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SOUTHERN COMPANY
Energy to Serve Your World℠

November 7, 2001

Docket Nos. 50-348
50-364

NEL-01-0137

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

Joseph M. Farley Nuclear Plant
Facility Operating License Amendment Request
Approval of Spent-Fuel Cask Lifting Devices

Ladies and Gentlemen:

Southern Nuclear Operating Company (SNC) letter NEL-00-0291 to the Nuclear Regulatory Commission (NRC), dated December 12, 2000, provided a summary of the licensing basis for the Joseph M. Farley Nuclear Plant (FNP) spent fuel cask crane. In that letter, SNC stated its intent to submit a license amendment request to replace license conditions 2.C.3.f and 2.C.4 to facility operating licenses (FOLs) NPF-2 and NPF-8, respectively, with a commitment to the requirements of ANSI N14.6, "Radioactive Materials Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More," for design, fabrication, testing, and quality assurance requirements associated with the spent fuel cask lift device. Accordingly, SNC requests to replace license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, with a commitment to ANSI N14.6 in the FNP Updated Final Safety Analysis Report (UFSAR) as discussed herein.

In accordance with the requirements of 10 CFR 50.90, SNC requests that the NRC amend FOLs NPF-2 and NPF-8 for FNP Units 1 and 2, respectively. Specifically, license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, require NRC approval of the lifting devices which attach the spent fuel cask to the crane prior to use of the spent fuel cask crane for the purpose of moving spent fuel casks. Subsequent to issuance of FOLs NPF-2 and NPF-8, the NRC issued NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," which endorsed the use of ANSI N14.6 for the design and inspection of special lift devices thereby eliminating the need for license conditions 2.C.3.f and 2.C.4. Accordingly, SNC requests that license conditions 2.C.3.f and 2.C.4 be removed from FOLs NPF-2 and NPF-8, respectively, and replaced with a commitment in the FNP UFSAR to ANSI N14.6 for the design, fabrication, testing, and quality assurance requirements associated with the spent fuel cask lift device. SNC requests that the NRC review and approve the requested change to FOLs NPF-2 and NPF-8 prior to June 30, 2002.

It should be noted that SNC letter NEL-00-0233, dated December 8, 2000, requested NRC approval of changes to FOLs NPF-2 and NPF-8 to remove or modify obsolete conditions. NRC approval of these changes is pending and should be considered in conjunction with the change to the FOLs requested herein.

A001

SNC has reviewed the proposed amendment pursuant to 10 CFR 50.92 and determined that it does not involve a significant hazards consideration. In addition, there is no significant increase in the amounts of effluents that may be released offsite, and there is no significant increase in individual or cumulative occupational radiation exposure. Consequently, the proposed amendment satisfies the criteria of 10 CFR 51.22(c)(9) for categorical exclusion from the requirements for an environmental assessment.

Enclosure 1 provides the basis for the proposed change. Pursuant to 10 CFR 50.91, Enclosure 2 provides the basis for the determination that the proposed change does not involve a significant hazards consideration pursuant to 10 CFR 50.92. Enclosure 3 provides mark-ups of the affected FOL pages reflecting the requested amendment. Enclosure 4 provides the typed FOL pages incorporating the requested amendment.

This letter contains a formal NRC commitment to comply with the requirements of ANSI N14.6, "Radioactive Materials – Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More," as clarified by NUREG-0612, for special lift devices used in conjunction with the spent-fuel cask crane to handle loaded spent-fuel storage casks. This commitment will become effective upon NRC approval of the requested amendment.

A copy of the proposed change has been sent to Dr. D. E. Williamson, the Alabama State Designee, in accordance with 10 CFR 50.91(b)(1).

Mr. D. N. Morey, states that he is a Vice President of Southern Nuclear Operating Company and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and that, to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

D N Morey

Dave Morey

Sworn to and subscribed before me this 7th *day of* November *2001.*

Gloria H. Buie
Notary Public

My Commission expires: 06/07/2005

TWS/kw: revamndreqcaskdev.doc

Enclosures:

1. Basis for Proposed Change
2. 10 CFR 50.92 Evaluation
3. Facility Operating License Mark-up Pages
4. Facility Operating License Typed Pages

cc: Southern Nuclear Operating Company
Mr. L. M. Stinson, General Manager - Farley

U. S. Nuclear Regulatory Commission, Washington, D. C.
Mr. F. Rinaldi, Licensing Project Manager - Farley

U. S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. T. P. Johnson, Senior Resident Inspector - Farley

Alabama Department of Public Health
Dr. D. E. Williamson - State Health Officer

Enclosure 1

J. M. Farley Nuclear Power Plant
Request to Revise Facility Operating License
Approval of Spent-Fuel Cask Lifting Devices

Basis for Proposed Change

Enclosure 1

Joseph M. Farley Nuclear Plant
Facility Operating License Amendment Request
Approval of Spent-Fuel Cask Lifting Devices

Basis For Proposed Change

Description of Change

Southern Nuclear Operating Company (SNC) operates the Joseph M. Farley Nuclear Plant (FNP) in accordance with facility operating licenses (FOLs) NPF-2 and NPF-8 issued for Unit 1 and Unit 2, respectively. License conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, require that SNC not use the FNP spent fuel cask crane for the purpose of moving spent fuel casks prior to submission to and approval by the Commission of the design of the lifting devices which attach the spent fuel cask to the crane. SNC requests that the NRC remove license conditions 2.C.3.f and 2.C.4 from FOLs NPF-2 and NPF-8, respectively. Further, SNC commits to the requirements of ANSI N14.6, "Radioactive Materials Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More," for Nuclear Materials, for the spent fuel cask special lift device.

Background

The NRC review of the license application for FNP Unit 1 and Unit 2 included a review of the spent-fuel cask crane against the NRC staff's requirements found in Branch Technical Position (BTP) APCSB 9-1, "Overhead Handling Systems for Nuclear Power Plants." As documented in the NRC Safety Evaluation Report (SER) for FNP, Supplement 2, dated October 1976, the NRC concluded that the spent fuel cask crane design, inservice inspection program, and proof test program equal or exceed the staff's requirements for single-failure proof cranes found in BTP APCSB 9-1 and was therefore acceptable. However, SER Supplement 2 noted that the design of devices for lifting the spent fuel cask had not been provided and that a condition to the license would be added to require submission for NRC approval of a report describing the design of lifting devices for spent fuel casks prior to use of the crane to handle the casks. Accordingly, license conditions 2.C.3.f and 2.C.4 were added to FOLs NPF-2 and NPF-8, respectively.

Subsequent to issuing the FNP FOLs, the NRC published NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," with recommended actions that should be taken to assure safe handling of heavy loads. NUREG-0612 defines a special lift device as a lifting device that is designed specifically for handling a certain load or loads, such as lifting rigs for the reactor vessel head or vessel internals, or the lifting device for a spent fuel cask. Section 5.1.1(4) of NUREG-0612 states that special lifting devices should satisfy the guidelines of ANSI N14.6, with the clarification that 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 the characteristics of the crane which will be used.

SNC letter NEL-00-0291 to the NRC, dated December 12, 2000, provided a summary of the licensing basis for the FNP spent fuel cask crane. In that letter, SNC stated its intent to submit a license amendment request to replace license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, with a commitment to the requirements of ANSI N14.6.
ANSI N14.6, as clarified by NUREG-0612, establishes the NRC guidance for the design, fabrication, testing, maintenance, and quality assurance requirements applicable to special lifting devices used to handle heavy loads in the proximity of safe shutdown equipment and irradiated spent fuel. Issuance of NUREG-0612 and the corresponding NRC endorsement of ANSI N14.6 for special lift devices, eliminates the need for license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively.

Justification

Section 5.1.2 of NUREG-0612 provides several options for handling heavy loads in the vicinity of the spent fuel pool in a pressurized-water reactor. Specifically, Section 5.1.2(1) states, "The overhead crane and associated lifting devices used for handling heavy loads in the spent fuel pool area should satisfy the single-failure proof guidelines of Section 5.1.6 of this report." In lieu of the single-failure proof guidelines of Section 5.1.6, the FNP spent-fuel cask crane meets the guidance of BTP APCSB 9-1, as described in SNC letter NEL-00-0291 to the NRC, dated December 12, 2000. As documented in the NRC SER for FNP, Supplement 2, dated October 1976, the NRC concluded that the spent fuel cask crane design, inservice inspection program, and proof test program equal or exceed the staff's requirements for single-failure proof cranes found in BTP APCSB 9-1 and was therefore, acceptable. Accordingly, the FNP spent fuel cask crane meets the applicable guidance of Section 5.1.2(1) of NUREG-0612.

Section 5.1.6(1)(a) of NUREG-0612 states the following with regard to special lift devices:

> Special lifting devices that are used for heavy loads in the area where the crane is to be upgraded should meet ANSI N14.6-1978, Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More For Nuclear Materials, as specified in Section 5.1.1(4) of this report except that the handling device should also comply with Section 6 of ANSI N14.6-1978. If only a single lifting device is provided instead of dual devices, the special lifting device should have twice the design safety factor as required to satisfy the guidelines of Section 5.1.1(4). However, loads that have been evaluated and shown to satisfy the evaluation criteria of Section 5.1 need not have lifting devices that also comply with Section 6 of ANSI N14.6.

Section 5.1.1(4) of NUREG-0612 referenced above states that in addition to the requirements of ANSI N14.6, 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 to be used. The stress design factors provided in Section 3.2.1.1 of ANSI N14.6 are as follows:

> The load-bearing members of a special lifting device shall be capable of lifting three times the combined weight of the shipping container with which it will be used, plus the weight of intervening components of the special lifting device, without generating a combined shear stress or maximum tensile stress at any point in the device in excess of the corresponding minimum yield strength of their materials or construction. They shall also be capable of lifting five times that weight without exceeding the ultimate strength of the materials.

As stated in Section 5.1.6(1)(a) of NUREG-0612 above, special lift devices should also comply with Section 6 of ANSI N14.6-1978. Section 6.1 of ANSI N14.6-1978 requires that special lift devices be designed with load-bearing members with increased stress design factors or a dual-load path such that a single component failure or malfunction will not result in uncontrolled lowering of the load. Section 6.2 of ANSI N14.6-1978 requires that special lift devices designed with increased stress design factors instead of a dual-load path shall have its load-bearing members designed with at least twice the normal stress design factor for handling the critical load. This is consistent with Section 5.1.6(1)(a) of NUREG-0612 which states, "If only a single lifting device is provided instead of dual devices, the special lifting device should have twice the design safety factor as required to satisfy the guidelines of Section 5.1.1(4)."

Accordingly, SNC proposes to replace license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, with a commitment to comply with the design, fabrication, testing, maintenance, and quality assurance requirements of ANSI N14.6, as clarified by NUREG-0612, for special lift devices which attach the spent fuel cask to the spent fuel cask crane. Farley Nuclear Plant UFSAR Section 9.1.4.2.2.5 will be updated to reflect the commitment to provide special lifting devices for the spent fuel cask crane in accordance with ANSI N14.6, as modified by NUREG-0612, upon NRC approval of the removal of license conditions 2.C.3.f and 2.C.4 from FOLs NPF-2 and NPF-8, respectively.

Summary

During original licensing activities associated with FNP, the NRC evaluated the design of the spent fuel cask crane and concluded that it met the single-failure requirements provided in BTP APCSB 9-1 and noted that the design of the spent fuel cask lift device had not been provided for NRC review and approval. Accordingly, the NRC incorporated license conditions 2.C.3.f and 2.C.4 to the FNP Unit 1 and Unit 2 operating licenses, respectively, to prohibit use of the spent fuel cask crane for moving spent fuel casks prior to submission to and NRC approval of the design for the spent fuel cask lifting device. Subsequently, the NRC published NUREG-0612 which endorsed ANSI N14.6, as modified by NUREG-0612, for the design, fabrication, testing, and quality assurance requirements for special lift devices such as the spent fuel cask lift device. SNC requests that license conditions 2.C.3.f and 2.C.4 be removed from FOLs NPF-2 and NPF-8, respectively, and that they be replaced with a commitment in the FNP UFSAR to ANSI N14.6, as modified by NUREG-0612. SNC has determined that the requested change meets the criteria of 10 CFR 50.92 and therefore, does not involve a significant hazards consideration.

Enclosure 2

J. M. Farley Nuclear Power Plant
Request to Revise Facility Operating License
Approval of Spent-Fuel Cask Lifting Devices

10 CFR 50.92 Evaluation

Enclosure 2

J. M. Farley Nuclear Power Plant
Request to Revise Facility Operating License
Approval of Spent-Fuel Cask Lifting Devices

10 CFR 50.92 Evaluation

Proposed Change

Southern Nuclear Operating Company (SNC) operates the Joseph M. Farley Nuclear Plant (FNP) in accordance with facility operating licenses (FOLs) NPF-2 and NPF-8 issued for Unit 1 and Unit 2, respectively. License conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, require that SNC not use the FNP spent fuel cask crane for the purpose of moving spent fuel casks prior to submission to and approval by the Commission of the design of the lifting devices which attach the spent fuel cask to the crane. SNC requests that the NRC remove license conditions 2.C.3.f and 2.C.4 from FOLs NPF-2 and NPF-8, respectively. Further, SNC commits to the requirements of ANSI N14.6, "Radioactive Materials Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More," for the spent fuel cask special lift device.

Analysis

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

   The proposed change replaces license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, with a commitment in the FNP Updated Final Safety Analysis Report (UFSAR) to the requirements of ANSI N14.6, as clarified by NUREG-0612, for the design, fabrication, testing, maintenance, and quality assurance requirements applicable to the spent fuel cask special lift device. The proposed change does not involve a physical change to or require new or different operability requirements for plant systems, structures, or components. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, provides methods acceptable to the NRC for assuring the safe handling of heavy loads. NUREG-0612 endorses the use of ANSI N14.6 for the design, fabrication, testing, maintenance, and quality assurance requirements applicable to special lifting devices used to handle heavy loads in the proximity of safe shutdown equipment and irradiated spent fuel, thereby eliminating the need for license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively. Accordingly, removal of license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NFP-8, respectively, does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   The proposed change replaces license conditions 2.C.3.f and 2.C.4 from FOLs NPF-2 and NPF-8, respectively, with a commitment in the FNP UFSAR to the requirements of ANSI N14.6, as clarified by NUREG-0612, for the design, fabrication, testing, maintenance, and quality assurance requirements applicable to the spent fuel cask special lift device. The proposed change does not involve: (1) a physical change to plant systems, structures or components; or (2) require new or different operability requirements for plant systems, structures, or components. SNC's commitment to the guidance provided in ANSI N14.6, as clarified by NUREG-0612, provides assurance that the spent fuel cask special lift device, in conjunction with the use of the single-failure proof spent fuel cask crane, will preclude the possibility of a cask drop accident. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. The proposed change does not involve a significant reduction in a margin of safety?

   The proposed change does not involve a physical change to the plant or impact the operability requirements of systems, structures, or components considered important to safety. As stated above, the use of ANSI N14.6, as clarified by NUREG-0612, has been endorsed by the NRC in NUREG-0612. The proposed change replaces license conditions 2.C.3.f and 2.C.4 to FOLs NPF-2 and NPF-8, respectively, with a commitment in the FNP UFSAR to the requirements of ANSI N14.6, as clarified by NUREG-0612, for the design, fabrication, testing, maintenance, and quality assurance requirements for the spent fuel cask crane special lift device. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Conclusion

Based on the preceding analysis, Southern Nuclear has determined that the proposed change to FOLs NPF-2 and NPF-8 will not significantly increase the probability or consequences of an accident previously evaluated, create the possibility of a new or different kind of accident from any accident previously evaluated, or involve a significant reduction in a margin of safety. Therefore, Southern Nuclear has determined the proposed change meets the requirements of 10 CFR 50.92(c) and does not involve a significant hazards consideration.

Enclosure 3

J. M. Farley Nuclear Power Plant
Request to Revise Facility Operating License
Approval of Spent-Fuel Cask Lifting Devices

Marked-Up Pages

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 147, are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the issuance of the license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the license supported by a favorable evaluation by the Commission.

(a) Southern Nuclear shall not operate the reactor in Operational Modes 1 and 2 with less than three reactor coolant pumps in operation.

(b) Deleted per Amendment 13

(c) Deleted per Amendment 2

(d) Deleted per Amendment 2

(e) Deleted per Amendment ##

Deleted per Amendment 2

(f) ~~Southern Nuclear shall not use the spent fuel cask crane for the purpose of moving spent fuel casks prior to submission to and approval by the commission of the design of the lifting devices which attach the spent fuel cask to the crane.~~

(g) Southern Nuclear shall maintain a secondary water chemistry monitoring program to inhibit steam generator tube degradation. This program shall include:

1. Identification of a sampling schedule for the critical parameters and control points for these parameters;

DELETED PER AMENDMENT ##

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 137, are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Deleted per Amendment ##

(4) ~~Southern Nuclear shall not use the spent fuel cask crane for the purpose of moving spent fuel casks prior to approval by the NRC of the lifting devices which attach the spent fuel cask to the crane.~~

(5) Deleted per Amendment ##

DELETED PER AMENDMENT ###

(6) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the approved fire protection program as described on the Final Safety Analysis Report for the facility, which implements the fire protection requirements of 10 CFR 50.48 and 10 CFR 50 Appendix R. Southern Nuclear may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown.

(7) Deleted per Amendment ##

(8) Deleted per Amendment ##

(9) Deleted per Amendment ##

(10) Deleted per Amendment ##

(11) Deleted per Amendment ##

(12) Deleted per Amendment ##

(13) Deleted per Amendment ##

(14) Deleted per Amendment ##

(15) Deleted per Amendment ##

(16) Deleted per Amendment ##

Enclosure 4

J. M. Farley Nuclear Power Plant
Request to Revise Facility Operating License
Approval of Spent-Fuel Cask Lifting Devices

Typed Pages

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 147, are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the issuance of the license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the license supported by a favorable evaluation by the Commission.

(a) Southern Nuclear shall not operate the reactor in Operational Modes 1 and 2 with less than three reactor coolant pumps in operation.

(b) Deleted per Amendment 13

(c) Deleted per Amendment 2

(d) Deleted per Amendment 2

(e) Deleted per Amendment ##

Deleted per Amendment 2

(f) Deleted per Amendment ###

(g) Southern Nuclear shall maintain a secondary water chemistry monitoring program to inhibit steam generator tube degradation. This program shall include:

1. Identification of a sampling schedule for the critical parameters and control points for these parameters;

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 137, are hereby incorporated in the license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Deleted per Amendment ##

(4) Deleted per Amendment ###

(5) Deleted per Amendment ##

(6) Fire Protection

Southern Nuclear shall implement and maintain in effect all provisions of the approved fire protection program as described on the Final Safety Analysis Report for the facility, which implements the fire protection requirements of 10 CFR 50.48 and 10 CFR 50 Appendix R. Southern Nuclear may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown.

(7) Deleted per Amendment ##

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(11) Deleted per Amendment ##

(12) Deleted per Amendment ##

(13) Deleted per Amendment ##

(14) Deleted per Amendment ##

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Attachment 3

13.9 Refueling Operations

TR 13.9.5 Spent Fuel Cask Crane

TR 13.9.5 The spent fuel cask crane shall be OPERABLE.

NOTE
The spent fuel cask shall not be lifted by this crane until the design of the cask lifting devices has been reviewed and approved by the NRC.

APPLICABILITY: When handling the spent fuel cask.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Ambient air temperature less than the cold proof test temperature.	A.1 TR 13.0.3 is not applicable Derate the crane 1-1/2% of rated load for each degree F the ambient temperature is below the proof test temperature.	Immediately
B. Lifting components not meeting any of the criteria of TRS 13.9.5.2.	B.1 Suspend lifting of loads with the main hoist until the degraded components are repaired or replaced.	Immediately

G. Hydrostatic Loads

Lateral hydrostatic pressure loads and buoyant forces resulting from the displacement of ground and flood waters are applied to the structures, as discussed in section 3.4.

H. Cask Drop Loads

Special lifting devices, as discussed in Section 9.1.4.2.2.5, are provided for the cask crane operation to prevent the dropping of the cask. However, a static equivalent load of 1000 Kips (over a 38.5 ft^2 area) has been considered in the design of the spent fuel pool slab.

3.8.4.3.2 Loading Combinations

The load combinations and load factors for Category I structures listed in Section 3.8.4.1 are as follows:

$C = 1/\phi\ (1.0D + 1.0R + 1.25E\ (\text{or } 1.25W))$

$C = 1/\phi\ (1.0D + 1.25H + 1.25E\ (\text{or } 1.25W))$

$C = 1/\phi\ (1.0D + 1.0R + 1.0E')$

$C = 1/\phi\ (1.0D + 1.25H + 1.0E' + 1.0R)$

$C = 1/\phi\ (1.0D + 1.0W_t + 1.25H)$

Where:

C = required capacity of the structures.

D = dead load of structure and equipment plus any other permanent loads contributing stress, such as soil or hydrostatic loads. In addition, a portion of "live load" will be added when such load is expected to be present during plant operation. An allowance will also be made for future permanent loads.

R = force of pressure on structure due to rupture of any one pipe.

H = force on structure due to thermal expansion of pipes under operation conditions.

E = 1/2 safe shutdown earthquake resulting from horizontal ground surface acceleration of 0.05g; vertical acceleration is 2/3 horizontal acceleration.

G. American Welding Society (AWS), AWS D2.0, for welding procedures.

H. Association of Iron and Steel Engineers (AISE), for design of structural members.

I. Crane Manufacturers Association of America (CMAA), specification No. 70, for structural, mechanical, and electrical design parameters.

J. Institute of Electrical and Electronics Engineers (IEEE), for industrial controls and recommended practices.

K. National Electrical Code (NEC), for specifying wiring, insulation, and fastenings.

L. National Electric Manufacturers Association (NEMA), for specifying electrical equipment such as controls and panels.

M. Occupational Safety and Health Admistration (OSHA), for safety requirements and for maintenance and operation checkout and testing procedures.

N. Steel Structures Painting Council (SSPC), for cleaning, surface preparation, and painting specifications.

O. Local and state codes, such as the Alabama State Code and the Southern Standard Building Code.

The new fuel bridge crane and the new fuel monorail hoist were designed, fabricated, installed, and tested in accordance with applicable sections of the AISC, ANSI, ASTM, ANS, CMAA, IEEE, NEC, NEMA, OSHA, SSPC, and state and local codes as outlined above.

9.1.4.2.2.5 Spent Fuel Cask Lifting Hardware. ~~Any special handling or lifting equipment that is utilized will be provided by the reprocessing and/or spent fuel shipping contractor along with the spent fuel cask. This equipment will be designed and manufactured in accordance with good engineering practice to ensure that it will perform its intended function safely. There are no regulations or specific industry codes applicable to this equipment.~~ ← See Insert

9.1.4.2.2.6 New Fuel Bridge Crane. The new fuel bridge crane is a top running single I beam crane spanning the new fuel

INSERT

The special lift devices which are used to attach the spent fuel cask to the spent fuel cask crane comply with the design, fabrication, testing, maintenance, and quality assurance requirements of ANSI N14.6, as clarified by NUREG-0612, Control of Heavy Loads at Nuclear Power Plants.

pool from the cask storage area. The spent-fuel rods are removed from the storage racks and are placed in the cask by the spent-fuel bridge crane. When cask loading is completed, the isolation gate is installed over the transfer slot by the spent-fuel bridge crane. The cask closure head is replaced on the cask, and the cask is raised to a height sufficient to allow installation and proper torquing of all head closure bolts. The cask is removed from the cask storage area and is placed in the cask wash area. After the cask is washed and decontaminated with demineralized water, the cask is lifted from the cask wash area, replaced on the rail car (or truck), and secured and prepared for shipment offsite.

The spent-fuel cask crane is prevented from moving above or into the vicinity of the spent fuel pool by rail stops and mechanical bumpers which are permanently attached to the rails in positions as shown in figure 1.2-9. These stops limit the main hook approach to the wall, which separates the cask wash and storage areas from the transfer canal, to 6 ft 4 in. As shown on figure 1.2-1.

The spent fuel cask crane is shared between Units 1 and 2. When the spent fuel cask crane conveys the spent fuel cask from the rail siding to the Unit 1 cask wash area and then returns over the route shown in figure 9.1-16, the spent fuel cask will traverse over safety-related equipment separated by intervening floors. A similar, but opposite hand, path exists for Unit 2. ~~The lifting and transport of a spent fuel cask is limited by the Technical Requirements Manual and by conditions of the operating licenses for both units.~~

9.1.4.3 Design Evaluation

9.1.4.3.1 Safe Handling

The manipulator crane design includes the following provisions to ensure safe handling of fuel assemblies:

A. Bridge, trolley, and winch drives are mutually interlocked, using redundant interlocks, to prevent simultaneous operation of any two drives.

B. Bridge and trolley drive operation is prevented except when both gripper tube up-position switches are actuated.

C. An interlock is supplied which prevents the opening of a solenoid valve in the airline to the gripper except when zero suspended weight is indicated by a force gauge. As backup protection for this interlock, the mechanical weight actuated lock in the gripper prevents operation of the gripper under load even if air pressure is applied to the operating cylinder.

acceptable, safe, dynamic fashion to the remaining cable. If there is an exaggerated displacement of the equalizer assembly, such as that caused by a cable break, a limit switch system is activated and automatically terminates hoisting motion. From the time the limit switches are activated, the hoisting motion will be stopped within a maximum of 3 in. of vertical travel. The 3 in. of vertical travel includes the movement of the equalizer bar necessary to activate the limit switch system. Prior to making a lift, a visual inspection of the equalizer assembly will be made so that unnecessary power shutoffs do not occur. Rope readjustment should not be required until a new rope is installed on the crane. However, if the equalizer assembly needs adjustment during a lift, the load will be lowered and the adjustment would be made on the adjusting nut provided in the rope socket assembly on either end of the equalizing bar. If the equalizing bar reaches the limits of its travel, which should occur only in the event of a cable failure, the load can be safely lowered with the remaining cable after any debris has been cleared away.

In conformance with CMAA specification No. 70, the upper and lower block sheaves are a minimum of 24 rope diameters in size and, as shown in figure 9.1-11, are so arranged that active parts of each rope are located in each quadrant of the load block. The reeving system design is such that, with either or both parts of the rope retaining the load, the total holding force of all effective parts of rope will remain nearly coaxial and concentric with the vertical axis of the hooks. Each sheave in both the upper and lower load blocks is provided with retainers in both the vertical and horizontal planes. These retainers will capture and retain the sheave in the event of a sheave pin, bearing, or sheave failure. Failure of any of these items will not result in loss of load, and the load can be safely lowered and repairs effected.

The main load block is provided with redundant load carrying devices, a lifting eye and a sister hook. Each of these load carrying devices is designed to handle the full rated load and to transmit it into the load block and sheaves while providing the normal load rotational capabilities found in standard crane designs. The lifting eye and sister hook may be rotated to all degrees with respect to each other, thus allowing redundant connections to the cask lifting apparatus. The vertical position of the lifting eye can be adjusted approximately 1/4 in. relative to the sister hook. This vertical adjustment can be used to tighten the fit between a ~~redundant~~ lifting device and the lifting eye and sister hook, thus minimizing any vertical displacement of the load in the event of a load transfer from one lifting element to the other. The lifting eye and each side of the sister hook are designed for the full rated load. Each lifting device can safely support a static

special

as described in section 9.1.4.2.2.5

load of 4W, where W is the design rated load. Both lifting elements have been tested to 200 percent of design rated capacity and were given a magnetic particle inspection in accordance with ASTM-A275. The block is a safety housing type and is provided with retainers to capture the sheaves in the event of a sheave, swivel, or bearing failure. As an added conservatism in the design, the swivel has a safety factor in excess of 7.5 on ultimate strength. The loss of any of the above components will not result in the loss of load, and the load may be safely lowered to effect repairs. The specific designs of spent fuel casks and associated lifting rigs which will be used in the future are not known. However, the applicant will ensure through appropriate means that any lifting rigs for spent fuel casks at the Farley Nuclear Plant (FNP) will have had required inspections performed.

If a redundant cask lifting device is used, a failure of one half of the redundant cask lifting device, or yoke, could allow the cask to free fall downward for a small distance prior to engagement of the full load carrying capacity of the intact half of the redundant lifting device. The impact force generated in the main hoist reeving system and the total cask vertical displacement have been calculated assuming a 1/2-in. cask free fall. The highest rope impact force occurs when the trolley is at either end of the bridge and is supporting the main hoist's full rated load at the high hook position (el 209.5 ft). For an initial cask free fall height of 1/2 in. and the crane loading conditions outlined above, the rope safety factors for the impact load are 3.18 based on 16 parts rope equally sharing the load or 2.40 based on lead line pull. The total calculated downward cask movement, including free fall due to yoke failure, is 1.1 in. For the same trolley position but with the full rated load suspended at the low hook position (el 114.5 ft), total calculated downward cask movement is 1.64 in.

As shown in figure 9.1-16, the highest object which lies in the path of the spent fuel cask, as it is transported from the rail car to the spent fuel area, is the parapet at el 188 ft. Actual as-built field measurements of the parapet show that the top of the parapet ranges between a high point of el 187 ft 11 3/4 in. and a low point of el 187 ft 11 1/2 in. The design elevations of the crane runways were el 177 ft 1 1/2 in and el 154 ft 6 in. As-built field measurements have shown that the runways are essentially straight and true and are installed at el 177 ft 1 13/16 in. and el 154 ft 6 1/4 in. The actual as-built parapet and runway dimensions are such that, for a specified high hook elevation, the actual clearance between the bottom of the load and the top of the parapet is 1/2 in. greater than design.

of a factor of one-fifth the tensile strength or one-third the yield strength of the materials. Reference to the Pellini Fracture Analysis Diagram indicates that even below the nil ductility temperature (NDT) of the type of steels used, a preexisting defect 12 to 24 in. long is required to initiate a brittle crack when the stresses are in the range of 1/4 to 1/3 of the yield strength of the material. The lowest ambient temperature envisaged during operation of the crane is 30°F. While this temperature may be at or near the NDT of the thicker steels used, it is believed that the likelihood of having linear defects 12 to 24 in. long in the welds in the structural members is negligible. This reasoning is reinforced by the absence of failure of the brittle fracture mechanism of structural members of cranes made from these types of steels, which have been operating under temperature conditions far lower than 30°F.

In view of the considerations described above, it was decided that notch toughness testing of the structural members of the crane was not necessary.

Nondestructive examination using the visual method was performed on all welds and adjacent weld metal. Additional examinations for lamellar tearing were not performed, since lamellar tearing is a problem only on heavier weldments in joints where the principal loading is across the thickness of the base materials. None of the welds in the structural members of the crane falls into this category.

Preheat and postweld heat treatment was specified in the welding procedures used to fabricate the structural members of the crane; however, none of the welds was of sufficient size or thickness to necessitate the application of postweld heat treatment.

As outlined above, the spent fuel cask crane has been designed with redundant load carrying devices, redundant main hoist ropes, redundant main hoist gear trains and load brakes between the main hoist motor and main drum, safety guards on the upper sheaves, safety housing main load block, and safety hub assemblies on the main hoist drum. A single failure of any element in the load carrying path will not cause a loss of load carrying ability.

spent fuel cask crane

9.1.4.3.3 Spent Fuel Cask Crane Component Failure Evaluation

All members in the load carrying path of the spent fuel cask crane have been designed with a minimum safety factor of 5 based on the 125-ton design rated load. In many instances, the calculated safety factors exceed the design safety value of 5.