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Vice President

440-280-5382

December 18, 2019
L-19-265

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
License Amendment Request to Extend Refueling Special Lifting Devices' Interval for Testing to Verify Continuing Compliance

Pursuant to 10 CFR 50.90, the FirstEnergy Nuclear Operating Company (FENOC) is submitting an amendment to the licensing basis for the Perry Nuclear Power Plant (PNPP). The proposed change revises the PNPP Updated Safety Analysis Report (USAR) section 9.1.4.2.2.1, "Fuel Handling System," and section 9.1.5, "Control of Heavy Loads Over or Near Spent Fuel and Other Critical Plant Systems/Components." The change extends the testing to verify continuing compliance interval for either non-destructive examination (NDE) or load testing for Refueling Special Lifting Devices from the current ANSI N14.6 interval, as invoked by NUREG-0612, from annually or prior to each use, typically at each refueling outage, to a ten-year interval.

This license amendment request does not require any changes to the PNPP Technical Specifications. The enclosure provides FENOC's evaluation of the proposed change. Attachment 1 to the enclosure provides the marked-up PNPP USAR pages.

FENOC requests approval of the proposed amendment by December 31, 2020, with an implementation period of 60 days to support implementation prior to the PNPP Unit No.1 refueling outage scheduled for spring 2021.

There are no regulatory commitments contained in this submittal. If there are any questions or additional information is required, please contact Mr. Phil H. Lashley, Acting Manager – Nuclear Licensing and Regulatory Affairs, at (330) 315-6808.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 18, 2019.

Sincerely,

Frank R. Payne

Enclosure:

Evaluation of Proposed License Amendment

cc: NRC Regional III Administrator
NRC Resident Inspector
NRC Project Manager
Branch Chief, Ohio Emergency Management Agency, State of Ohio
(NRC Liaison)

Subject: License Amendment Request to Extend Refueling Special Lifting Devices' Interval for Testing to Verify Continuing Compliance

ATTACHMENTS:

1. Updated Safety Analysis Report Pages (Mark-up)

1.0 SUMMARY DESCRIPTION

Pursuant to 10 CFR 50.90, the FirstEnergy Nuclear Operating Company (FENOC) is submitting an amendment to the licensing basis for the Perry Nuclear Power Plant (PNPP).

The proposed change revises the PNPP Updated Safety Analysis Report (USAR) section 9.1.4.2.2.1, "Fuel Handling System," and section 9.1.5, "Control of Heavy Loads Over or Near Spent Fuel and Other Critical Plant Systems/Components." The change extends the testing to verify continuing compliance non-destructive examination (NDE) or load test inspection interval for refuel special lifting devices from annually or prior to each use, typically at each refueling outage, to a ten-year interval. The current interval is consistent with ANSI N14.6-1978, "American National Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials." FENOC concludes that the proposed change to extend the inspection interval is appropriate as these devices are used under controlled conditions and at frequencies of use that are substantially less severe than those possible for the type of lifting device for which ANSI N14.6-1978 was originally prepared.

This license amendment request does not require any changes to the PNPP Technical Specifications.

2.0 DETAILED DESCRIPTION

NUREG-0612, July 1980, Control of Heavy Loads at Nuclear Plants, was developed by the staff to provide adequate measures that minimize the occurrence of the principal causes of load handling accidents and to provide an adequate level of defense-in-depth for handling of heavy loads near spent fuel and safe shutdown systems. NUREG-0612 states special lifting devices should satisfy the guidelines of ANSI N14.6-1978.

ANSI N14.6-1978, section 5.3.1, "Testing to Verify Continuing Compliance," requires each special lifting device to be subjected annually (or if not used for greater than a year, then prior to use) to either 1) a load test with visual examination of critical areas including major load bearing welds, or 2) dimensional testing, visual inspection, and nondestructive testing of major load-carrying welds and critical areas.

PNPP USAR sections 9.1.4, and 9.1.5, describe compliance with NUREG-0612 for load handling and ANSI N14.6-1978 for special lifting devices.

2.1 System Design and Operation

The proposed change extends the testing to verify continuing compliance non-destructive examination (NDE) or load test inspection interval for the following refuel special lifting devices:

- Refuel Shield Strongback
- Dryer Separator Strongback
- RPV Head Strongback/Carousel
- Insulation Frame Strongback and Adapter
- Stud Strongback and Hardware

<u>Refuel Shield Strongback</u>

During reactor vessel disassembly, the refuel shield strongback is used during transport of the refueling shield from its storage location in the separator storage pool to its position to span between the reactor pressure vessel (RPV) flange and pool floor at the wall between the reactor cavity pool and dryer storage pool. Following its use, the shield is transported back to its storage location as part of reactor reassembly. During transport, the refueling shield center of gravity is not permitted to pass inside the diameter of RPV studs. The refueling shield strongback is stored on the refuel floor when not in use.

<u>Dryer Separator Strongback</u>

The dryer separator strongback is used during transport of the separator and transport of the dryer between the reactor vessel and pool storage location during reactor vessel assembly and reassembly. When not in use during the refueling outage, the strongback is normally stored on the refuel floor, or atop either the dryer or separator in the storage pool during outages. The strongback may also be used to lift the dryer and separator for repositioning in the storage pool.

<u>RPV Head Strongback/Carousel</u>

During reactor disassembly, the RPV head strongback/carousel is used during transport of the RPV head and RPV studs/tensioners from the reactor vessel to the storage location on the refuel floor. The strongback/carousel is transported back to its storage location as part of reactor reassembly. The strongback/carousel is stored on the refuel floor when not in use.

<u>Insulation Frame Strongback and Adapter</u>

During reactor vessel disassembly, the insulation frame strongback and adapter are used to transport the insulation and framework above the reactor vessel head to the storage location on the refuel floor. The strongback transports the insulation and framework back to its location above the RPV head as part of reactor reassembly. The strongback is stored on the refuel floor when not in use.

Stud Strongback and Hardware

During reactor vessel disassembly and reassembly, the stud strongback may be used to transport multiple removed reactor vessel head studs. The strongback transports the studs between the reactor flange and the storage position on the refuel floor. The strongback is stored on the refuel floor when not in use.

2.2 Current Technical Specifications Requirements

This license amendment request does not require any changes to the PNPP Technical Specifications.

2.3 Reason for the Proposed Change

Extension of the load testing or NDE interval to verify continuing compliance will result in reductions to refueling outage durations for those outages during which load testing or NDE is not required. This will correspondingly result in decreases to inspection personnel radiation exposure given that the special lifting devices may be contaminated and in high dose areas. ANSI N14.6-1978 was originally intended for devices used for handling shipping containers containing nuclear materials. In comparison, the special lifting devices for refueling at PNPP are used and stored under controlled conditions and at frequencies substantially less severe than those possible for the type of devices for which ANSI N14.6-1978 was originally intended. FENOC concludes that testing on a ten-year interval, in conjunction with continued visual inspection and dimensional testing consistent with ANSI N14.6-1978, ensures that major load-carrying welds and critical areas are adequately inspected to meet the intent of ANSI N14.6-1978 and NUREG-0612.

2.4 Description of the Proposed Change

The proposed change is to state that testing to verify continuing compliance, NDE or load testing, is to be conducted on a different interval than what is specified within ANSI N14.6-1978. As such, the licensing basis as described in the USAR is being revised to add the following:

> *"Per ANSI N14.6-1978, to verify continuing compliance, each special lifting device shall be subjected annually (period not to exceed 14 months) to a load test equal to 150% of the maximum loads to which the device is to be subjected and to visual inspection of critical areas (including major load-bearing welds) for defects, and all components shall be inspected for permanent deformation. As an alternative, the load testing may be omitted, and dimensional testing, visual inspection, and nondestructive testing of major load-carrying welds and critical areas can be performed. If the device has not been used for a period exceeding one year, this testing is not required, but is conducted before returning the device to service. For the refuel special lifting devices, i.e., the Refuel Shield*

Strongback, Dryer Separator Strongback, RPV Head Strongback/Carousel, Insulation frame Strongback and Adapter, Stud Strongback and Hardware, testing to verify continuing compliance is performed consistent with ANSI N14.6-1978 with the exception the NDE or load testing is conducted on a 10-year interval."

3.0 TECHNICAL EVALUATION

On December 22, 1980, the NRC issued Generic Letter (GL) 80-113, "Control of Heavy Loads" (Reference 2), which noted issuance of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants Resolution of Generic Technical Activity A-36" (Reference 3), and contained several recommendations for licensees relating to the handling of heavy loads. The purpose of the GL was to request that licensees review the controls for handling of heavy loads to determine the extent to which the guidelines of NUREG-0612 are presently satisfied at the licensee's facility, and to identify the changes and modifications that would be required in order to fully satisfy these guidelines. Enclosure 3 to the GL, "Request for Additional Information on Control of Heavy Loads," section 2.1.3.d, requested licensees to describe any proposed alternatives and demonstrate their equivalency in terms of load-handling reliability.

NUREG-0612 was issued in July 1980, to provide the results of the review of the handling of heavy loads including recommendations on actions that should be taken to assure safe handling of heavy loads. Within the report, recommended guidelines were included for adoption to provide adequate measures that minimize the occurrence of the principal causes of load handling accidents and to provide an adequate level of defense-in-depth for handling of heavy loads near spent fuel and safe shutdown system.

In a Cleveland Electric Illuminating (CEI) letter to the NRC, dated June 19, 1981 (Reference 6), CEI documented completion of review of control for the handling of heavy loads at the Perry Nuclear Power Plant. The conclusion of the CEI Perry Nuclear Power Plant Control of Heavy Loads Study, Revision 0, was that with the exception of specific procedures under development for the administrative control for handling heavy loads, crane inspection, testing and maintenance as well as operator qualification, there were no changes or modifications required to fully satisfy the requirements of NUREG-0612. Revision 1 of the Heavy Loads Study, which was submitted to the NRC on September 28, 1981, concluded that the result of the PNPP Heavy Load Study/Evaluation demonstrated that the estimated consequences of such a drop do not exceed the limits set by the evaluation criteria of NUREG-0612.

With regard to refuel special lifting devices, defense-in-depth is accomplished through providing for "sufficient…equipment inspection to assure reliable operation of the handling system." Guideline 4 of NUREG-0612 (section 5.1.1(4)) states that "Special Lifting Devices should satisfy the guidelines of ANSI N14.6-1978." Additionally, Guideline 4 notes that "certain inspections and load tests may be accepted in lieu of certain material requirements in the standard."

ANSI N14.6-1978 states in section 5.3, "Testing to Verify Continuing Compliance," sub-section 5.3.1 that each special lifting device shall be subjected annually (period not to exceed 14 months) to either of the following:

> (1) A load test equal to 150% of the maximum loads to which the device is to be subjected. After sustaining the test load for a period not less than 10 minutes, critical areas, including major load-bearing welds, shall be subjected to visual inspection for defects, and all components shall be inspected for permanent deformation.
>
> (2) In cases where surface cleanliness and conditions permit, the load testing may be omitted, and dimensional testing, visual inspection, and nondestructive testing of major load-carrying welds and critical areas in accordance with 5.5 of this standard shall suffice. If the device has not been used for a period exceeding one year, this testing shall not be required. However, in this event, the test shall be applied before returning the device to service.

Currently, inspections of the special lifting devices, as described in the PNPP USAR, are implemented as part of PNPP's preventative maintenance program. PNPP procedure for "Control of Lifting Operations" requires heavy load movements to be conducted using the safe load path requirements within the Heavy Load Study and/or the Perry Plant Equipment Removal Scheme. The procedure requires that any load path deviating from or not addressed in the Heavy Load study or Plant equipment Removal Scheme safe load paths be evaluated via a documented Engineering evaluation and a 10 CFR 50.59 review, as required. The requirements listed in the preventative maintenance procedures are consistent with USAR section 9.1.4.2.2.1 and ANSI N14.6-1978.

While FENOC proposes to change the NDE or load testing inspection frequency at PNPP to a ten-year interval, visual inspections that include dimensional testing will continue to be conducted on a periodicity of annually or prior to each use, typically at each refueling, on the major load-carrying welds and critical areas of the refuel special lifting devices consistent with ANSI N14.6-1978.

FENOC has evaluated the proposed change and believes the ten-year NDE or load test inspection interval to be appropriate and not compromise the reliability of the devices for the following reasons:

- The requirements in ANSI N14.6-1978 were specifically written for devices used for lifting shipping containers with much greater utilization than the PNPP refuel special lifting devices. In contrast, the refuel special lifting devices at PNPP are used intermittently. The Refuel Shield Strongback, RPV Head Strongback/Carousel, Insulation Frame Strongback, and Stud Strongback and Hardware would typically be used for two lifts per refueling outage for each device. The Dryer Separator Strongback is used for four to six lifts per refueling outage. Based upon low usage, any fatigue usage would not be of concern for evaluation. Therefore, as these devices are not subject to large numbers of repetitive load cycles causing fatigue damage, it is concluded that performing NDE or load test inspections less frequently will not result in reduction in reliability of the special lifting devices due to concerns of service-related defects attributed to fatigue.

- Visual inspection of the special lifting devices' load bearing components, to identify flaws or deficiencies that could lead to failure of the components, is required prior to each use controlled by PNPP preventive maintenance procedures. The interval for the other inspections required by ANSI N14.6 section 5.3.1 (visual, dimensional checks, etc.) will remain at annually (or if not used for greater than a year, then prior to use), typically at each refueling outage. Also, continued compliance with the incident testing and inspection requirements of ANSI N14.6 sections 5.3.2 through 5.3.8 will be maintained within the proposed amendment.

- FENOC has reviewed available records of past NDE results, from 2004 to current, which show that previous relevant indications have been evaluated. In no instance did the indications noted through NDE result in service-related defects or failures relative to the lifting function of the devices. The following table identifies the last examination method used for each special lifting device and the date of that examination.

Special Lifting Device	Method	Inspection Date
Refuel Shield Strongback	PT	8/6/18
Dryer Separator Strongback	Load Test	8/2/18
RPV Head Strongback/Carousel	PT	2/20/19
	MT	7/31/18
Insulation Frame Strongback	MT	7/26/18
Stud Strongback and Hardware	PT (Initial)	1/14/19

- The Refuel Shield Strongback, RPV Head Strongback/Carousel, Insulation Frame Strongback, Stud Strongback and Hardware, and Dryer Separator Strongback are stored and used within the containment building. The area is not subject to harsh external temperature variations or a normally wetted corrosive environment. Use and storage under these conditions provide assurances that the potential for deterioration due to environmental concerns is mitigated.

FENOC concludes that revising the NDE or load test inspection interval to ten-years is appropriate, beneficial, and will not result in any appreciable reduction in the reliability of the refuel special lifting devices' load handling capabilities when contrasted with the NDE interval specified in ANSI N14.6-1978. The proposed NDE or load testing on a ten-year interval in conjunction with continued visual inspection consistent with ANSI N14.6-1978 ensures that major load-carrying welds and critical areas are adequately inspected to meet the intent of ANSI N14.6-1978 and NUREG-0612.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

The following NRC guidance document is applicable to the proposed change.

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants, Resolution of Generic Technical Activity A36," identifies an acceptable method for Special Lifting Devices to be used in handling heavy loads in the area of the reactor vessel or spent fuel in the spent fuel pool. Section 5.1.1(4) (Guideline 4) of the NUREG states that Special Lifting Devices should satisfy the guidelines of ANSI N14.6-1978, "Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 pounds (4500 kg) or More for Nuclear Materials." This standard should apply to all Special Lifting Devices which carry heavy loads in areas as defined above.

For operating plants certain inspections and load tests may be accepted in lieu of certain material requirements in the standard. In addition, the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on characteristics of the crane which will be used. This is in lieu of the guideline in Section 3.2.1.1 of ANSI N14.6 which bases the stress design factor on only the weight (static load) of the load and of the intervening components of the special handling device.
As this section of the NUREG indicates, there are allowances for proposing alternatives to ANSI N14.6-1978 requirements toward satisfying Guideline 4. NUREG-0612 section 5.1 indicates that the following sections provide guidelines on how the defense-in-depth approach may be satisfied for various plant areas. One of the tenets of providing for defense-in-depth in NUREG-0612 is providing equipment inspection to assure reliable operation of the handling system.

The refuel special lifting devices at PNPP are used under controlled conditions and at frequencies of use that are substantially less severe than those possible for the type of devices that the ANSI N14.6-1978 standard was originally prepared. The proposed change ensures appropriate provisions for equipment inspection to assure reliable operation resulting in fulfillment of the guidelines of NUREG-0612.

USAR sections 9.1.4, Fuel Handling System, and 9.1.5, Control of Heavy Loads Over or Near Spent Fuel and Other Critical Plant Systems/Components, describe compliance with NUREG-0612 for load handling and ANSI N14.6-1978 for special lifting devices.

Therefore, the current licensing basis for the NDE or load test inspection interval as described in the USAR is consistent with ANSI N14.6-1978, section 5.3.1, does not affect plant compliance with this guidance, and will ensure that the functional capabilities and performance levels of equipment required for safe operation are met.

4.2 Precedent

This proposed change is consistent with the Technical Evaluation Report issued to the Wisconsin Public Service Corporation for the Kewaunee Nuclear Power Plant, dated March 6, 1984 (Reference 4), and Issuance of Amendment to the Northern States Power Company for the Prairie Island Nuclear Generating Plant, dated May 1, 2018 (Reference 5).

These approved changes are similar to the changes proposed in this request. There are no differences between the plant and design licensing bases with regard to load handling for PNPP and the units listed above that would affect the applicability of the change.

4.3 No Significant Hazards Consideration Determination

Pursuant to 10 CFR 50.90, the FirstEnergy Nuclear Operating Company (FENOC) hereby submits an amendment to the licensing basis for the Perry Nuclear Power Plant (PNPP). Specifically, the proposed change revises the PNPP Updated Safety Analysis Report (USAR) to modify the testing to verify continuing compliance inspection interval for refuel special lifting devices. The current NDE or load test inspection interval is consistent with ANSI N14.6-1978, “American National Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials.” FENOC concludes that the proposed change to revise the inspection interval is appropriate as these devices are used under controlled conditions and at frequencies of use that are substantially less severe than those possible for the type of lifting device for which ANSI N14.6-1978 was originally prepared. Therefore, the proposed change continues to support the NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants Resolution of Generic Technical Activity A-36,” defense-in-depth philosophy of assuring reliable operation of load handling systems through provision of sufficient equipment inspection.

FENOC has evaluated whether a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?
Response: No.

The proposed change does not impact the consequences of an accident previously evaluated as it only modifies an already existing inspection interval and does not change the manner in which heavy loads are handled using these devices. The proposed change also does not significantly increase the probability of a previously evaluated accident since the change does not alter the manner in which the devices are used and does not involve a physical change to the devices. The use of each device is infrequent and concerns of degradation due to fatigue are negligible, especially when compared to what is possible for the type of devices for which ANSI N14.6-1978 and its corresponding inspection interval were originally intended. Continued visual inspections and dimensional testing consistent with ANSI N14.6-1978 on a periodicity of annually or prior to each use, typically at each outage, will continue to provide a high degree of probability that any flaws will be detected and addressed.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any previously evaluated?

Response: No.

The proposed change impacts the frequency of NDE or load test inspections on the refuel special lifting devices. The proposed change, by its nature, does not alter the manner in which the devices are used and does not involve a physical change to the devices. It also does not change the manner in which heavy loads are handled using these devices.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed change does not impact the designs or usage of the devices in any manner, therefore, there is no impact on the margins of safety for those designs. The change extends the frequency at which NDE inspections and load testing on major load carrying welds and other critical members are performed. However, given the evaluation of available past NDE inspection results, infrequent use, continued periodic inspection, or dimensional testing, the proposed change will not result in any appreciable reduction in the reliability of the special lifting devices load handling capabilities.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, FENOC concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. American National Standard Institute, ANSI N14.6-1978. “American National Standard for Special Devices for Shipping Containers Weighing 10,000 pounds (4500 kg) or More for Nuclear Materials,” dated February 15, 1978.

2. NRC Generic Letter, GL 80-113, “Control of Heavy Loads,” dated December 22, 1980. (ADAMS Accession Number ML071080219)

3. NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants – Resolution of Generic Technical Activity A-36,” dated July 1980. (ADAMS Accession Number ML070250180)

4. Franklin Research Center Technical Evaluation Report, “Control of Heavy Loads (C-10), Wisconsin Public Service Corporation, Kewaunee Nuclear Power Plant,” dated March 6, 1984. (ADAMS Accession Number ML111672032)

5. Prairie Island Nuclear Generating Plant, Units 1 and 2 – Issuance of Amendment RE: Special Heavy Lifting Device Nondestructive Examination Frequency, dated May 1, 2018 (ADAMS Accession Number ML18100A788)

6. CEI letter from Dalwyn R. Davidson to Darrell G. Eisenhut NRC, dated 6/19/1981

Attachment 1
L-19-265

Proposed USAR Changes (Mark-up)
(10 pages follow)

9.1.4 FUEL HANDLING SYSTEM

9.1.4.1 Design Bases

The fuel handling system is designed to provide a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after post-irradiation cooling. Safe handling of fuel includes design considerations for maintaining occupational radiation exposures as low as reasonable achievable during transportation and handling.

Design criteria for major fuel handling system equipment is provided in <Table 9.1-3>, <Table 9.1-4>, <Table 9.1-5>, and <Table 9.1-6> which list the safety class, quality group and seismic category. Where applicable, the appropriate ASME, ANSI, industrial, and electrical codes are identified.

The transfer of new fuel assemblies between the new fuel unloading stand and the new fuel inspection stand and/or the new fuel storage vault is accomplished using an auxiliary hoist mounted from the 125 ton hoist of the fuel handling area crane equipped with a general purpose grapple or the fuel bundle lift hook.

The new fuel will be transferred from the new fuel vault or from the inspection stand to a 4-bundle rack on the cask pool floor using either the fuel building crane equipped with a special purpose grapple or the 1,000 pound monorail hoist on the fuel handling platform. From this point on, the fuel will be handled by the telescoping grapple on the fuel handling platform and transported to either the Spent Fuel Pool/ Fuel Prep Pool Storage Racks or the Fuel Prep Machines or the Incline Fuel Transfer System. The fuel therefore is never more than six feet above the spent fuel storage racks - thus minimizing the fresh fuel drop accident. The fuel will be transported between the reactor and fuel handling area of the intermediate buildings by the fuel transfer system. In the containment, the fuel will be handled by the telescoping grapple on the refueling platform.

These platforms are Safety Class 2 and Seismic Category I. Allowable stress due to safe shutdown earthquake loading is 120 percent of yield or 70 percent of ultimate, whichever is least. A dynamic analysis is performed on the structures using the response spectrum method with load contributions resulting from each of three earthquake components being combined by the SRSS procedure. Working loads of the platform structures are in accordance with the AISC Manual of Steel Construction. All parts of the hoist systems are designed to have a safety factor of five based on the ultimate strength of the material. A redundant load path is incorporated in the fuel hoists so that no single component failure could result in a fuel bundle drop. Maximum deflection limitations are imposed on the main structures to maintain relative stiffness of the platform. Welding of the platforms is in accordance with AWS D14-1 or ASME Boiler and Pressure Vessel Code Section 9. Gears and bearings meet AGMA Gear Classification Manual and ANSI B3.5. Materials used in construction of load bearing members are to ASTM specifications. For personnel safety, OSHA Part 1910-179 is applied. Electrical equipment and controls meet ANSI CI, National Electric Code and NEMA Publication No. IC1, MG1.

The auxiliary fuel grapple and the main telescoping fuel grapples have redundant lifting features and an indicator which confirms positive grapple engagement.

The fuel grapple is used for lifting and transporting fuel bundles. It is designed as a telescoping grapple that can extend to the proper work level and in the normal up position state can still maintain adequate water shielding over fuel. The auxiliary fuel grapple and the monorail hoist of the fuel handling platform are designed to Seismic Category I requirements.

Redundant electrical interlocks preclude the possibility of raising radioactive material out of the water. Full up travel and full down travel are set using encoders and PLC generated limits. The full up travel stop is encoder/PLC based. An independent limit switch is utilized as a backup.

Providing a separate cask loading pool, capable of being isolated from the fuel storage pool, will eliminate the potential accident of dropping the cask and rupturing the fuel storage pool. Furthermore, limitation of the travel of the crane handling the cask will preclude transporting the cask over any fuel storage pool. Refer to <Chapter 15.0> for accident considerations.

9.1.4.2 System Description

<Table 9.1-7> lists typical tools and servicing equipment supplied with the nuclear system. The sections that follow describe the use of some of the major tools and servicing equipment, and address safety aspects of the design where applicable. Sections may be performed in parallel and not as listed.

9.1.4.2.1 Spent Fuel Shipping Cask and Spent Fuel Dry Storage Casks

The initial designs of cask storage and handling facilities are based on a design cask weighing approximately 125 tons with approximate dimensions 21 feet long and 10 feet in diameter. This size cask is expected to accommodate 24 to 32 fuel bundles. A flatbed (railroad or truck) transports the cask to and from the fuel handling area of the intermediate building. The flatbed is equipped with a cask cooling system and storage area for the cask yoke. Overland offsite transportation of the cask conforms to transportation rules and regulations of <49 CFR 173>.

The cask is handled by a yoke which is attached to the cask lifting trunnions. The yoke is provided with sufficient component redundancy and design safety features to ensure that, for all postulated credible component failures, a cask drop is precluded.

Each end of the cask is equipped with an energy-absorbing crash cone. The crash cones are constructed of a stainless steel honeycomb encased in aluminum. The performance of the crash cone complies with the requirements of <49 CFR 173>.

9.1.4.2.1.1 Spent Fuel Dry Cask Storage Casks

The HI-TRAC 125D transfer cask provides shielding and structural protection of the multi-purpose canister (MPC) during loading, unloading, and movement of the MPC from the spent fuel pool to the storage overpack. The transfer cask is a multi-walled (carbon steel/ lead/carbon steel) cylindrical vessel with a neutron shield water jacket attached to the exterior. This cask can accommodate a maximum of 68 fuel assemblies. The HI-TRAC is approximately 16.8 feet long and 7.81 feet in diameter, as shown on Drawing 3768, Sheet 3 (Reference 31). The 125 ton weight designation for this transfer cask is the maximum weight of a loaded transfer cask during any loading, unloading or transfer operation. Two Pressure Relief Valves are part of the HI-TRAC transfer cask water jacket, where they perform a water/steam pressure relief function if necessary. The HI-TRAC 125D design includes a bottom pool lid which is removable to facilitate transfer of the loaded MPC into the HI-STORM 100S Version B while in a stacked cask configuration.

The HI-STORM 100S Version B is a heavy-walled steel and concrete, cylindrical vessel that provides shielding and structural protection of the MPC during storage. The HI-STORM 100S Version B is approximately 18.2 feet long and 11 feet in diameter, as shown on Drawing 4116, Sheet 3 (Reference 31). The HI-STORM 100S Version B design includes a lid which incorporates the air outlet ducts into the lid. Its side wall consists of plain (unreinforced) concrete that is enclosed between inner and outer carbon steel shells. The cask has four air inlets at the bottom and four air outlets at the top to allow air to circulate naturally through the cavity to cool the MPC inside. The inner shell has supports attached to its interior surface to guide the MPC during insertion and removal, and allow cooling air to circulate through the overpack. A loaded MPC is stored within the HI-STORM 100S Version B in a vertical orientation.

9.1.4.2.2 Overhead Bridge Cranes

9.1.4.2.2.1 Containment Polar Crane

The containment polar crane is designed to Seismic Category I requirements. The crane consists of two crane girders and a trolley. The circular runway (rails) which supports the crane girders is supported from the containment walls at Elevation 721'-0" <Figure 1.2-11> and provides for 360° rotation of the crane girders.

The trolley travels laterally on the crane girders. The main and auxiliary hoisting equipment (125 ton and 10 ton capacity, respectively) are located on the trolley.

The containment polar crane with the vessel head strongback will be used to handle the 90 ton RPV head. The polar crane with the dryer/separator strongback will be used to handle the RPV internals. Both strongbacks are designed so that no single component failure will cause the load to drop or swing uncontrollably out of an essentially horizontal attitude.

The vessel head strongback is cruciform-shaped. It attaches to the crane sister hook by means of an integral hook box and two hook pins. Each pin is capable of carrying the rated load. Each leg of the cruciform is capable of carrying the rated load.

On both ends of each leg are adjustable lifting rods, suspended vertically to attach the lifting legs to the RPV head. These are for adjustment for even four point load distribution and allow for some flexibility in diametrical location of the lifting lugs on the head.

The maximum potential drop height is at the point where the head gets lifted vertically from the vessel and before moving it horizontally to the head storage pedestals. The elevation difference from vessel flange to storage elevation is approximately 30 feet.

The shroud head load of 53 tons and the steam dryer load of 36.4 tons will both be lifted with the dryer/separator strongback.

This strongback is a cruciform shape with box-shaped sockets at the four ends. Each socket box is adjustable to accommodate the two different lug spacings on the dryer and on the shroud head. Pneumatically operated lifting pins will penetrate the sockets to engage the lifting lugs and pneumatically operated hook box pins will engage the polar crane sister hook.

Prior to initial use, ~~E~~each of the above strongbacks are load tested at 125 percent rated load or higher. At this test, measurements are taken to verify that deflections are within acceptable limits. Non-destructive testing of load bearing structural welds, in accordance with ANSI N14.6 1978, is performed after the load test to ensure structural integrity.

For lifting other loads over or near spent fuel, the Reactor Building polar crane auxiliary hoist is qualified for lifting light loads (loads less than 1048 lbs) over spent fuel, for lifting the IFTS gates near the spent fuel, as well as for other specified tools and components noted in (Reference 10) for loads up to 4,000 lbs. in accordance with administrative and maintenance procedures. When the polar crane load blocks are moved over or near spent fuel in the racks or open reactor, the main hoist shall be electrically disabled.

The polar crane is also used for the erection of major pieces of equipment during the construction phase. The containment polar crane is not used for fuel handling purposes.

9.1.4.2.2.2 Fuel Handling Area Crane

The primary purpose of the fuel handling area crane is to facilitate onsite handling of the fuel cask. This is a bridge-type crane, supported by reinforced concrete columns that spans the width of the fuel handling area. Its range of service includes the new fuel storage site, cask storage pool and cask washdown area. The fuel handling area crane rails do not extend over any portion of the spent fuel pool; thus, the cask cannot be transported over the spent fuel storage racks. The main hook has a 125 ton capacity and the auxiliary hook has a 20 ton capacity.

The original Fuel Handling Building crane furnished by P&H Harnischfeger did not meet current guidelines for designation as "single-failure-proof". The crane has a main hook rated for 125 tons that was originally qualified to "single-failure-proof" based upon NRC <Regulatory Guide 1.104> [Overhead Crane Handling Systems for Nuclear Power Plants, February 1976 (Withdrawn August 16, 1979)]. The crane was modified to comply with current guidelines for designation of the hoist for main hook as single-failure-proof, including applicable guidelines of NRC <NUREG-0554> (Single-Failure-Proof Cranes for Nuclear Power Plants, May 1979) and NRC <NUREG-0612> (Control of Heavy Loads at Nuclear Power Plants, July 1980) (Appendix C) of <NUREG-0612> applies to upgrade of existing cranes to single-failure-proof) to support spent fuel dry storage cask handling activities. Compliance with <NUREG-0554> required evaluation of existing components and upgrading of controls. (Appendix C) of <NUREG-0612> addresses the method to be used for modification of existing cranes. A <NUREG-0554> Conformance Matrix was developed to identify upgrades to the crane necessary for it to comply with applicable guidelines of <NUREG-0554> (Reference 10). A

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9.1.4.5.3 Fuel Support Grapple

The fuel support grapple has an instrumentation system consisting of mechanical switches and indicator lights. This system provides the operator with a positive indication that the grapple is properly aligned and oriented and that the grappling mechanism is either extended or retracted.

9.1.4.5.4 Other

Refer to <Table 9.1-7> for additional refueling and servicing equipment not requiring instrumentation.

9.1.4.5.5 Radiation Monitoring

The radiation monitoring equipment for the refueling and servicing equipment is discussed in <Section 12.3.4>.

9.1.5 CONTROL OF HEAVY LOADS OVER OR NEAR SPENT FUEL AND OTHER CRITICAL PLANT SYSTEMS/COMPONENTS

During the operational phase, the guidelines of <NUREG-0612>, "Control of Heavy Loads at Nuclear Power Plants," Section 5.1.1 (Phase I of <NUREG-0612>, as defined in <Generic Letter 85-11>), are complied with to reduce the potential of an uncontrolled movement or lowering of a heavy load, by adherence to the following procedures and requirements:

a. Maintenance procedures provide the necessary guidelines to ensure safe handling of heavy loads over or in the vicinity of spent fuel, fuel in the core, and safe shutdown, and decay heat removal systems and equipment.

b. Engineering evaluation and subsequent approval of a defined safe load path and rigging/lifting arrangement.

c. Specified training/qualification of crane operators, periodic testing/inspection of lifting equipment and control of lifting devices in accordance with plant administrative procedures.

d. Per ANSI N14.6-1978, to verify continuing compliance, each special lifting device shall be subjected annually (period not to exceed 14 months) to a load test equal to 150% of the maximum loads to which the device is to be subjected and to visual inspection of critical areas (including major load-bearing welds) for defects, and all components shall be inspected for permanent deformation. As an alternative, the load testing may be omitted, and dimensional testing, visual inspection, and nondestructive testing of major load-carrying welds and critical areas can be performed. If the device has not been used for a period exceeding one year, this testing is not required, but is conducted before returning the device to service. For the refuel special lifting devices, i.e., the Refuel Shield Strongback, Dryer Separator Strongback, RPV Head Strongback/Carousel, Insulation Frame Strongback and Adapter, Stud Strongback and Hardware, testing to verify continuing compliance is performed consistent with ANSI N14.6-1978 with the exception the NDE or load testing is conducted on a 10 year interval.

9.1.5.1 Introduction/Licensing Background

NRC <Generic Letter 80-113> and <Generic Letter 81-07> requested that Cleveland Electric Illuminating (CEI) review their controls for handling of heavy loads to determine the extent to which they met the guidelines in <NUREG-0612>, “Control of Heavy Loads at Nuclear Power Plants.”

In a CEI letter, dated 6/19/1981, to NRC, (Reference 11), CEI documented completion of review of controls for the handling of heavy loads at the Perry Nuclear Power Plant (PNPP). The conclusion of the CEI Perry Nuclear Plant Control of Heavy Loads Study, Revision 0, submitted by the 6/19/1981 letter, was that with the exception of specific procedures under development for the administrative control for handling heavy loads, crane inspection, testing and maintenance as well as operator qualification, there were no changes or modifications required to fully satisfy the requirements of <NUREG-0612>. Revision 1 of the Heavy Loads Study, which was submitted to the NRC on September 28, 1981, concluded that the result of the PNPP Heavy Load Study/Evaluation demonstrated that the estimated consequences of such a drop do not exceed the limits set by the evaluation criteria of <NUREG-0612>. Additional submittals from CEI were provided to the NRC on June 9, 1982; September 15, 1982; and November 8, 1982; and on January 14, 1983, (Reference 12), (Reference 13), (Reference 14), and (Reference 15).

In <Generic Letter 85-11>, the NRC staff concluded that a detailed review of the <NUREG-0612> Phase II guidelines (specifically guidelines in <Section 5.1.2>, <Section 5.1.3>, <Section 5.1.4>, <Section 5.1.5>, and <Section 5.1.6> was not necessary. The staff based its conclusion on the improvements resulting from implementation of Phase I <Section 5.1.1> requirements and the findings through a pilot review of several Phase II responses.