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License Number NPF-3

Docket Number 50-346

Serial Number 2726

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United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555-0001

Subject: Supplemental Information Regarding License Amendment Application to Increase Spent Fuel Storage Capability
(License Amendment Request No. 98-0013; TAC No. MB0688)

Ladies and Gentlemen:

On December 2, 2000, the FirstEnergy Nuclear Operating Company (FENOC) submitted an application for an amendment to the Davis-Besse Nuclear Power Station (DBNPS), Unit Number 1, Operating License Number NPF-3, Appendix A Technical Specifications, regarding a proposed increase in spent fuel storage capability. The proposed amendment (DBNPS Serial Number 2640) would allow an increase from the current capacity of 735 fuel assemblies, to a new capacity of 1624 fuel assemblies.

By NRC letter dated July 25, 2001, FENOC received a request for additional information (DBNPS Log Number 5819) regarding the license amendment application. Attachment 1 of Enclosure 1 provides the response to this request for additional information (RAI), as informally provided to the NRC staff on August 2 and August 13, 2001.

The December 2, 2000, license amendment application included both a proprietary and non-proprietary version of Holtec International Report No. HI-992329, "Design and Licensing Report, Davis-Besse Spent Fuel Pool Rerack Project" (Attachments 4 and 5 to Enclosure 1 of the license amendment application). In addition to the response to the RAI, revisions to various sections of this report are attached. The reasons for these revisions are as follows:

- Holtec International Report Section 10.6, "Removal and Decontamination of Existing Racks and Associated Structures," described plans to remove all storage cells individually from the existing rack frame prior to removing the rack frame and associated rack-to-wall braces in parts. Subsequent to the submittal of the license amendment application, an alternate plan

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was developed. This alternate plan would remove only the cells and braces necessary to facilitate removal of the rack. The alternate plan will reduce the complexity of the diver's actions and, correspondingly, result in reduced dive time. As a result, the alternate plan is projected to reduce dose to personnel packaging the rack parts for shipment. The revised report sections reflect this alternate plan.

The December 2, 2000 license amendment application proposed changes to Technical Specification (TS) 3/4.9.7, "Refueling Operations – Crane Travel – Fuel Handling Building" that would allow loads of up to 17,530 pounds to be moved over fuel assemblies stored in the cask pit provided that an impact cover is installed. As described in the proposed associated TS Bases, the impact cover is capable of withstanding a dropped load of up to 17,530 pounds. The 17,530 pound weight limit assumed that the heaviest rack to be lifted over the impact cover would be a new rack, however the existing racks, if removed as described above, are heavier. The approximate weight of the heaviest existing rack, plus rigging, is 26,386 pounds. Therefore, existing racks, or portions thereof, weighing more than 17,530 pounds will be precluded by TS 3/4.9.7 from being moved over stored fuel assemblies, including fuel assemblies stored in the cask pit. Safe load paths will be used for the movement of the existing racks.

- Associated with the aforementioned alternate plan, the spent fuel cask crane will be used to lift the existing racks out of the spent fuel pool (SFP), utilizing a lift rig similar to the new rack lift rig presently described in Holtec International Report Section 3.5, "Heavy Load Considerations for the Proposed Re-racking." The revised report sections note these considerations.

- The rack drop analysis described in Holtec International Report Section 7.0, "Fuel Handling and Mechanical Accidents," was based on a drop of the heaviest new rack. With the aforementioned plan to lift existing racks of a heavier weight than the new racks, the rack drop analysis required revision. The revised report sections summarize the results of the revised rack drop analysis.

- Section 10.6 of the Holtec International Report described plans to perform pressure washing the internals of each existing rack prior to lifting from the spent fuel pool floor. However, industry experience indicates that this pressure washing may only marginally decrease contamination levels, while 1) increasing dose levels in the water due to stirring up contamination in the bottom of the pool, and 2) decreasing water clarity. Cleaning up the water would require increased filtration and radiation exposures due to the need to change filters. Accordingly, the DBNPS plans to initially utilize pressure washing, to monitor the results, and to utilize pressure washing unless the results compel otherwise. The revised report sections make pressure washing an optional activity based on radiological and water clarity considerations.

- Holtec International Report Section 9.5, "Anticipated Dose During Rack Installation," stated: "Each diver will be equipped with whole body and extremity dosimetry with remote, above surface, readouts which will be continuously monitored by Radiation Protection (RP) personnel." This statement is revised to clarify that the extremity dosimetry does not include remote, above surface readouts.

Attachment 2 of Enclosure 1 provides a markup of the affected report sections showing the proposed changes, and Attachment 3 of Enclosure 1 provides the revised affected pages. These revisions have been reviewed by Holtec International and apply to both the proprietary and non-proprietary versions of the report. The license amendment application concluded that the proposed changes have no adverse effect on nuclear safety and that the proposed changes do not involve a significant hazards consideration. The revisions to the Holtec International Report have no effect on these conclusions.

In order to support the planned commencement of the SFP re-rack modification in October 2001, FENOC requests that the NRC staff complete its review and approval of the license amendment as expeditiously as possible.

Should you have any questions or require additional information, please contact Mr. David H. Lockwood, Manager - Regulatory Affairs, at (419) 321-8450.

Very truly yours,

MKL

Enclosures

cc: J. E. Dyer, Regional Administrator, NRC Region III
S. P. Sands, NRC/NRR Project Manager
D. J. Shipley, Executive Director, Ohio Emergency Management Agency, State of Ohio (NRC Liaison)
K. S. Zellers, NRC Region III, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

Docket Number 50-346
License Number NPF-3
Serial Number 2726
Enclosure 1

SUPPLEMENTAL INFORMATION

IN SUPPORT OF THE

APPLICATION FOR AMENDMENT

TO

FACILITY OPERATING LICENSE NPF-3

DAVIS-BESSE NUCLEAR POWER STATION

UNIT NUMBER 1

Attached is supplemental information for Davis-Besse Nuclear Power Station (DBNPS), Unit Number 1 Facility Operating License Number NPF-3, License Amendment Request Number 98-0013 (DBNPS Serial Number 2640, dated December 2, 2000).

This information, submitted under cover letter Serial Number 2726, includes Attachment 1, a response to the July 25, 2001 NRC Request for Additional Information (DBNPS Log Number 5819), Attachment 2, a markup of the revisions to the Holtec International Report No. HI-992329, "Design and Licensing Report, Davis-Besse Spent Fuel Pool Rerack Project," and Attachment 3, revised pages for the Holtec International Report.

I, Guy G. Campbell, state that (1) I am Vice President - Nuclear of the FirstEnergy Nuclear Operating Company, (2) I am duly authorized to execute and file this certification on behalf of the Toledo Edison Company and The Cleveland Electric Illuminating Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

By: ______________________________
Guy G. Campbell, Vice President - Nuclear

Affirmed and subscribed before me this 4th day of September, 2001.

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Notary Public, State of Ohio - Nora L. Flood
My commission expires September 4, 2002.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

REGARDING

LICENSE AMENDMENT REQUEST (LAR) 98-0013

FOR

DAVIS-BESSE NUCLEAR POWER STATION UNIT NUMBER 1

NRC Request for Information:

1. In your submittal, you state that "Underwater diving operations are required to remove underwater obstructions and the existing racks, to aid in the rack installation by assisting in the positioning of new rack modules, and to verify installation per design." In addition, you stated that you will use the Davis-Besse Nuclear Power Station procedures to ensure safe diving operations, including radiological controls. Do these procedures meet the intent of the guidance in Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants," Appendix A (e.g., do they include details concerning the method of radiation surveys for the dive area and the emergency procedures for diver rescue, etc.)? Also, do the procedures provide for continuous observation of diving operations by a dedicated member of the dive support team to prevent loss of control of the diver in the SFP? (Refer to Nuclear Regulatory Commission Information Notice 97-68.)

DBNPS Response:

The Davis-Besse Nuclear Power Station (DBNPS) Radiation Protection (RP) Section has written a procedure specifically for this project: DB-HP-01114, "Diving Operations in Contaminated Waters Near Highly Radioactive Components." This procedure will be issued for use after RP personnel have completed training to the requirements of the procedure. The procedure is in conformance with the intent of Regulatory Guide 8.38, Appendix A, and incorporates lessons-learned from NRC Information Notice 97-68.

Additional procedures associated with diving which will be utilized as appropriate, include:

DB-HP-01106, "Radiological Controls for Diving Operations"
DB-HP-01108, "Hot Particle Detection and Control"
DB-HP-01109, "High Radiation Area Access Control"
DB-HP-01206, "Multiple Badging: Issue, Use, and Collection"
DB-HP-01208, "Extremity Badging: Issue, Use, and Collection"
DB-MN-00025, "Control of Diving"

A discussion of the six considerations addressed in Regulatory Guide 8.38, Appendix A, follows:

1) Procedure DB-HP-01114 requires that a Radiation Work Permit (RWP) be written for the diving. Based on the applicable survey results, the RWP will detail any limits and precautions over and above those specified in the procedure.

2) Procedure DB-HP-01114 contains instructions for continuous RP observation of the diver by an underwater camera. The instructions specify the expectations for stopping the diving (e.g., dosimeter alarm, loss of communication, loss of visual contact). A review of these expectations is required as part of the procedure-required pre-job brief.

3) Procedure DB-HP-01114 includes a pre-job brief checklist, which requires that a current map of fuel/irradiated component locations be posted at the diver monitoring station, and that the diver be briefed on the radiological conditions and hazards in the pool. The checklist of the poolside brief of the diver requires that the radiological conditions and concerns be re-reviewed prior to initiating the dive. In addition to the map and briefings, barriers will be installed on the top of the racks to indicate the boundaries of the safe dive area.

4) Procedure DB-HP-01114 requires that prior to diving in the pool, an underwater survey (contact and general area readings) be completed on the work area and travel path to and from the work area. These surveys are to be re-performed if a fuel or radiation source is moved, or if it is suspected that radiation conditions in the pool may have changed. Per the procedure, these surveys are to be completed with two independent survey instruments. In addition, to supplement the surveys, the diver shall be equipped with a remote-readout radiation detector that is continuously monitored by RP personnel.

5) Procedure DB-HP-01114 requires that physical barriers be provided as an additional measure to preclude a diver from accidentally moving into a radiological un-safe area of the pool. The barriers will extend approximately 5 to 6 feet above the top of the racks. When the diver is below the top of the racks, the vertical side of the empty racks will form a barrier.

   The diver will wear a safety harness to which a line is attached that leads to the diver tender above the water. In specific situations, this line can be used to limit the movement of the diver. The diver is also equipped with voice communication to the surface. Voice communication can be used to warn a diver of proximity to an un-safe condition.

   As described in Section 10 of Attachment 4 of the LAR submittal, the DBNPS procedures associated with diving will be supplemented with the safe-practices guidance document provided by the diving company. This guidance document describes the precautions and controls for dive operations and were developed utilizing OSHA Standard 29CFR-1910, Subpart T. The document specifically addresses "diving emergencies". The safety harness and line identified above, allows retrieval of an unrestrained diver. A second diver, with dosimetry, will always be prepared to quickly enter the pool to rescue a restrained diver. The diving company requires that diving personnel are trained on diver rescue actions. In addition, the pre-job brief checklist verifies that a diver rescue plan has been established.

6) The operability check of the diver teledosimetry is built into the dosimetry circuitry. This circuitry goes through an operability check every time it is energized. The poolside brief checklist verifies the teledosimetry equipment is installed and operating properly. The teledosimetry will alarm at the above water station that is monitored by a RP technician who is in communication with diver. The radiation monitor mounted in the helmet of the diver gives an audible indication to the diver. In addition, the diver shall be equipped with a remote-readout radiation detector that is continuously monitored by RP personnel. The calibration of the dosimetry is maintained per the established dosimetry calibration program.

NRC Request for Information:

2. The radioactivity in the pool water is, as you noted, dependent on the amount of fuel assembly movement within the pool. Prior to starting the SFP reracking, the fuel assemblies stored in existing racks will be moved to Cask Pit and Transfer Pit racks. After the installation of the new high density racks in the SFP, fuel shuffling will be also performed. What steps will be taken to minimize the impact of these fuel movements on the concentrations of radioactive materials in the pool water, and their contribution to occupational dose received by workers, especially for divers?

DBNPS Response:

Unless operation of the Spent Fuel Pool Cooling System interferes with diver operations or safety, the system will be run at all times. Normally the coolant is filtered as part of the cooling operation. (The coolant may also be run through a demineralizer.) If it is determined the normal filtration is not adequate, or handling of the associated filters could create an unacceptable condition, an auxiliary filtration system can be utilized. Upon completion of each fuel shuffle, the pool will be surveyed to identify the radiation levels within the pool, with specific emphasis on the diving area. Any unacceptable radiation levels will be corrected prior to allowing a diver in the pool.

As the existing racks are removed from the pool they will be rinsed or pressure washed and surveyed. Any unacceptable survey results will require compensatory actions to reduce worker exposure.

The Spent Fuel Pool Skimmer System is available to clean the surface of the pool. This will be run as necessary, based on radiation levels and clarity concerns. If this is not adequate, or filter handling is not ALARA, an auxiliary skimmer can be made available.

The fuel in the SFP has been moved a number of times since being removed from the reactor. Therefore, spalling of deposits from the surface of the fuel should be minimal during handling for re-racking.

The question states, in part: "Prior to starting the SFP reracking, the fuel assemblies stored in existing racks will be moved to Cask Pit and Transfer Pit racks." For clarification purposes, it is noted that not all of the fuel assemblies currently stored in existing racks will be moved to Cask Pit and Transfer Pit racks. The Cask Pit and Transfer Pit racks allow for minimization of dose to underwater divers during re-racking activities by providing for temporary storage of a limited number of fuel assemblies. In addition, if re-racking activities can be completed prior to the upcoming Thirteenth Refueling Outage, the Cask Pit racks alone would provide adequate temporary storage of fuel assemblies, and temporary storage of fuel assemblies in the Transfer Pit would likely not be required.

NRC Request for Information:

3. The footnote to Table 9.5.1, "Estimate of Person-rem Dose During Re-racking," indicates the dose rate for diving operations was assumed to be 20 – 40 mrem/hr. It is unclear for which of the re-racking steps listed in the table this applies. Please specify the person-rem estimate for the diving operations including a number of divers and expected total man-hrs.

DBNPS Response:

As stated in Holtec International Report Section 9.5, "Anticipated Dose During Rack Installation," the dose estimate provided in Table 9.5.1 was based on Holtec International's experience with re-racking similar spent fuel pools, and is believed to be a reasonable estimate for planning purposes. Since the LAR submittal, the DBNPS-specific re-racking sequence of events has been refined and a better dose estimate has been determined. It is currently estimated that a total dose of 4.1 man-rem will be incurred during the re-racking. This value is less than the 6 to 12 man-rem total dose estimate initially provided in Table 9.5.1.

The dose rates to the diver are estimated to range from a maximum of 75 mrem/hour, to a low of 0.5 mrem/hour. The average dose rate to the diver is expected to be approximately 4 mrem/hour.

At this time, it is planned to only have one diver in the SFP at a time. It is estimated that 200 dives will be needed, resulting in approximately 531 dive-hours. Therefore, the dose estimate for diving operations is approximately 2.1 man-rem. This estimate is included in the total dose estimate mentioned above.

The following table summarizes the individual task components comprising the dose estimate for the DBNPS re-racking:

ACTIVITY	IN-WATER MAN LOADING	HOURS	DOSE RATE (mrem/hr)	DOSE (mrem)
Dive to remove seismic restraints	1 diver	180	4	720
Dive to remove racks	1 diver	40	4	160
Dive to remove seismic restraints from floor	1 diver	60	4	240
Dive to remove failed fuel canisters	1 diver	36	4	144
Measure/install bearing pads for new racks	1 diver	120	4	480
Topside loading of old racks into containers (12 racks/6 failed fuel racks)	-	-	80 mrem/rack	1440
Topside loading of seismic restraints	-	-	3 mrem/hr	360
Install new racks	1 diver	70	4	280
Cask pit work	1 diver	25	2	50
Miscellaneous Support Activities *	-	-	Varies with Area	260

* Miscellaneous Support Activities around the pool perimeter supporting topside work, dive activities, radiological surveys, fuel movement, filter change outs and sluice activities are estimated at 260 mrem.

NRC Request for Information:

4. Is there any job or operation which needs mock-up training? If it is, have you developed a plan to perform a mock-up training?

DBNPS Response:

Removal of the seismic restraints (associated with the existing racks) will require some remote cutting equipment. Training on mock-ups will be completed prior to mobilization at the DBNPS to ensure equipment operability and allow training of the work crew.

Radiation Protection personnel will have training on the diver dosimetry prior to initiating re-racking. This training will be completed at a local dive tank/training facility utilizing a diver.

NRC Request for Information:

5. Does the fuel integrity history of Davis-Besse spent fuel indicate that it is likely that this operation will generate or encounter discrete radioactive particles (DRPs)? If so, what controls will be implemented to address the unique exposure situations posed by DRPs?

DBNPS Response:

Due to fuel integrity challenges at the DBNPS, one fuel assembly has had all its fuel rods, except a failed rod, relocated in a new fuel assembly structure. In addition, several fuel assemblies have had failed rods removed. Based on the rod movement techniques utilized, it is not expected that actual fuel pellets will be discovered, but it is possible DRPs could be encountered. The existing racks will be rinsed or pressure washed and monitored as they come out of the water, and the pool floor will be surveyed upon removal of the racks.

Each diver will be equipped with extremity dosimetry and with whole body dosimetry with remote, above surface, readouts that will be continuously monitored by RP personnel. Divers will also be equipped with underwater survey instrumentation with remote readout capabilities. Divers will be in continuous communication with RP personnel. Radiation surveys of the dive area will be conducted prior to each dive operation and following movement of radioactive components in the SFP.

The DBNPS above-water area survey requirements and techniques specified in procedures DB-HP-01114, "Diving Operations in Contaminated Waters Near Highly Radioactive Components," (to be issued upon completion of personnel training) and DB-HP-01108, "Hot Particle Detection and Control," will be used to identify and appropriately handle DRPs.

Re-racking activities should not create DRPs, as the metal to be cut during the removal of the existing racks is not expected to be highly activated. In addition, abnormal handling of radioactive components (e.g., fuel assemblies) stored in the SFP is not required to complete the re-racking.

NRC Request for Information:

6. The April 1997, Calvert Cliff's diving event demonstrated that tending the diver's tether is not an effective restraint that prevents diver access to unauthorized areas in the pool. Discuss the physical controls that will be used to ensure that the diver is not able to access spent fuel or other highly activated components during these operations.

DBNPS Response:

Physical barriers will be provided as an additional measure to preclude a diver from accidentally moving into a radiological un-safe area of the pool. The barriers will extend approximately 5 to 6 feet above the top of the racks. When the diver is below the top of the racks, the vertical side of the empty racks will form a barrier.

In addition to the physical barrier, the following are some of the activities that will enhance the radiological safety of the diver:

- Diver briefing on the radiological conditions.
- Visual monitoring of the diver.
- Diver communication with a designated diver communicator and Radiation Protection personnel.
- Water clarity and underwater lighting to allow diver visibility of work area.
- Monitoring of diver teledosimetry.
- Diver experience (e.g., underwater body control).
- Reinforced diver awareness of the potential dangers.

Docket Number 50-346
License Number NPF-3
Serial Number 2726
Enclosure 1
Attachment 2

MARKUP OF THE REVISIONS

TO THE

DESIGN AND LICENSING REPORT
DAVIS-BESSE SPENT FUEL POOL RERACK PROJECT
HOLTEC INTERNATIONAL REPORT NO. HI-992329

(13 pages attached)

- Use of a cover to protect the fuel assemblies stored temporarily in the Cask Pit or Transfer Pit during movement of heavy loads over the stored fuel.

The following are some of the salient features which make lifting heavy loads during the re-racking a safe evolution:

a. Safe Load Paths and Procedures

The Cask Pit, which will contain fuel during most of the re-racking, is located west of the SFP, between the Auxiliary Building Train Bay/Loading Area and the SFP, (see Figure 3.5-1). During re-racking the load path of some new racks may~~will~~ tra~~ns~~verse the Cask Pit. In the event the loads paths traverse the Cask Pit,~~Therefore,~~ a Cask Pit cover shall be used to protect the fuel in the Cask Pit. The cover will be designed to ASME B & PV Code, Division 1, Subsection NF. The cover will be qualified to withstand the drop of the heaviest new rack, including rigging, from an appropriate height. The height that heavy loads may travel over the Cask Pit cover will be administratively controlled by procedures.

The Cask Pit cover is a heavy load. The activities associated with its installation and removal will be administatively controlled by procedures to meet the requirements of NUREG-0612.

Safe load paths will be identified for moving the remaining heavy loads in the Fuel Building. Safe load paths will maximize the benefits of strategic fuel shuffles that allow for the greatest distance between a heavy load and stored fuel.

Note: All fuel movements to support the re-racking will utilize the fuel handling bridge, and be controlled per the normal DBNPS fuel movement procedures.

All heavy loads are lifted in such a manner that the C.G. of the lift point is aligned with the C.G. of the load being lifted. Turnbuckles rather than slings are utilized to "fine tune" the verticality of the new rack being lifted.

Movement of heavy loads will be conducted in accordance with written procedures, which will be reviewed and approved by DBNPS.

b. Supervision of Lifts

Procedures used during the removal/installation of the SFP racks and the Cask Pit cover require supervision of heavy load lifts by a designated individual who is responsible for ensuring procedure compliance and safe lifting practices.

c. Crane Operator Training

All crew members involved in the use of the lifting and upending equipment will be given training by Holtec International using a videotape-aided instruction course which has been utilized in previous re-rack operations.

d. Lifting Devices Design and Reliability

The SFCC is comprised of a main hook rated for 140 tons as well as an auxiliary hook rated for 20 tons. A temporary hoist with an appropriate capacity will be attached to the SFCC hook to be used to prevent submergence of the hook.

The following table determines the maximum lift weight during rack installation.

Item	Weight (lbs)
Existing Rack New Rack	22,886 (maximum) 14,030 (maximum)
Lift Rig	1,000
Rigging	500
Temporary hoist	2,000
Total Lift – Existing Racks Total Lift – New Racks	26,386 17,530

It is clear, based on the heaviest rack weight to be lifted, that the heaviest load being lifted is well below the rating of the SFCC hooks. The temporary hoist to be used in conjunction with the SFCC hook will be selected to provide an adequate load capacity and comply with NUREG-0612.

~~Remotely engaging l~~Lift rigs, meeting all requirements of NUREG-0612 as a single failure proof design, will be used to lift the new and existing rack modules. Dual load paths are built into the design of the lift rigs via four independent load paths. There are four separate eye pads as well as four separate lifting rods. The design of the lift rig allows for the failure of one load path while maintaining a 5:1 safety factor in each of the remaining load paths. Therefore, the lift rigs comply~~ies~~ with the duality feature called for in Section 5.1.6 (3a) of NUREG 0612.

The rigs have ~~has~~ the following attributes:

- The traction rod is designed to prevent loss of its engagement with the rig in the locked position. Moreover, the locked configuration of the new rack lift rig can be directly verified from above the pool water without the aid of an underwater camera. The locked configuration for the existing rack lift rig must be verified by the diver or an underwater camera.

- The stress analysis of the rigs are~~is~~ carried out and the primary stress limits postulated in ANSI N14.6 [3.5.4] are met.

- The rigs are~~is~~ load tested with 300% of the maximum weight to be lifted. The test weight is maintained in the air for 10 minutes. All critical weld joints are liquid penetrant examined to establish the soundness of all critical joints.

The existing racks are made up of a rack structure which contains individual fuel storage cells. These racks are not free standing. There are seismic braces which are attached to the rack structure and extend out to the pool walls, (but are not attached to the wall). ~~Prior to lifting the existing racks from the SFP, the individual storage cells will be removed from the rack structure. Then, a~~As necessary to facilitate rack removal, ~~any~~ rack-to-wall seismic braces and individual cells may ~~will~~ be removed. The remaining rack will be lifted from the pool utilizing the lift rig described in the proceeding paragraph. In the event the remaining rack cannot be lifted with the lift rig, the rack will be cut in appropriate pieces. ~~Finally the rack structure will be lifted from the pool after being cut into appropriate parts. The rack material will be lifted with slings. The weight of a cell is approximately 270 lbs. A complete rack structure, including all seismic braces, weighs approximately 9,600 lbs.~~ Standard rigging will be used for the removal of all pieces. NUREG-0612 shall govern all picks involving the removal of components that make up the existing rack array. The rigging utilized to install and remove the Cask Pit cover shall meet the requirements of NUREG-0612.

e. Crane Maintenance

The SFCC is maintained functional per the DBNPS preventative maintenance procedures.

The proposed heavy loads compliance will be in accordance with the guidelines of NUREG-0612, which calls for measures to "provide an adequate defense-in-depth for handling of heavy loads near spent fuel...". The NUREG-0612 guidelines cite four major causes of load handling accidents, namely

i. operator errors
ii. rigging failure
iii. lack of adequate inspection
iv. inadequate procedures

The racking program ensures maximum emphasis on mitigating the potential load drop accidents by implementing measures to eliminate shortcomings in all aspects of the operation including the four aforementioned areas. A summary of the measures specifically planned to deal with the major causes is provided below.

Operator errors: As mentioned above, comprehensive training will be provided to the installation crew. All training shall be in compliance with ANSI B30.2.

Rigging failure: The lift rigs~~ing device~~ designed for movement~~handling and installation~~ of the new and existing racks have~~has~~ redundancies in the lift legs and lift eyes such that there are four independent load members in the new rack lift rig. Failure of any one load bearing member would not result in uncontrolled swing of the load, or lead to uncontrolled lowering of the load. The rigs comply~~ies~~ with all provisions of ANSI 14.6-1978, including compliance with the primary stress criteria, load testing at 300% of maximum lift load, and dye examination of critical welds.

The design of the ~~new~~ rack lift rigs~~ design~~ is similar to the rigs used in the initial racking or the re-rack of numerous other plants, such as Hope Creek, Millstone Unit 1, Indian Point Unit Two, Ulchin II, Laguna Verde, J.A. FitzPatrick, and Three Mile Island Unit 1.

The slings used to remove the parts of the existing racks will be selected, inspected, and maintained in accordance with ANSI B30.9-1971 [3.5.2].

Lack of adequate inspection: The designer of the racks has developed a set of inspection points that have been proven to eliminate any incidence of rework or erroneous installation in numerous prior re-rack projects. Surveys and measurements are performed on the storage racks prior to and subsequent to placement into the pools to ensure that the as-built dimensions and installed locations are acceptable. Measurements of the pool and floor elevations are also performed to determine actual pool configuration and to allow height adjustments of the pedestals prior to rack installation. These inspections minimize rack manipulation during placement into the pool.

Inadequate procedures: Procedures will be developed to address operations pertaining to rack removal and installation. These procedures will include, but not limited to, mobilization, rack handling, upending, lifting, installation, verticality, alignment, dummy gage testing, site safety,

7.0 FUEL HANDLING AND MECHANICAL ACCIDENTS

7.1 Introduction

The USNRC OT position paper [7.1] specifies that the design of the rack must ensure the functional integrity of the spent fuel racks under the postulated load drop events. This section contains synopses of the analyses carried out to demonstrate the regulatory compliance of the proposed racks under postulated mechanical accidents germane to the Davis-Besse Nuclear Power Station (DBNPS).

If necessary for installation personnel (i.e., underwater diver) safety during the SFP re-racking, a rack will be placed in the Transfer Pit to allow temporary storage of fuel. The Transfer Pit is a flooded pit which is connected to the SFP by a three foot wide gate. The analyses described are applicable to both the Spent Fuel Pool (SFP) and the Transfer Pit.

7.2 Description of Accidents

In the evaluation of fuel handling accidents discussed herein, the concern is with the damage to the storage racks, and the Spent Fuel Pool (SFP) and Transfer Pit structures. The configuration of the rack cell size, spacing, and neutron absorber material must remain consistent with the configurations used in the criticality and thermal-hydraulic evaluations. Maintaining these designed configurations will ensure that the results of the criticality and thermal-hydraulic evaluations remain valid.

The top of the SFP and Transfer Pit floor liner is 6'-6" higher than the elevation of the Cask Pit floor liner. Except as noted below, all drop scenarios postulated to occur in the SFP and Transfer Pit are identical to the accidents postulated for the Cask Pit - which were presented to the NRC per LAR 98-0007 (Docket Number 50-346) and approved February 29, 2000. Based on the differences in floor elevations, the results for the Cask Pit will be conservative and valid for the SFP and Transfer Pit. The initial conditions for two of the Cask Pit scenarios were modified for the SFP and Transfer Pit analyses. As there will be a heavier rack handled~~installed~~ in the SFP than was handled~~installed~~ in the Cask Pit, the weight of the dropped rack was changed. Also, shallow drop scenario 2 was re-run without the 6'-6" conservatism to give more realistic results.

Two categories of fuel assembly drop accidents are evaluated: a shallow drop and a deep drop, both of which are discussed in detail below. Each of the fuel handling accidents considers the drop of a fuel assembly, along with the portion of handling tool, which may be severed due to a single element failure. The total dropped weight is 2,482 pounds. The origin of the dropping trajectory is chosen as the highest elevation that the load can be lifted, by the Fuel Storage Handling Bridge, which is 98.13 inches above the upper elevation of the Cask Pit fuel storage racks. As explained above, a more realistic height of 18.875 inches was selected for shallow drop scenario 2.

Additional evaluations were also performed to consider the ability of the rack to withstand a 500 pound uplift force and the SFP and Transfer Pit to withstand a rack drop during installation. Material definitions are provided in Table 7.2.1.

These accident evaluations consider only the extent of rack and pool damage, and do not address fuel damage. As the new racks do not change the height of the stored fuel, and the design bases source term bounds the fuel to be stored in the racks, the design bases fuel handling accident in the Spent Fuel Pool Area remains the same.

7.2.1 Shallow Drop Events

The first category of fuel handling accidents considers a fuel assembly striking either the top of stored fuel or the top of the storage rack and is referred to herein as a "shallow drop" event. The criticality evaluation described in section 4.6.4 limits the gross cell wall deformation of the impacted and 8 surrounding cells to 8.75 inches, (4.75 inches from the top of the cell to the top of the Boral, and 4 inches of Boral deformation). The thermal-hydraulic evaluation for the racks assumed a maximum flow blockage of 50% after a drop accident, (see section 5.6). Therefore, the acceptance criteria for the shallow drop events are, a) less than or equal to 8.75 inches of cell deformation, and b) less than or equal to 50% cell blockage.

directly below the pedestal sustains a very localized compressive stress of 21 ksi, as shown in Figure 7.4.8, which results in only localized damage to the concrete.

A plan view of the finite element model for the second deep drop scenario is shown in Figure 7.4.9. This scenario considers the dropped assembly to fall through an interior cell striking the base-plate at a point near the middle of the rack This drop scenario produces some deformation of the base-plate and localized severing of the base-plate to cell wall welds. The collision between the 2482 lb. impactor and the 0.75 inch thick rack base-plate occurs at 406 in/sec initial velocity and results in an accentuated local deformation of the base-plate extending over a 26 inches square area around the impact zone. Due to the proximity of the fuel assembly lower end fitting, the shock of the initial impact is carried into the walls of the centrally located cell, and fails the connecting welds to the adjoining cells. The base-plate does not break during the impact, but the welds connecting the cells located in the vicinity of the collision area to the plate are severed.

The structural damage resulting from this scenario has no adverse effect on the coolant flow through the storage cells. The maximum calculated Von-Mises stress in the base-plate as shown in Figure 7.4.10 is 46.04 ksi and the maximum calculated plastic strain in the base-plate is 0.109, as shown in Figure 7.4.11. Figure 7.4.12 shows the deformed shape of the base-plate. The maximum displacement of the base-plate is 3.36 inches, which develops 0.0135 seconds after the initial collision and extends over less than 9 storage spaces. The maximum base-plate displacement is less than the distance to the liner plate (5¾ inches) and less than the 4 inches assumed in the criticality evaluation. Therefore, the liner integrity and criticality acceptance criteria, discussed in Section 7.2.2, are satisfied.

7.4.3 Rack Drop Event Results

Numerical analyses of the drops of the heaviest new rack (14,030 pounds) and the heaviest existing rack (22,886 pounds)~~analysis of the drop of a 14,030 pound rack~~ into the SFP or Transfer Pit shows that the rack does not pierce the ¼ inch liner. (A 12,150 pound rack was appropriately assumed for the Cask Pit analysis.) The maximum calculated Von-Mises stress for respiratory protective equipment. Activities will be governed by a Radiation Work Permit, and personnel monitoring equipment will be issued to each individual.

Divers will be used for the removal of the existing SFP racks, installation of the new racks, and removal of rack interferences in the SFP. Each diver will be equipped with extremity dosimetry, and whole body ~~and extremity~~ dosimetry with remote, above surface, readouts which will be continuously monitored by Radiation Protection (RP) personnel. Divers will also be equipped with underwater survey instrumentation with remote readout capabilities. Divers will be in continuous communication with RP personnel. Radiation surveys of the dive area will be conducted prior to each dive operation and following movement of radioactive components in the SFP. Either visual or physical barriers will be used to ensure divers maintain a safe distance from radiation sources. A safety line attached to the diver will be manned by a dive tender at all times. This line will be used as necessary to limit diver movement.

Personnel traffic and equipment movement in the SFP area will be controlled to minimize contamination and to assure exposures are maintained ALARA. Cleanup of source material, which could contribute to an excessive dose for the divers, will be performed, as necessary, in accordance with good practices to limit dose ALARA. The existing SFP filtration system, or a temporary filtration system, will be used to maintain water clarity in the SFP.

After the rack removal/installations, the lifting devices will be washed with demineralized water and wrapped as necessary for contamination controls. The lifting devices ~~rig~~ will be stored at the DBNPS site or appropriately disposed.

10.0 INSTALLATION

10.1 Introduction

The installation phase of the Davis-Besse Nuclear Power Station (DBNPS) Unit 1 Spent Fuel Pool (SFP) re-rack project will be executed by Holtec International's Field Services Division. Holtec, serving as the installer, is responsible for performance of specialized services, such as underwater diving and welding operations, as necessary. All installation work at the DBNPS is performed in compliance with NUREG-0612 (refer to Section 3.0), Holtec Quality Assurance Procedure 19.2, DBNPS project specific procedures, and applicable DBNPS procedures.

A Cask Pit cover will be required~~is necessary~~ if~~as~~ the load path of some heavy loads~~ will~~ traverse the Cask Pit when it is loaded with fuel. ~~T~~If required, the cover will be designed to ASME B & PV Code, Division 1, Subsection NF. The cover will be qualified to withstand the drop of an object of 17,530 lbs. from a height dictated by the cover design. The height and weight will be administratively controlled by procedures.

The Cask Pit cover will be a heavy load. The activities associated with the installation and removal of the cover, including the rigging, will meet the requirements of NUREG-0612

Crane operators are trained in the operation of overhead cranes per the requirements of ANSI/ASME B30.2, and the plant's specific training program. Consistent with the installer's past practices, a videotape aided training session is presented to the installation team, all of whom are required to successfully complete a written examination prior to the commencement of work. Fuel handling bridge operations are performed by the DBNPS personnel, who are trained in accordance with DBNPS procedures.

A temporary crane will be used, as necessary, to position existing racks for removal and the final positioning of the new racks. The crane will be designed using CMAA-70 and the AISC manual, to meet the intent of NUREG 0612 through a defense-in-depth approach, (see Section 3.6).

The lift rig designed for removal of the existing racks will be engaged in the corners of the racks by the diver. The lift riging device designed for handling and installation of the new racks at the DBNPS is engaged and disengaged on lift points at the bottom of the rack. TAs described in Section 3.5, the lift rigsing device complyies with the provisions of ANSI N14.6-1978 and NUREG-0612, including compliance with the design stress criteria, load testing at a multiplier of maximum working load, and nondestructive examination of critical welds.

Slings used for removal of the exiting racks will be selected, inspected, and maintained in accordance with ANSI B30.9-1971.

A surveillance and inspection program shall be maintained as part of the installation of the racks. A set of inspection points, which have been proven to eliminate any incidence of rework or erroneous installation in previous rack projects, is implemented by the installer.

Underwater diving operations are required to remove underwater obstructions and the existing racks, to aid in the rack installation by assisting in the positioning of new rack modules, and to verify installation per design. The DBNPS procedures for control of diving and radiological controls for diving operations are utilized. The DBNPS procedures are supplemented by the safe-practices guidance provided by the diving company. These documents describe the precautions and controls for dive operations and were developed utilizing OSHA Standard 29CFR-1910, Subpart T.

Holtec International developed procedures, to be used in conjunction with the DBNPS procedures, which cover the scope of activities for the rack installation effort. Similar procedures have been utilized and successfully implemented by Holtec on previous rack installation projects. These procedures are written to include ALARA practices and provide requirements to assure equipment, personnel, and plant safety. These procedures are reviewed and approved in accordance with DBNPS administrative procedures prior to use on site. The following is a list of the Holtec procedures, used in addition to the DBNPS procedures to implement the installation phase of the project.

Prior to~~ pressure washing and~~ removal of an existing rack, a quality verification shall be performed in order to ensure that no fuel assemblies remain in the module. If determined necessary based on ALARA philosophy, ~~T~~the interior of each storage location shall be subjected to pressure washing. ~~Upon completion of pressure washing rack internals, t~~The rack will then be disassembled as required for removal.

As described in Section 3.5, to facilitate removal of each rack from the Spent Fuel Pool,~~The~~ individual rack-to-wall braces and storage cells may~~will~~ be disconnected from the rack frame and removed from the pool. The remaining rack will be lifted from the pool utilizing a specifically designed lift rig. In the event the remaining rack cannot be lifted with the lift rig, the rack will be cut in appropriate pieces. ~~After being cut into appropriate size parts, the remaining rack skeletal frame and the associated rack to wall braces will be hoisted from the pool.~~ After rigging, the rack components shall be lifted a short distance and held stationary for a procedure-defined duration. The components will be removed from the pool using the Spent Fuel Cask Crane, Temporary Crane, and/or fuel handling bridge mono-rails (based on load restrictions).

The ~~cells and/or~~ rack components~~skeletal frame~~ will then be lifted slowly to a point just below the pool water surface to allow for any additional~~ pressure~~ washing of the exteriors. Upon completion of~~ pressure~~ washing, the existing rack components shall be removed from the fuel pool under Health Physics dose rate surveillance. The components shall remain over the pool until all significant dripping has abated. If required, additional volume reduction shall take place. The components shall then be transported along the safe load path to a designated location for any needed wrapping or placement into anti-contamination bags. An appropriate shipping container will arrive on site to remove the existing rack components for eventual processing.

10.7 Installation of New Racks

Installation of the new high density racks, supplied by Holtec International, involves the following activities. The racks are delivered in the horizontal position. A new rack module is removed from the shipping trailer using a suitably rated crane, while maintaining the horizontal configuration. The rack is placed on the up-ender and secured. Using two independent overhead hooks, or a single overhead hook and a spreader beam, the module is up-righted into a vertical position.

The new rack lifting device is engaged in the lift points at the bottom of the rack. The rack is then transported to a pre-leveled surface where, after leveling the rack, the appropriate quality control receipt inspection is performed. (See 10.1B & D.)

The SFP floor is inspected and any debris, which may inhibit the installation of bearing pads, is removed.

After SFP floor preparation, new rack bearing pads are positioned on the floor before the module is lowered into the pool. The new rack module is lifted with the Spent Fuel Cask Crane (SFCC) and transported along the pre-established safe load path. The rack module is carefully lowered into the SFP. A temporary hoist, with an appropriate capacity, is attached to the SFCC in order to eliminate contamination of the hook during lifting operations in the SFP. For some racks, a temporary crane (see Section 3.6) may be necessary to move racks along the pool floor to their final position on the bearing pads.

Elevation readings are taken to confirm that the module is level. In addition, rack-to-rack and rack-to-wall off-set distances are also measured. Adjustments are made as necessary to ensure compliance with design documents. The lifting device is then disengaged and removed from the SFP under Health Physics direction. As directed by procedure, post-installation free path verification is performed using an inspection gage.

If the load path of a new rack traverses the Cask Pit when it contains fuel, aA Cask Pit cover, designed to withstand a new rack load drop from an appropriate height above the operating deck shall be used to protect the fuel loaded in the Cask Pit racks. ~~This Cask Pit cover is necessary because the load path of some racks will traverse the Cask Pit as they are moved into the Spent Fuel Pool.~~

Docket Number 50-346
License Number NPF-3
Serial Number 2726
Enclosure 1
Attachment 3

REVISED PAGES

FOR THE

DESIGN AND LICENSING REPORT
DAVIS-BESSE SPENT FUEL POOL RERACK PROJECT
HOLTEC INTERNATIONAL REPORT NO. HI-992329

(13 pages attached)

- Use of a cover to protect the fuel assemblies stored temporarily in the Cask Pit or Transfer Pit during movement of heavy loads over the stored fuel.

The following are some of the salient features which make lifting heavy loads during the re-racking a safe evolution:

a. Safe Load Paths and Procedures

The Cask Pit, which will contain fuel during most of the re-racking, is located west of the SFP, between the Auxiliary Building Train Bay/Loading Area and the SFP, (see Figure 3.5-1). During re-racking the load path of some new racks may traverse the Cask Pit. In the event the loads paths traverse the Cask Pit, a Cask Pit cover shall be used to protect the fuel in the Cask Pit. The cover will be designed to ASME B & PV Code, Division 1, Subsection NF. The cover will be qualified to withstand the drop of the heaviest new rack, including rigging, from an appropriate height. The height that heavy loads may travel over the Cask Pit cover will be administratively controlled by procedures.

The Cask Pit cover is a heavy load. The activities associated with its installation and removal will be administatively controlled by procedures to meet the requirements of NUREG-0612.

Safe load paths will be identified for moving the remaining heavy loads in the Fuel Building. Safe load paths will maximize the benefits of strategic fuel shuffles that allow for the greatest distance between a heavy load and stored fuel.

Note: All fuel movements to support the re-racking will utilize the fuel handling bridge, and be controlled per the normal DBNPS fuel movement procedures.

All heavy loads are lifted in such a manner that the C.G. of the lift point is aligned with the C.G. of the load being lifted. Turnbuckles rather than slings are utilized to "fine tune" the verticality of the new rack being lifted.

Movement of heavy loads will be conducted in accordance with written procedures, which will be reviewed and approved by DBNPS.

b. Supervision of Lifts

Procedures used during the removal/installation of the SFP racks and the Cask Pit cover require supervision of heavy load lifts by a designated individual who is responsible for ensuring procedure compliance and safe lifting practices.

c. Crane Operator Training

All crew members involved in the use of the lifting and upending equipment will be given training by Holtec International using a videotape-aided instruction course which has been utilized in previous re-rack operations.

d. Lifting Devices Design and Reliability

The SFCC is comprised of a main hook rated for 140 tons as well as an auxiliary hook rated for 20 tons. A temporary hoist with an appropriate capacity will be attached to the SFCC hook to be used to prevent submergence of the hook.

The following table determines the maximum lift weight during rack installation.

Item	Weight (lbs)
Existing Rack New Rack	22,886 (maximum) 14,030 (maximum)
Lift Rig	1,000
Rigging	500
Temporary hoist	2,000
Total Lift – Existing Racks Total Lift – New Racks	26,386 17,530

It is clear, based on the heaviest rack weight to be lifted, that the heaviest load being lifted is well below the rating of the SFCC hooks. The temporary hoist to be used in conjunction with the SFCC hook will be selected to provide an adequate load capacity and comply with NUREG-0612.

Lift rigs, meeting all requirements of NUREG-0612 as a single failure proof design, will be used to lift the new and existing rack modules. Dual load paths are built into the design of the lift rigs via four independent load paths. There are four separate eye pads as well as four separate lifting rods. The design of the lift rig allows for the failure of one load path while maintaining a 5:1 safety factor in each of the remaining load paths. Therefore, the lift rigs comply with the duality feature called for in Section 5.1.6 (3a) of NUREG 0612.

The rigs have the following attributes:

- The traction rod is designed to prevent loss of its engagement with the rig in the locked position. Moreover, the locked configuration of the new rack lift rig can be directly verified from above the pool water without the aid of an underwater camera. The locked configuration for the existing rack lift rig must be verified by the diver or an underwater camera.

- The stress analysis of the rigs are carried out and the primary stress limits postulated in ANSI N14.6 [3.5.4] are met.

- The rigs are load tested with 300% of the maximum weight to be lifted. The test weight is maintained in the air for 10 minutes. All critical weld joints are liquid penetrant examined to establish the soundness of all critical joints.

The existing racks are made up of a rack structure which contains individual fuel storage cells. These racks are not free standing. There are seismic braces which are attached to the rack structure and extend out to the pool walls, (but are not attached to the wall). As necessary to facilitate rack removal, rack-to-wall seismic braces and individual cells may be removed. The remaining rack will be lifted from the pool utilizing the lift rig described in the proceeding paragraph. In the event the remaining rack cannot be lifted with the lift rig, the rack will be cut in appropriate pieces. Standard rigging will be used for the removal of all pieces. NUREG-0612 shall govern all picks involving the removal of components that make up the existing rack array. The rigging utilized to install and remove the Cask Pit cover shall meet the requirements of NUREG-0612.

e. Crane Maintenance

The SFCC is maintained functional per the DBNPS preventative maintenance procedures.

The proposed heavy loads compliance will be in accordance with the guidelines of NUREG-0612, which calls for measures to "provide an adequate defense-in-depth for handling of heavy loads near spent fuel...". The NUREG-0612 guidelines cite four major causes of load handling accidents, namely

i. operator errors
ii. rigging failure
iii. lack of adequate inspection
iv. inadequate procedures

The racking program ensures maximum emphasis on mitigating the potential load drop accidents by implementing measures to eliminate shortcomings in all aspects of the operation including the four aforementioned areas. A summary of the measures specifically planned to deal with the major causes is provided below.

Operator errors: As mentioned above, comprehensive training will be provided to the installation crew. All training shall be in compliance with ANSI B30.2.

Rigging failure: The lift rigs designed for movement of the new and existing racks have redundancies in the lift legs and lift eyes such that there are four independent load members in the new rack lift rig. Failure of any one load bearing member would not result in uncontrolled swing of the load, or lead to uncontrolled lowering of the load. The rigs comply with all provisions of ANSI 14.6-1978, including compliance with the primary stress criteria, load testing at 300% of maximum lift load, and dye examination of critical welds.

The design of the rack lift rigs is similar to the rigs used in the initial racking or the re-rack of numerous other plants, such as Hope Creek, Millstone Unit 1, Indian Point Unit Two, Ulchin II, Laguna Verde, J.A. FitzPatrick, and Three Mile Island Unit 1.

The slings used to remove the parts of the existing racks will be selected, inspected, and maintained in accordance with ANSI B30.9-1971 [3.5.2].

Lack of adequate inspection: The designer of the racks has developed a set of inspection points that have been proven to eliminate any incidence of rework or erroneous installation in numerous prior re-rack projects. Surveys and measurements are performed on the storage racks prior to and subsequent to placement into the pools to ensure that the as-built dimensions and installed locations are acceptable. Measurements of the pool and floor elevations are also performed to determine actual pool configuration and to allow height adjustments of the pedestals prior to rack installation. These inspections minimize rack manipulation during placement into the pool.

Inadequate procedures: Procedures will be developed to address operations pertaining to rack removal and installation. These procedures will include, but not limited to, mobilization, rack handling, upending, lifting, installation, verticality, alignment, dummy gage testing, site safety, and ALARA compliance. The procedures will be the successors of the procedures successfully implemented in previous projects.

Table 3.5.1 provides a synopsis of the requirements delineated in NUREG-0612, and its intended compliance.

7.0 FUEL HANDLING AND MECHANICAL ACCIDENTS

7.1 Introduction

The USNRC OT position paper [7.1] specifies that the design of the rack must ensure the functional integrity of the spent fuel racks under the postulated load drop events. This section contains synopses of the analyses carried out to demonstrate the regulatory compliance of the proposed racks under postulated mechanical accidents germane to the Davis-Besse Nuclear Power Station (DBNPS).

If necessary for installation personnel (i.e., underwater diver) safety during the SFP re-racking, a rack will be placed in the Transfer Pit to allow temporary storage of fuel. The Transfer Pit is a flooded pit which is connected to the SFP by a three foot wide gate. The analyses described are applicable to both the Spent Fuel Pool (SFP) and the Transfer Pit.

7.2 Description of Accidents

In the evaluation of fuel handling accidents discussed herein, the concern is with the damage to the storage racks, and the Spent Fuel Pool (SFP) and Transfer Pit structures. The configuration of the rack cell size, spacing, and neutron absorber material must remain consistent with the configurations used in the criticality and thermal-hydraulic evaluations. Maintaining these designed configurations will ensure that the results of the criticality and thermal-hydraulic evaluations remain valid.

The top of the SFP and Transfer Pit floor liner is 6'-6" higher than the elevation of the Cask Pit floor liner. Except as noted below, all drop scenarios postulated to occur in the SFP and Transfer Pit are identical to the accidents postulated for the Cask Pit - which were presented to the NRC per LAR 98-0007 (Docket Number 50-346) and approved February 29, 2000. Based on the differences in floor elevations, the results for the Cask Pit will be conservative and valid for the SFP and Transfer Pit. The initial conditions for two of the Cask Pit scenarios were modified for the SFP and Transfer Pit analyses. As there will be a heavier rack handled in the SFP than was handled in the Cask Pit, the weight of the dropped rack was changed. Also, shallow drop scenario 2 was re-run without the 6'-6" conservatism to give more realistic results.

Two categories of fuel assembly drop accidents are evaluated: a shallow drop and a deep drop, both of which are discussed in detail below. Each of the fuel handling accidents considers the drop of a fuel assembly, along with the portion of handling tool, which may be severed due to a single element failure. The total dropped weight is 2,482 pounds. The origin of the dropping trajectory is chosen as the highest elevation that the load can be lifted, by the Fuel Storage Handling Bridge, which is 98.13 inches above the upper elevation of the Cask Pit fuel storage racks. As explained above, a more realistic height of 18.875 inches was selected for shallow drop scenario 2.

Additional evaluations were also performed to consider the ability of the rack to withstand a 500 pound uplift force and the SFP and Transfer Pit to withstand a rack drop during installation. Material definitions are provided in Table 7.2.1.

These accident evaluations consider only the extent of rack and pool damage, and do not address fuel damage. As the new racks do not change the height of the stored fuel, and the design bases source term bounds the fuel to be stored in the racks, the design bases fuel handling accident in the Spent Fuel Pool Area remains the same.

7.2.1 Shallow Drop Events

The first category of fuel handling accidents considers a fuel assembly striking either the top of stored fuel or the top of the storage rack and is referred to herein as a "shallow drop" event. The criticality evaluation described in section 4.6.4 limits the gross cell wall deformation of the impacted and 8 surrounding cells to 8.75 inches, (4.75 inches from the top of the cell to the top of the Boral, and 4 inches of Boral deformation). The thermal-hydraulic evaluation for the racks assumed a maximum flow blockage of 50% after a drop accident, (see section 5.6). Therefore, the acceptance criteria for the shallow drop events are, a) less than or equal to 8.75 inches of cell deformation, and b) less than or equal to 50% cell blockage.

directly below the pedestal sustains a very localized compressive stress of 21 ksi, as shown in Figure 7.4.8, which results in only localized damage to the concrete.

A plan view of the finite element model for the second deep drop scenario is shown in Figure 7.4.9. This scenario considers the dropped assembly to fall through an interior cell striking the base-plate at a point near the middle of the rack This drop scenario produces some deformation of the base-plate and localized severing of the base-plate to cell wall welds. The collision between the 2482 lb. impactor and the 0.75 inch thick rack base-plate occurs at 406 in/sec initial velocity and results in an accentuated local deformation of the base-plate extending over a 26 inches square area around the impact zone. Due to the proximity of the fuel assembly lower end fitting, the shock of the initial impact is carried into the walls of the centrally located cell, and fails the connecting welds to the adjoining cells. The base-plate does not break during the impact, but the welds connecting the cells located in the vicinity of the collision area to the plate are severed.

The structural damage resulting from this scenario has no adverse effect on the coolant flow through the storage cells. The maximum calculated Von-Mises stress in the base-plate as shown in Figure 7.4.10 is 46.04 ksi and the maximum calculated plastic strain in the base-plate is 0.109, as shown in Figure 7.4.11. Figure 7.4.12 shows the deformed shape of the base-plate. The maximum displacement of the base-plate is 3.36 inches, which develops 0.0135 seconds after the initial collision and extends over less than 9 storage spaces. The maximum base-plate displacement is less than the distance to the liner plate (5¾ inches) and less than the 4 inches assumed in the criticality evaluation. Therefore, the liner integrity and criticality acceptance criteria, discussed in Section 7.2.2, are satisfied.

7.4.3 Rack Drop Event Results

Numerical analyses of the drops of the heaviest new rack (14,030 pounds) and the heaviest existing rack (22,886 pounds) into the SFP or Transfer Pit shows that the rack does not pierce the ¼ inch liner. (A 12,150 pound rack was appropriately assumed for the Cask Pit analysis.) The maximum calculated Von-Mises stress for the liner of about 26 ksi, as shown in Figure 7.4.13, is less than the failure stress of 71 ksi for the liner material. The respiratory protective equipment. Activities will be governed by a Radiation Work Permit, and personnel monitoring equipment will be issued to each individual.

Divers will be used for the removal of the existing SFP racks, installation of the new racks, and removal of rack interferences in the SFP. Each diver will be equipped with extremity dosimetry, and whole body dosimetry with remote, above surface, readouts which will be continuously monitored by Radiation Protection (RP) personnel. Divers will also be equipped with underwater survey instrumentation with remote readout capabilities. Divers will be in continuous communication with RP personnel. Radiation surveys of the dive area will be conducted prior to each dive operation and following movement of radioactive components in the SFP. Either visual or physical barriers will be used to ensure divers maintain a safe distance from radiation sources. A safety line attached to the diver will be manned by a dive tender at all times. This line will be used as necessary to limit diver movement.

Personnel traffic and equipment movement in the SFP area will be controlled to minimize contamination and to assure exposures are maintained ALARA. Cleanup of source material, which could contribute to an excessive dose for the divers, will be performed, as necessary, in accordance with good practices to limit dose ALARA. The existing SFP filtration system, or a temporary filtration system, will be used to maintain water clarity in the SFP.

After the rack removals/installations, the lifting devices will be washed with demineralized water and wrapped as necessary for contamination controls. The lifting devices will be stored at the DBNPS site or appropriately disposed.

10.0 INSTALLATION

10.1 Introduction

The installation phase of the Davis-Besse Nuclear Power Station (DBNPS) Unit 1 Spent Fuel Pool (SFP) re-rack project will be executed by Holtec International's Field Services Division. Holtec, serving as the installer, is responsible for performance of specialized services, such as underwater diving and welding operations, as necessary. All installation work at the DBNPS is performed in compliance with NUREG-0612 (refer to Section 3.0), Holtec Quality Assurance Procedure 19.2, DBNPS project specific procedures, and applicable DBNPS procedures.

A Cask Pit cover will be required if the load path of some heavy loads traverse the Cask Pit when it is loaded with fuel. If required, the cover will be designed to ASME B & PV Code, Division 1, Subsection NF. The cover will be qualified to withstand the drop of an object of 17,530 lbs. from a height dictated by the cover design. The height and weight will be administratively controlled by procedures.

The Cask Pit cover will be a heavy load. The activities associated with the installation and removal of the cover, including the rigging, will meet the requirements of NUREG-0612

Crane operators are trained in the operation of overhead cranes per the requirements of ANSI/ASME B30.2, and the plant's specific training program. Consistent with the installer's past practices, a videotape aided training session is presented to the installation team, all of whom are required to successfully complete a written examination prior to the commencement of work. Fuel handling bridge operations are performed by the DBNPS personnel, who are trained in accordance with DBNPS procedures.

A temporary crane will be used, as necessary, to position existing racks for removal and the final positioning of the new racks. The crane will be designed using CMAA-70 and the AISC manual, to meet the intent of NUREG 0612 through a defense-in-depth approach, (see Section 3.6).

The lift rig designed for removal of the existing racks will be engaged in the corners of the racks by the diver. The lift rig designed for handling and installation of the new racks at the DBNPS is engaged and disengaged on lift points at the bottom of the rack. As described in Section 3.5, the lift rigs comply with the provisions of ANSI N14.6-1978 and NUREG-0612, including compliance with the design stress criteria, load testing at a multiplier of maximum working load, and nondestructive examination of critical welds.

Slings used for removal of the exiting racks will be selected, inspected, and maintained in accordance with ANSI B30.9-1971.

A surveillance and inspection program shall be maintained as part of the installation of the racks. A set of inspection points, which have been proven to eliminate any incidence of rework or erroneous installation in previous rack projects, is implemented by the installer.

Underwater diving operations are required to remove underwater obstructions and the existing racks, to aid in the rack installation by assisting in the positioning of new rack modules, and to verify installation per design. The DBNPS procedures for control of diving and radiological controls for diving operations are utilized. The DBNPS procedures are supplemented by the safe-practices guidance provided by the diving company. These documents describe the precautions and controls for dive operations and were developed utilizing OSHA Standard 29CFR-1910, Subpart T.

Holtec International developed procedures, to be used in conjunction with the DBNPS procedures, which cover the scope of activities for the rack installation effort. Similar procedures have been utilized and successfully implemented by Holtec on previous rack installation projects. These procedures are written to include ALARA practices and provide requirements to assure equipment, personnel, and plant safety. These procedures are reviewed and approved in accordance with DBNPS administrative procedures prior to use on site. The following is a list of the Holtec procedures, used in addition to the DBNPS procedures to implement the installation phase of the project.

Prior to removal of an existing rack, a quality verification shall be performed in order to ensure that no fuel assemblies remain in the module. If determined necessary based on ALARA philosophy, the interior of each storage location shall be subjected to pressure washing. The rack will then be disassembled as required for removal.

As described in Section 3.5, to facilitate removal of each rack from the Spent Fuel Pool, individual rack-to-wall braces and storage cells may be disconnected from the rack frame and removed from the pool. The remaining rack will be lifted from the pool utilizing a specifically designed lift rig. In the event the remaining rack cannot be lifted with the lift rig, the rack will be cut in appropriate pieces. After rigging, the rack components shall be lifted a short distance and held stationary for a procedure-defined duration. The components will be removed from the pool using the Spent Fuel Cask Crane, Temporary Crane, and/or fuel handling bridge mono-rails (based on load restrictions).

The rack components will then be lifted slowly to a point just below the pool water surface to allow for any additional washing of the exteriors. Upon completion of washing, the existing rack components shall be removed from the fuel pool under Health Physics dose rate surveillance. The components shall remain over the pool until all significant dripping has abated. If required, additional volume reduction shall take place. The components shall then be transported along the safe load path to a designated location for any needed wrapping or placement into anti-contamination bags. An appropriate shipping container will arrive on site to remove the existing rack components for eventual processing.

10.7 Installation of New Racks

Installation of the new high density racks, supplied by Holtec International, involves the following activities. The racks are delivered in the horizontal position. A new rack module is removed from the shipping trailer using a suitably rated crane, while maintaining the horizontal configuration. The rack is placed on the up-ender and secured. Using two independent overhead hooks, or a single overhead hook and a spreader beam, the module is up-righted into a vertical position.

The new rack lifting device is engaged in the lift points at the bottom of the rack. The rack is then transported to a pre-leveled surface where, after leveling the rack, the appropriate quality control receipt inspection is performed. (See 10.1B & D.)

The SFP floor is inspected and any debris, which may inhibit the installation of bearing pads, is removed.

After SFP floor preparation, new rack bearing pads are positioned on the floor before the module is lowered into the pool. The new rack module is lifted with the Spent Fuel Cask Crane (SFCC) and transported along the pre-established safe load path. The rack module is carefully lowered into the SFP. A temporary hoist, with an appropriate capacity, is attached to the SFCC in order to eliminate contamination of the hook during lifting operations in the SFP. For some racks, a temporary crane (see Section 3.6) may be necessary to move racks along the pool floor to their final position on the bearing pads.

Elevation readings are taken to confirm that the module is level. In addition, rack-to-rack and rack-to-wall off-set distances are also measured. Adjustments are made as necessary to ensure compliance with design documents. The lifting device is then disengaged and removed from the SFP under Health Physics direction. As directed by procedure, post-installation free path verification is performed using an inspection gage.

If the load path of a new rack traverses the Cask Pit when it contains fuel, a Cask Pit cover, designed to withstand a new rack load drop from an appropriate height above the operating deck shall be used to protect the fuel loaded in the Cask Pit racks.

COMMITMENT LIST

THE FOLLOWING LIST IDENTIFIES THOSE ACTIONS COMMITTED TO BY THE DAVIS-BESSE NUCLEAR POWER STATION (DBNPS) IN THIS DOCUMENT. ANY OTHER ACTIONS DISCUSSED IN THE SUBMITTAL REPRESENT INTENDED OR PLANNED ACTIONS BY THE DBNPS. THEY ARE DESCRIBED ONLY FOR INFORMATION AND ARE NOT REGULATORY COMMITMENTS. PLEASE NOTIFY THE MANAGER – REGULATORY AFFAIRS (419-321-8450) AT THE DBNPS OF ANY QUESTIONS REGARDING THIS DOCUMENT OR ANY ASSOCIATED REGULATORY COMMITMENTS.

COMMITMENTS	DUE DATE
1. Section 10.6 of the Holtec International Report described plans to perform pressure washing the internals of each existing rack prior to lifting from the spent fuel pool floor. However, industry experience indicates that this pressure washing may only marginally decrease contamination levels, while 1) increasing dose levels in the water due to stirring up contamination in the bottom of the pool, and 2) decreasing water clarity. Cleaning up the water would require increased filtration and radiation exposures to change filters. Accordingly, the DBNPS plans to initially utilize pressure washing, to monitor the results, and to utilize pressure washing unless the results compel otherwise. [cover letter]	1. During implementation of the SFP re-rack plant modification.
2. The Davis-Besse Nuclear Power Station (DBNPS) Radiation Protection (RP) Section has written a procedure specifically for this project: DB-HP-01114, "Diving Operations in Contaminated Waters Near Highly Radioactive Components." This procedure will be issued for use after RP personnel have completed training to the requirements of the procedure. The procedure is in conformance with the intent of Regulatory Guide 8.38, Appendix A, and incorporates lessons-learned from NRC Information Notice 97-68. [Enclosure 1 Attachment 1 Page 1]	2. Prior to underwater diving operations in the SFP during implementation of the SFP re-rack plant modification.

COMMITMENTS	DUE DATE
3. Upon completion of each fuel shuffle, the pool will be surveyed to identify the radiation levels within the pool, with specific emphasis on the diving area. Any unacceptable radiation levels will be corrected prior to allowing a diver in the pool. [Enclosure 1 Attachment 1 Page 3]	3. During implementation of the SFP re-rack plant modification.
4. As the existing racks are removed from the pool they will be rinsed or pressure washed and surveyed. Any unacceptable survey results will require compensatory actions to reduce worker exposure. [Enclosure 1 Attachment 1 Page 4] The existing racks will be rinsed or pressure washed and monitored as they come out of the water, and the pool floor will be surveyed upon removal of the racks. [Enclosure 1 Attachment 1 Page 6]	4. During implementation of the SFP re-rack plant modification.
5. Removal of the seismic restraints (associated with the existing racks) will require some remote cutting equipment. Training on mock-ups will be completed prior to mobilization at the DBNPS to ensure equipment operability and allow training of the work crew. [Enclosure 1 Attachment 1 Page 6]	5. Prior to underwater diving operations in the SFP during implementation of the SFP re-rack plant modification.
6. Radiation Protection personnel will have training on the diver dosimetry prior to initiating re-racking. This training will be completed at a local dive tank/training facility utilizing a diver. [Enclosure 1 Attachment 1 Page 6]	6. Prior to underwater diving operations in the SFP during implementation of the SFP re-rack plant modification.
7. Physical barriers will be provided as an additional measure to preclude a diver from accidentally moving into a radiological un-safe area of the pool. The barriers will extend approximately 5 to 6 feet above the top of the racks. When the diver is below the top of the racks, the vertical side of the empty racks will form a barrier. [Enclosure 1 Attachment 1 Page 7]	7. Prior to underwater diving operations in the SFP during implementation of the SFP re-rack plant modification.