The Trojan procedure was found to be consistent with the owner's manual. During the pre-operational welding demonstrations, the analyzer began alarming during grinding operations on the weld area. The analyzer was verified as functioning properly. Further investigation determined that air was being introduced into the canister by the rotating action of the grinder causing the argon to be displaced by the air and the analyzer to alarm. A modification was made to the oxygen detector sample probe to reduce the problem.

Documents Reviewed: FHP 50-06 "ISFSI MPC 24E/24EF Closure Welding and Lid Removal For Unloading," Rev 1

Category: Welding/NDE **Topic:** Maximum Detectable Flaw Size

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement The critical flaw size for the MPC lid weld was calculated to be in excess of 0.375". Using this size as a target, a multi-layer dye penetrant exam will be performed on the root and final weld passes and each approximately 3/8" layer of weld depth.

Finding: The requirement to conduct the dye penetrant exams had been incorporated into Procedures FHP 50-06 and HPP 1135-201. Specifically, Procedure FHP 50-06, Page 6 of Attachment 2, Step 5 stated that a multi-layer liquid penetrant exam was to be performed on the completed root layer, each approximate 3/8" layer of weld depth and the final weld cap in accordance with Procedure HPP-1135-201. Trojan successfully demonstrated the dye penetrant exam techniques for the NRC inspectors on a truncated canister during the pre-operational demonstrations.

Documents Reviewed: (a) FHP 50-06 "ISFSI MPC 24E/24EF Closure Welding and Lid Removal For Unloading," Rev 1 (b) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2

Category: Welding/NDE **Topic:** NDE Personnel Qualifications

Reference: FSAR 72-17 Sect 9.1.3

Requirement Personnel performing and evaluation the results of NDE examinations and leak testing of the MPC closure welds will be qualified in accordance with SNT-TC-1A-1992, "Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing."

Finding: Procedure FHP 50-06 Step 2.3.5 required that Holtec or subcontracted independent personnel assigned to perform visual or liquid penetrant examinations be qualified in accordance with Procedure HPP-1135-700. Procedure HPP 1135-700 was reviewed and found to meet the requirements established in the American Society for Nondestructive Testing, Inc.-Technical Council document SNT-TC-1A-1992. Specifics of the program for Level II and III certification included requirements for education and training, documentation of previous NDE training, minimum previous experience qualifications for Level II NDE, training program, visual acuity testing and certification exams. A review of the qualifications of the NDE Level III inspector assigned to Trojan confirmed that he met the qualification requirements in Procedure HPP 1135-700.

Documents Reviewed: (a) FHP 50-06 "ISFSI MPC 24E/24-EF Closure Welding and Lid Removal for Unloading," Rev 1 (b) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2 (c) HPP 1135-211 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 1 (d) HPP 1135-700 "Written Practice for Qualification and Certification of NDE Personnel"

Category: Welding/NDE **Topic:** NDE/Helium Testing of Vent/Drain Port Covers

Reference: FSAR 72-17 Sect 5.1.1.2 & 9.2.3.1.1

Requirement After helium backfill is complete, the MPC vent and drain port covers are welded in place and dye penetrant tested on each weld pass. Helium is then injected into the vent and drain port cavities and set screws are installed and welded into place and dye penetrant tested. Once these steps are completed the licensee is required to helium leak test the vent and drain port cover welds.

Finding: Requirements for the dye penetrant examinations and helium leak testing of the vent and drain port covers was incorporated into Procedure FHP 50-06. Specifically, Page 3 of Attachment 3, Step 7 required a liquid penetrant exam of the root and cap of the vent and drain cover plate welds in accordance with Procedure HPP 1135-201. Page 4 of Attachment 3, Steps 8 and 9 required helium leak testing of the vent and drain covers. The successful nondestructive examination of a vent port cover on a truncated cask was observed by the NRC inspectors during the pre-operational testing and was determined to be performed in compliance with the applicable procedures. During loading of the first canister, the dye penetrant examinations and helium leak testing of the vent and port drain covers was observed by the NRC inspectors. The examinations and tests were successfully completed.

Documents Reviewed: (a) FHP 50-06 "ISFSI MPC 24E/24EF Closure Welding and Lid Removal For Unloading," Rev 1 (b) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2

Category: Welding/NDE **Topic:** Permanent Record of Weld Integrity

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement A permanent record of the dye penetrant (PT) examinations, including all relevant indications shall be made using video, photographic, or other means providing a retrievable record of weld integrity. The records shall be taken during the final interpretation period described in ASME Section V, Article 6.

Finding: The requirement to document the dye penetrant examinations, including a photographic record of any relevant indications, was included in Procedure HPP 1135-201. Exhibits 7.1 "Liquid Penetrant Examination Report," and 7.2 "Liquid Penetrant Examination Report Log," were provided for documenting the liquid penetrant exams. Step 6.9.9 of Procedure HPP 1135-201 required a photographic image to be made of any relevant indications deemed acceptable during the evaluation of the canister lid to shell welds. Polaroid pictures of the indications will be added to the welding inspection records for all relevant indications. Discussions with personnel during the pre-operational testing concluded that redundant, retrievable records of the examination results will be created and kept separate from one another at the Trojan site. The documents will also be scanned into a database to create a third retrievable record. A bi-weekly update of the database will be stored in a fire code vault.

Documents Reviewed: (a) FHP 50-06 "ISFSI MPC 24E/24EF Closure Welding and Lid Removal For Unloading," Rev 1 (b) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2

Category: Welding/NDE **Topic:** PT of Cover Plates & Closure Ring

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement MPC lid weld strength and MPC leak tightness are verified by performing a dye penetrant examination of the vent and drain port cover plates and closure ring welds per Section V, Article 6, with acceptance criteria per Section III, NB-5350.

Finding: Procedure FHP 50-06 Attachment 3 "Vent and Drain Cover Plate Weld Traveler," and Attachment 4 "Closure Ring Weld Traveler," directed the use of Procedure HPP 1135-201 for the dye penetrant examination of the vent and drain port cover plates and closure ring welds. Procedure HPP 1135-201 Step 6.1.1 stated that the dye penetrant examination process described in this procedure was qualified in accordance with the requirements of ASME Section III Subsection NB-5350 and ASME Section V Article 6. Selected acceptance criteria specified in ASME Section V Article 6 were reviewed against the criteria in Procedure HPP 1135-201 including the acceptance criteria for evaluating discontinuities of the weld surface and nonrelevant and relevant indications to determine whether defects were present. The criteria in the ASME code were found to be incorporated into Procedure HPP 1135-201. During the pre-operational testing, the Level III NDE inspector demonstrated the dye penetrant weld examination methods that will be used on the vent and drain cover plates and the closure ring welds.

Documents Reviewed: (a) HPP 1135-131 "Trojan ISFSI Completion Project MPC Lid Fit Up and Transfer of MPC and Lid to Fuel Building," Rev 4 (b) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (c) FHP 50-06 "ISFSI MPC 24E/24-EF Closure Welding and Lid Removal for Unloading," Rev 1 (d) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2

Category: Welding/NDE **Topic:** PT of Lid-to-Shell Weld

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement MPC lid weld strength and MPC leak tightness are verified by performing a multi-layer dye penetrant examination of the MPC lid-to-shell weld per Section V Article 6 with acceptance criteria per Section III, NB-5350. The multi-layer dye penetrant examination includes the root and final weld passes and each approximately 3/8" layer of weld depth.

Finding: Procedure FHP 50-06 Attachment 2 "MPC Lid to Shell Weld Traveler," directed the use of Procedure HPP 1135-201 for the dye penetrant examination of the lid to shell weld. Procedure HPP 1135-201 Step 6.1.1 stated that the dye penetrant examination process described in this procedure was qualified in accordance with the requirements of ASME Section III Subsection NB-5350 and ASME Section V Article 6. A review of selected portions of the required ASME code found the procedure to be consistent with the code requirements. Procedure FHP 50-06 Attachment 2 Step 5 required the dye penetrant examination of the lid to shell weld to include the root layer, each approximate 3/8" layer of weld depth and the final weld cap. During the pre-operational testing, the Level III NDE inspector adequately demonstrated the dye penetrant weld examination methods that will be used on the lid to shell weld. During the loading of the first canister, the NRC inspectors observed the dye penetrant examinations of the lid to shell weld and were provided a briefing by the examiner of the indications found. All indications were minor and the weld was determined to be of high quality.

Documents Reviewed: (a) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (b) FHP 50-06 "ISFSI MPC 24E/24-EF Closure Welding and Lid Removal for Unloading," Rev 1 (c) HPP 1135-201 "Trojan ISFSI Completion Project Liquid Penetrant Exam Procedure," Rev 2

Category: Welding/NDE **Topic:** Visual Weld Examinations

Reference: FSAR 72-17 Sect 3.3.2.2

Requirement MPC lid weld strength and MPC leak tightness are verified by performing a visual exam of the MPC lid-to-shell weld, vent port and drain port cover plate welds and closure ring weld per Section V Article 9 with acceptance criteria per Section III, NF-5360.

Finding: Procedure FHP 50-06 Attachment 2 "MPC Lid to Shell Weld Traveler," Attachment 3 "Vent and Drain Cover Plate Weld Traveler," and Attachment 4 "Closure Ring Weld Traveler," directed the use of Procedure HPP 1135-211 for the visual examination of the lid to shell weld, vent and drain port cover plate welds and the closure ring welds. Procedure HPP 1135-211 Step 6.1.1 stated that the visual examination process described in this procedure was qualified in accordance with the requirements of ASME Section III Subsection NF-5360 and ASME Section V Article 9. Selected acceptance criteria specified in ASME Section V Article 9 was reviewed against the criteria in Procedure HPP 1135-211 including requirements that procedures contain essential variables such as the technique used, surface conditions, viewing method, illumination, personnel qualifications and procedure qualification reference. ASME Section III, Division 1, NF-5360 required visual inspection criteria to include acceptable fillet weld undersize and oversize tolerances, filet and groove weld fusion tolerances, overlap and crater criteria, surface porosity, arc strikes and slag. The criteria in the ASME codes were found to be incorporated into Procedure HPP 1135-211. During the pre-operational testing, the Level III NDE inspector demonstrated the visual weld examination methods that would be used on the lid to shell weld, vent and drain cover plate welds and the closure ring welds. All visual examinations conducted during the loading of the first canister were observed by the NRC inspectors. The visual examinations were conducted in accordance with applicable procedures. No significant weld problems were identified during the visual examinations.

Documents Reviewed: (a) HPP 1135-131 "Trojan ISFSI Completion Project MPC Lid Fit Up and Transfer of MPC and Lid to Fuel Building," Rev 4 (b) FHP 50-03 "Loading and Placing Concrete Cask Into Storage," Rev 1 (c) FHP 50-06 "ISFSI MPC 24E/24-EF Closure Welding and Lid Removal for Unloading," Rev 1 (d) HPP 1135-211 "Trojan ISFSI Completion Project Weld Exam Procedure," Rev 1

Category: Welding/NDE **Topic:** Welder Qualifications

Reference: FSAR 72-17 Table 4.2-1

Requirement The welders and welding operators are qualified in accordance with ASME Section IX.

Finding: At the time of the pre-operational inspection, Barrett Welding Robotic Services, Inc. (BWRS) had tested and qualified nine welders for automatic robotic flux core arc welding and twelve welders for manual flux core arc welding and the gas tungsten arc welding. Qualifications were based on the requirements in ASME Section IX and the welders' ability to deposit sound weld metal and operate the welding equipment in conjunction with the qualified welding procedure specifications. Three welding procedure specifications (WPS) had been developed and qualified (WPS-BRWS-HI-001, WPS-BRWS-HI-002, WPS-BRWS-HI-003) by Barrett Welding Robotic Services, Inc.. All three welding procedure specifications applied to the lid to shell weld, vent and drain port cover welds and the ring enclosure weld. ASME Section IX, Article III, "Welding Performance Qualifications," required that each manufacturer or contractor shall qualify each welder or welding operator for each welding process to be used in production welding in accordance with qualified welding procedure specifications. Barrett Welding Robotic Services, Inc. performed the testing and qualification process for the welders. A random sampling and review of training records for three welders concluded that they had been trained and qualified in accordance with the requirements in the ASME code. Specifically, the three welders had qualified on all three welding procedure specifications and had welded numerous coupons of variable thickness which were evaluated using visual examination, nondestructive examination and mechanical testing to ensure that the welders could consistently deposit sound weld metal. Each of the nine welders qualified on the robotic system participated in a complete full circumference shield lid to canister weld which was subsequently NDE tested to ensure weld integrity. All coupons produced to qualify the welding process had been appropriately identified and labeled as required by ASME Section IX.

Documents Reviewed: (a) ASME Sections III and IX, 2001 Edition (b) PQR-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 0 (c) PQR-BRWS-HI-002 "Flux Core Arc Welding Automatic/Robotic," Rev 0 (d) PQR-BRWS-HI-003 "Gas Tungsten Arc Welding Manual," Rev 0 (e) WPS-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 1 (f) WPS-BRWS-HI-002 "Flux Core Arc Welding Auto/Robotic Welding Process," Rev 1 (g) WPS-BRWS-HI-003 "Gas Tungsten Arc Welding Manual," Rev 1

Category: Welding/NDE **Topic:** Welding Procedures

Reference: FSAR 72-17 Table 4.2-1

Requirement Welding procedures are written and qualified in accordance with ASME Section IX.

Finding: Welding procedure specifications (WPS) and procedure qualification records (PQR) had been developed in accordance with the ASME code for automatic flux core welding, manual flux core welding and manual gas tungsten arc welding. Any of the three qualified welding processes could be used on the shell to lid weld, vent and drain port cover plate welds and the ring enclosure weld. ASME Code Section XI, Article II stated that each manufacturer or contractor shall be required to prepare a procedure qualification record of the welding data used to weld a test coupon. ASME Code Sections III and IX contained the required specifics that must be evaluated and incorporated into the procedure qualification record and welding procedure specification as part of the qualification process. The three procedure qualification records and welding procedure specifications had been developed in accordance with the ASME codes and addressed such variables as applicable base metals, welding wire, weld thickness, shielding and backing gases, amperage, voltage, and welding travel speed. As part of the qualification process, coupons had been welded to test the integrity of the welding in conjunction with the base metal. Tensile testing and guided bend testing of the welding coupons, as required by ASME Section IX, was performed by an independent laboratory as part of the qualification process.

Documents Reviewed: (a) ASME Sections IX, 1995 Edition (b) PQR-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 0 (c) PQR-BRWS-HI-002 "Flux Core Arc Welding Automatic/Robotic," Rev 0 (d) PQR-BRWS-HI-003 "Gas Tungsten Arc Welding Manual," Rev 0 (e) WPS-BRWS-HI-001 "Flux Core Arc Welding Manual," Rev 1 (f) WPS-BRWS-HI-002 "Flux Core Arc Welding Auto/Robotic Welding Process," Rev 1 (g) WPS-BRWS-HI-003 "Gas Tungsten Arc Welding Manual," Rev 1

Category: Welding/NDE **Topic:** Welding/Cutting Demonstrations

Reference: FSAR 72-17 Sect 9.2.3.1.1

Requirement The canister weld mock-ups will be used to test the automated welding equipment including actual welding of the lid, the vent and drain port cover plates, and closure ring. Emphasis will be placed on acceptability of the welds as well as compliance with approved ALARA practices. The canister weld mock-ups will also be used to test the cutting equipment including actual cutting away of portions of the vent and drain port cover plates from the canister lid and cutting away of the canister lid from the canister.

Finding: Procedure FHP 50-06 contained the appropriate steps and information for canister welding and lid removal. During the pre-operational testing, truncated canisters were used to perform welding and lid removal demonstrations. The truncated canisters were the same diameter and metal composition as the actual canisters, but were shorter in length. Welding demonstrations that were observed included root pass welding of a lid to the shell, welding the vent and drain cover ports and welding a closure ring in place. Welding was performed using the robotic system. All welding was observed to be in accordance with procedures. Discussions with the welding contractor indicated a very strong and in-depth knowledge of the welding process. This was reflective of the years of effort that had been dedicated to qualifying the welding process being used. Radiological controls were demonstrated during the welding. The radiological personnel were familiar with the expected radiological conditions that could be encountered during the welding process and had a good knowledge of ALARA techniques that could be applied to keep exposures low. This included temporary shielding in the gap between the canister and the transfer cask, keeping people away from the cask except when working, and providing continuous monitoring of radiological conditions during welding. The radiation protection personnel were also aware that prior to welding, several gallons of water would be removed from the canister which could increase dose rates in the welding work area. Provisions had also been established for cutting a canister lid off should removal of the spent fuel be necessary. The cutting technique was demonstrated on a vent port cover and several passes around the lid to shell circumference of a truncated cask. Procedure FHP 50-06 Attachment 7 "Cutting of

Access to Vent/Drain Ports and MPC Lid Weld Removal" was reviewed and found to contain the appropriate information to safely access the vent and drain ports and to successfully cut and remove the lid. The welding contractor had practiced using the cutting equipment on several truncated canisters (re-welded lids/covers etc.) to train personnel, ensure that equipment performed adequately and to verify the adequacy of the procedure. The same technique planned for Trojan to cut a canister lid off had been successfully used on a canister at the Hatch plant. Close coordination between the Hatch plant personnel and the welding crew at Trojan had occurred during the Hatch lid cutting effort. During the actual loading of the first canister, the NRC observed the welding of the canister. The robotic system and the welding staff successfully completed the welding of the first canister with few problems and produced an extremely high quality weld.

Documents Reviewed: FHP 50-06 "ISFSI MPC 24E/24EF Closure Welding and Lid Removal For Unloading," Rev 1