RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**124-8071**
SRP Section:	**09.01.05 – Overhead Heavy Load Handling Systems**
Application Section:	**09.01.05**
Date of RAI Issue:	**08/04/2015**

Question No. 09.01.05-4

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

DCD Tier 2, Section 9.1.5 classifies the main hoist of the Polar crane as single failure proof. The staff finds it not clear whether the polar crane auxiliary hoist is also single failure proof.

In addition, DCD Tier 2, Section 9.1.5.2.2.1 states that containment polar crane auxiliary hoist has 60-ton load block and Table 9.1.5-1 indicates capacity to be 81.6 metric tons.

The applicant is requested to provide classification of the containment polar crane auxiliary hoist, clarify its capacity, and describe features provided to control travel restrictions.

Response

The containment polar crane will be used to handle loads including the integrated head assembly, reactor vessel internals, and other necessary equipment or components in the containment during an outage. The main hoist of the polar crane is designed with single-failure-proof features so that any credible failure of a single component will not result in the loss of capability to stop and hold the critical load. The auxiliary hoist of the polar crane, which is used for routine maintenance and for inservice inspection, is not designed as single failure proof, and its control restrictions are included in the main hoist path. The DCD will be revised to clarify that the main hoist of the polar crane is designed as a single-failure-proof crane.

The capacity of the containment polar crane main hoist is 475 tons. The capacity of the containment polar crane auxiliary hoist is 90 tons. During construction, the polar crane is equipped with a special trolley arrangement that increases the load block rated capacity to 950

tons. Therefore, the DCD will be revised to correct the capacity.

Impact on DCD

DCD Tier 2, Subsection 9.1.5.2.2 and Table 9.1.5-1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

The design of the containment polar crane conforms to the requirements of ASME NOG-1, Type 1 cranes; NUREG-0612; and Section 2-1 of ASME B30.2. ~~The~~ The main hoist of the containment polar crane is designed as a single-failure-proof crane, so that a single failure will not result in the crane losing the capability to perform its safety function with the hoisting system and braking system on the drum for trolley and bridge through redundancy or duality in braking components, and through two independent reeving systems. The containment polar crane is also designed as seismic Category II in accordance with NRC RG 1.29. The dynamic behaviors according to the seismic event are restricted by the seismic restraints, which prevent the bridge or trolley from jumping the rails during an earthquake.

The containment polar crane is used to handle the IHA and RV internals. The containment polar crane, which has a ~~450~~ 475-ton-rated capacity for normal operation, is used with various lifting rigs to remove the IHA with the RV closure head and RV upper and lower internals, as described in Subsections 9.1.5.2.2.1 and 9.1.5.2.2.2. A ~~60~~ 90-ton auxiliary load block is used for routine maintenance and for inservice inspection (ISI). During construction, the polar crane is equipped with a special trolley arrangement that increases the load block rated capacity to ~~900~~ 950 tons. The crane is controlled from its bridge-mounted cab or a festooned pendant control. The polar crane is designed to maintain its integrity without dropping its load during an SSE. The main hoist of the polar crane has an inching feature that enables the crane to be properly positioned.

The normal parking position of the polar crane is based on a location that does not interface with the post-accident radiation monitoring functions.

9.1.5.2.2.1 Integrated Head Assembly

The IHA is shown in Figure 9.1.5-1. The IHA is composed of the cooling shroud assembly, lifting frame assembly, control element drive mechanism (CEDM) cooling system, missile shield, head area cable system, and seismic support system. The lifting frame assembly, including the main columns attached to the RV closure head, lifts the IHA with the RV closure head for the refueling operation. The lifting system of the IHA is designed, tested, and inspected to meet the design criteria of NUREG-0612 (Reference 22) and ANSI N14.6 (Reference 27). When the lifting system is designed, the maximum lifting crane acceleration/ deceleration dynamic load factor of 0.15 g is applied. The IHA is lifted using the main hoist of the containment polar crane.

Table 9.1.5-1 (1 of 2)

Specification of Major Equipment

Polar Crane

1. Type		Overhead bridge crane	
2. Operating device		Pendant control on operating floor, cab on crane	
3. Component supplied		Trolley	
4. Electric power supply		Power	480 V ac, 60 Hz, 3 Phase
		Space heater	120 V ac, 60 Hz, Single Phase
5. Bridge span		43.6 m (143 ft 0 in)	
6. Top level of the rail		73.5 m (241 ft 0 in)	
		Main hoist	Auxiliary hoist
7. Capacity	U.S. ~~Metric~~ ton	475 ~~430.9~~	~~81.6~~ 90
8. Lift	m (ft in)	36.88 m (121 ft 0 in)	53.34 m (175 ft 0 in)
9. Hoist coverage	m (ft in)	See Figure 9.1.4-9	
10. Hoisting speed	m/min	0.366 ~ 0.914	2.438 ~ 6.096
11. Traveling speed	m/min	Bridge: 0.366 ~ 9.144	
		Trolley: 3.048 ~ 7.62	
12. ASME NOG-1 Type		I	
13. Seismic Category		II	

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APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**124-8071**
SRP Section:	**09.01.05 – Overhead Heavy Load Handling Systems**
Application Section:	**09.01.05**
Date of RAI Issue:	**08/04/2015**

Question No. 09.01.05-5

In accordance with SRP 9.1.5, the NRC reviews overhead heavy load handling systems(OHLHS) consisting of all components and equipment for moving all heavy loads (i.e., loads weighing more than one fuel assembly and its handling device) at the plant site for compliance with the requirements of General Design Criteria (GDCs) 1, 2, 4, and 5.

DCD Tier 1, Section 2.7.4.5.1 states, “The overhead heavy load handling system (OHLHS) is a non safety-related system that handles and moves any loads greater than a fuel assembly load.” However, DCD Tier 2 Section 9.1.5 defines a heavy load as “[h]eavy loads are loads that weigh more than the weight of one fuel assembly plus its handling device. For the APR1400, a fuel assembly weighs approximately 639 kg (1,409 lb) and its handling device weighs approximately 82 kg (181 lb). For the APR1400, a heavy load is therefore any load greater than approximately 721 kg (1,590 lb).”

The applicant is requested to verify whether the definition of heavy load includes the weight of the handling devices and update DCD accordingly.

Response

The overhead heavy load handling systems(OHLHS) handles and moves heavy loads greater than a fuel assembly load plus its handling device. The DCD will be revised to clarify this point.

Impact on DCD

DCD Tier 1, Subsection 2.7.4.5.1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

2.7.4.5 Overhead Heavy Load Handling System

2.7.4.5.1 Design Description

load plus its handling device.

The overhead heavy load handling system (OHLHS) is a non safety-related system that handles and moves any loads greater than a fuel assembly ~~load.~~ OHLHS consists of one fuel handling area overhead crane, one containment polar crane, and other cranes and hoists that handle heavy loads which may damage safe shutdown equipment in the event of accidental drop.

The containment polar crane is used to handle the reactor vessel head in the area of the reactor vessel and the fuel handling area overhead crane is used to handle new fuel containers and spent fuel casks in the fuel handling area.

The containment polar crane is designed as a single-failure-proof crane so that any single failure does not result in losing the crane's capability to perform its own functions. The containment polar crane is also designed as seismic Category II and therefore, the dynamic effects arising from seismic events are restricted by the seismic restraints which prevent the bridge or trolley from leaving the rails during and after a safe shutdown earthquake (SSE).

The fuel handling area overhead crane, equipped with a cask handling hoist and a fuel handling hoist, is mounted on the rail that extends the entire length of the fuel handling area. Once fuel assemblies are received onsite, provisions are installed permanently to restrict movement of the crane over the spent fuel pool (SFP) area for safe heavy-load handling.

The fuel handling area overhead crane is designed as seismic Category II. During an SSE, the fuel handling area overhead crane and all its components retain structural integrity, and the bridge and trolley remain in place on their respective runways with their wheels prevented from leaving the tracks.

1. The functional arrangement of the OHLHS is as described in the Design Description of Subsection 2.7.4.5.1.

2. The OHLHS retains structural integrity and does not impair the ability of a seismic Category I equipment to perform its design basis safety function during or following an SSE.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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Docket No. 52-046

RAI No.:	**124-8071**
SRP Section:	**09.01.05 – Overhead Heavy Load Handling Systems**
Application Section:	**09.01.05**
Date of RAI Issue:	**08/04/2015**

Question No. 09.01.05-6

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

DCD Tier 1, Section 2.7.4.5 specifies “[t]he fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage racks.” The same statement can be found in DCD Tier 1, ITAAC Table 2.7.4.5, Item 7. However, DCD Tier 2, Section 9.1.5.3 states, “[t]he fuel handling area overhead crane is restricted from moving heavy loads over the SFP by the permanent mechanical stops installed on the rails.”

The staff finds that there is a difference between “moving new fuel over spent fuel storage racks” versus “moving heavy loads over SFP”. Also inconsistent is the acceptance criteria for Item 7 in DCD Tier 1, ITAAC Table 2.7.4.5 since it incorrectly indicates that the crane can only move over the spent fuel storage racks, which is the opposite to what is expected for such crane.

The applicant is requested to revise the DCD and ITAAC to clearly define the travel restrictions applied to the fuel handling area overhead crane.

Response

The fuel handling hoist of the fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage racks in the spent fuel pool. The cask handling hoist of the fuel handling area overhead crane is interlocked and equipped with mechanical stops to prevent moving a cask over the spent fuel storage racks in the spent fuel pool, and interlocked to prevent moving a cask over the new fuel storage racks. Therefore, the fuel handling area overhead crane, which has a fuel handling hoist and a cask handling hoist, is

restricted from moving heavy loads over the spent fuel pool. These travel restrictions will be clearly defined in the revised DCD and ITAAC.

Impact on DCD

DCD Tier 1, Subsection 2.7.4.5.1 and Table 2.7.4.5-1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

3. The containment polar crane and fuel handling area crane have seismic restraints that prevent the bridge and trolley on their respective runways with their wheels from leaving the tracks during and after an SSE.

4. The containment polar crane has the dual reeving system and at least two holding brake system.

5. OHLHS prevents the uncontrolled lowering of a heavy load.

6. The hoists of containment polar crane and the fuel handling area overhead crane are provided with two limit switches to prevent the hoisting system from two-blocking.

7. The fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage ~~racks~~.

racks in the spent fuel pool.

8. The cask handling hoist of fuel handling area overhead crane is interlocked and equipped with mechanical stops to prevent moving a cask over the spent fuel storage racks ~~and the new fuel storage racks~~.

9. The OHLHS has a control system to return to or maintain a secure holding position of critical loads in the event of a system fault.

2.7.4.5.2 Inspections, Tests, Analyses, and Acceptance Criteria

The ITAAC for the OHLHS is described in Table 2.7.4.5-1.

in the spent fuel pool, and interlocked to prevent moving a cask over the new fuel storage racks.

Table 2.7.4.5-1 (3 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. OHLHS prevents the uncontrolled lowering of a heavy load.	5. The following tests for the OHLHS will be performed in accordance with ASME NOG-1: • full-load test with a minimum of 100% of rated load in accordance with ASME NOG-1. • rated load test with a minimum of 125 % of rated load in accordance with ASME NOG-1. • no-load test in accordance with ASME NOG-1.	5. A report exist and concludes tha the as-built OHLHS operate with 100% of rated load and lower, stop and hold 125% of rated load.
6. The hoists of containment polar crane and the fuel handling area overhead crane are provided with two limit switches to prevent the hoisting system from two-blocking.	6. Tests of the fuel handling area overhead crane and containment polar crane hoists will be performed to confirm limit switches de-energize the hoist drive motor and the motor power supply.	6. The fuel handling area overhead crane and containment building polar crane hoists are equipped with the protective control system to de-energize th hoist drive motor and the motor power supply.
7. The fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage ~~racks.~~ racks in the spent fuel pool.	7. Tests of fuel handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function to limit travel.	7. The fuel handling hoist of fuel handling area overhead crane is limited by the interlock ~~to~~ to prevent travel over the spent fuel storage ~~racks.~~ racks in the spent fuel pool.
8. The cask handling hoist of fuel handling area overhead crane is interlocked and equipped with mechanical stops to prevent moving a cask over the spent fuel storage racks ~~and the new fuel storage racks.~~ in the spent fuel pool, and interlocked to prevent moving a cask over the new fuel storage racks.	8. Tests of cask handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function and mechanical stop to limit travel.	8. The cask handling hoist travel of fuel handling area overhead crane is limited by the interlock and the mechanical stops.
9. OHLHS has a control system to return to or maintain a secure holding position of critical loads in the event of a system fault.	9. Tests of the as-built OHLHS control system will be performed to assure that the as-built OHLHS returns to or maintains a secure holding position of critical loads in the event of a system.	9. The as-built control system includes safety devices which assure that the as-built OHLHS returns to and/or maintains a secure holding position of critical loads in the event of a system fault.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**124-8071**
SRP Section:	**09.01.05 – Overhead Heavy Load Handling Systems**
Application Section:	**09.01.05**
Date of RAI Issue:	**08/04/2015**

Question No. 09.01.05-7

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

DCD Tier 1, Section 2.7.4.5 specifies “[t]he fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage racks.” The same statement can be found in DCD Tier 1, ITAAC Table 2.7.4.5, Item 7. However, DCD Tier 2, Section 9.1.5.3 states, “[t]he fuel handling area overhead crane is restricted from moving heavy loads over the SFP by the permanent mechanical stops installed on the rails.”

The staff finds that there is a difference between “moving a cask over the spent fuel storage racks and the new fuel storage racks” versus “moving heavy loads over the SFP.” Also inconsistent is the design commitment for Item 8 in DCD Tier 1, ITAAC Table 2.7.4.5 since, while verifying interlocks prohibit cask travel over new fuel racks and spent fuel racks, it does not verify interlock movement restrictions over the complete spent fuel pool. Further, the staff finds that the design commitment only discusses movement of a cask over racks and does not address other heavy loads (i.e. gates, etc…) handled with the fuel handling area overhead crane.

The applicant is requested to revise the DCD and ITAAC to clearly define the travel restrictions applied to the fuel handling area overhead crane and update DCD accordingly.

Response

The fuel handling hoist of the fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage racks in the spent fuel pool. The cask handling hoist of the fuel handling area overhead crane is interlocked and equipped with mechanical

stops to prevent moving a cask over the spent fuel storage racks in the spent fuel pool, and interlocked to prevent moving a cask over the new fuel storage racks. Therefore, the fuel handling area overhead crane with its cask handling hoist and fuel handling hoist is restricted from moving heavy loads over the spent fuel pool. These travel restrictions will be clearly defined in the revised ITAAC.

The fuel handling area overhead crane will be used to handle loads from the receipt of new fuel containers, new fuel assemblies, spent fuel casks, and other necessary tools. Limit switches and interlocks located on the fuel handling area overhead crane prevent any improper operations that may result in a fuel handling accident. Therefore, the above travel restrictions restrict the operating area limit of the fuel handling area overhead crane.

DCD Tier 1, Table 2.7.4.5-1 and DCD Tier 2, Subsection 9.1.5.2.1 will be revised.

Impact on DCD

DCD Tier 1, Table 2.7.4.5-1 and DCD Tier 2, Subsection 9.1.5.2.1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

Table 2.7.4.5-1 (3 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. OHLHS prevents the uncontrolled lowering of a heavy load.	5. The following tests for the OHLHS will be performed in accordance with ASME NOG-1: • full-load test with a minimum of 100% of rated load in accordance with ASME NOG-1. • rated load test with a minimum of 125 % of rated load in accordance with ASME NOG-1. • no-load test in accordance with ASME NOG-1.	5. A report exist and concludes tha the as-built OHLHS operate with 100% of rated load and lower, stop and hold 125% of rated load.
6. The hoists of containment polar crane and the fuel handling area overhead crane are provided with two limit switches to prevent the hoisting system from two-blocking.	6. Tests of the fuel handling area overhead crane and containment polar crane hoists will be performed to confirm limit switches de-energize the hoist drive motor and the motor power supply.	6. The fuel handling area overhead crane and containment building polar crane hoists are equipped with the protective control system to de-energize th hoist drive motor and the motor power supply.
7. The fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage ~~racks.~~ racks in the spent fuel pool.	7. Tests of fuel handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function to limit travel.	7. The fuel handling hoist of fuel handling area overhead crane is limited by the interlock ~~to~~ to prevent travel over the spent fuel storage ~~racks.~~ racks in the spent fuel pool.
8. The cask handling hoist of fuel handling area overhead crane is interlocked and equipped with mechanical stops to prevent moving a cask over the spent fuel storage racks ~~and the new fuel storage racks.~~ in the spent fuel pool, and interlocked to prevent moving a cask over the new fuel storage racks.	8. Tests of cask handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function and mechanical stop to limit travel.	8. The cask handling hoist travel of fuel handling area overhead crane is limited by the interlock and the mechanical stops.
9. OHLHS has a control system to return to or maintain a secure holding position of critical loads in the event of a system fault.	9. Tests of the as-built OHLHS control system will be performed to assure that the as-built OHLHS returns to or maintains a secure holding position of critical loads in the event of a system.	9. The as-built control system includes safety devices which assure that the as-built OHLHS returns to and/or maintains a secure holding position of critical loads in the event of a system fault.

specifications of the fuel handling area overhead crane and the polar crane are given in Table 9.1.5-1. Additionally, other hoists and cranes as listed in Table 9.1.5-2 are used to handle critical heavy loads in other plant areas where their accidental drops could damage safe shutdown equipment.

The fuel handling area overhead crane will be used to handle the loads from receipt of new fuel containers, new fuel assemblies, spent fuel casks, and other necessary tools.

9.1.5.2.1 Fuel Handling Area Overhead Crane

The fuel handling area overhead crane with a cask handling hoist and a fuel handling hoist is mounted on the rail that extends the entire length of the fuel handling area. During construction, the overhead crane travels the entire rail without any provisions for restrictions; however, once fuel assemblies are onsite, provisions are installed permanently to restrict movement of the crane over the spent fuel pool (SFP) area. These provisions are mechanical, electrical, or a combination of mechanical and electrical, including the automatic stop of bridge, trolley and hoist movement, automatic control of bridge and hoist speed, and automatic cutoff of heavy load limit and lifting height. In addition, procedural and administrative controls are provided to provide reasonable assurance of safe operation for the fuel handling area overhead and to control the safe load path and safe lifting practice.

The cask handling hoist is used to transfer the shipping cask among the cask loading pit, cask decontamination pit, and truck bay. The hoist has a minimum capacity of 150 tons and incorporates a variable-speed hoist and electrical interlocks to control bridge and trolley travel.

The fuel handling hoist is used for handling the new fuel container and new fuel assemblies during transfer from the new fuel shipping container to the new fuel elevator, new fuel storage racks, or new fuel inspection station. The hoist has a minimum capacity of 10 tons and incorporates electrical interlocks to control the transfer path of the new fuel assemblies and to restrict fuel handling loads. The hoist is mechanically restricted from passing over the spent fuel racks.

The safe load handling paths of the cask handling hoist are shown in Figure 9.1.5-6. The design of the hoists and cranes conforms to the requirements of ASME NOG-1, Type II crane, CMAA-70, and Section 2-1 of ASME B30.2. The fuel handling area overhead crane conforms with the requirements of NUREG-0612, NRC RG 1.13 (Reference 11), and NRC SRP 9.1.5 and is designed as seismic Category II in accordance with NRC RG 1.29 (Reference 12). During an SSE, the fuel handling area overhead crane and all its components retain control and hold all loads up to the maximum critical load for all loading

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Question No. 09.01.05-8

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

DCD Tier 1, Section 2.7.4.5 specifies “OHLHS prevents the uncontrolled lowering of a heavy load.” Similarly, ITAAC Design Commitment for Item 5 of DCD Tier 1, Table 2.7.4.5-1 specifies ″OHLHS prevents the uncontrolled lowering of a heavy load.”

The staff finds that the testing and acceptance criteria of the ITAAC are requesting NOG-1 load tests to verify lifting capacity.

The applicant is requested to justify how lift capacity testing is sufficient to assure uncontrolled lowering of a heavy load will not occur.

Response

Both the containment polar crane and the fuel handling area overhead crane are designed to prevent a fuel handling equipment or fuel cask drop by providing special devices that are locked in a manner that will not allow the release of the fuel handling equipment or the fuel cask. Also, the overspeed switch is attached on the cranes to prevent uncontrolled lowering of a heavy load. NOG-1 load tests include the proper function testing of devices. However, the overspeed switch function test will be performed at the manufacturing shop, and it is impossible to test the overspeed switch function during power plant operation. Therefore, the testing and acceptance criteria of the ITAAC will be deleted.

Impact on DCD

DCD Tier 1, Table 2.7.4.5-1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

Delete

Table 2.7.4.5-1 (3 of 3)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
~~5. OHLHS prevents the uncontrolled lowering of a heavy load.~~	~~5. The following tests for the OHLHS will be performed in accordance with ASME NOG-1:~~ ~~• full-load test with a minimum of 100% of rated load in accordance with ASME NOG-1.~~ ~~• rated load test with a minimum of 125 % of rated load in accordance with ASME NOG-1.~~ ~~• no-load test in accordance with ASME NOG-1.~~	~~5. A report exist and concludes tha the as-built OHLHS operate with 100% of rated load and lower, stop and hold 125% of rated load.~~
5. ~~6.~~ The hoists of containment polar crane and the fuel handling area overhead crane are provided with two limit switches to prevent the hoisting system from two-blocking.	~~6.~~ Tests of the fuel handling area overhead crane and containment polar crane hoists will be performed to confirm limit switches de-energize the hoist drive motor and the motor power supply.	~~6.~~ The fuel handling area overhead crane and containment building polar crane hoists are equipped with the protective control system to de-energize th hoist drive motor and the motor power supply.
6. ~~7.~~ The fuel handling hoist of fuel handling area overhead crane is interlocked to prevent moving new fuel over the spent fuel storage racks.	~~7.~~ Tests of fuel handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function to limit travel.	~~7.~~ The fuel handling hoist of fuel handling area overhead crane is limited by the interlock to travel over the spent fuel storage racks.
7. ~~8.~~ The cask handling hoist of fuel handling area overhead crane is interlocked and equipped with mechanical stops to prevent moving a cask over the spent fuel storage racks and the new fuel storage racks.	~~8.~~ Tests of cask handling hoist of fuel handling area overhead crane will be performed to confirm the interlock function and mechanical stop to limit travel.	~~8.~~ The cask handling hoist travel of fuel handling area overhead crane is limited by the interlock and the mechanical stops.
8. ~~9.~~ OHLHS has a control system to return to or maintain a secure holding position of critical loads in the event of a system fault.	~~9.~~ Tests of the as-built OHLHS control system will be performed to assure that the as-built OHLHS returns to or maintains a secure holding position of critical loads in the event of a system.	~~9.~~ The as-built control system includes safety devices which assure that the as-built OHLHS returns to and/or maintains a secure holding position of critical loads in the event of a system fault.

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Question No. 09.01.05-9

10 CFR 52.47(a)(2) requires that a standard design certification applicant provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished.

According to Section 9.1.5 of the DCD Tier 2, the design of the hoists on the fuel handling area overhead crane will conform to the requirements of ASME NOG-1, Type II crane, CMAA-70, and Section 2-1 of ASME B30.2.

DCD Tier 2, Section 9.1.5.2.1 states “[d]uring an SSE, the fuel handling area overhead crane and all its components retain control and hold all loads up to the maximum critical load for all loading conditions, and the bridge and trolley remain in place on their respective runways with their wheels prevented from leaving the tracks. The crane is not required to be functional during and after the SSE, but structural integrity is preserved.”

As defined by NOG-1, a Type II crane is “a crane that is not used to handle a critical load. It shall be designed and constructed so that it will remain in place with or without a load during a seismic event; however, the crane need not support the load nor be operational during and after such an event. Single-failure-proof features are not required.”

The staff finds the DCD stating that the cranes will retain control and hold its load whereas, as indicated above, NOG-1 Type II cranes are not designed to support their loads during or after an SSE.

The applicant is requested to describe any additional design features provided with this Type II crane to hold all loads up to the maximum critical load for all loading conditions during SSE. The DCD should be modified accordingly.

Response

During an SSE, the fuel handling area overhead crane retains structural integrity, and the bridge and trolley remain in place on their respective runways with their wheels prevented from leaving the tracks. The crane is not required to be functional during and after the SSE, but structural integrity is preserved. The DCD will be revised to clarify this point.

Impact on DCD

DCD Tier 2, Subsection 9.1.5.2.1 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

specifications of the fuel handling area overhead crane and the polar crane are given in Table 9.1.5-1. Additionally, other hoists and cranes as listed in Table 9.1.5-2 are used to handle critical heavy loads in other plant areas where their accidental drops could damage safe shutdown equipment.

9.1.5.2.1 Fuel Handling Area Overhead Crane

The fuel handling area overhead crane with a cask handling hoist and a fuel handling hoist is mounted on the rail that extends the entire length of the fuel handling area. During construction, the overhead crane travels the entire rail without any provisions for restrictions; however, once fuel assemblies are onsite, provisions are installed permanently to restrict movement of the crane over the spent fuel pool (SFP) area. These provisions are mechanical, electrical, or a combination of mechanical and electrical, including the automatic stop of bridge, trolley and hoist movement, automatic control of bridge and hoist speed, and automatic cutoff of heavy load limit and lifting height. In addition, procedural and administrative controls are provided to provide reasonable assurance of safe operation for the fuel handling area overhead and to control the safe load path and safe lifting practice.

The cask handling hoist is used to transfer the shipping cask among the cask loading pit, cask decontamination pit, and truck bay. The hoist has a minimum capacity of 150 tons and incorporates a variable-speed hoist and electrical interlocks to control bridge and trolley travel.

The fuel handling hoist is used for handling the new fuel container and new fuel assemblies during transfer from the new fuel shipping container to the new fuel elevator, new fuel storage racks, or new fuel inspection station. The hoist has a minimum capacity of 10 tons and incorporates electrical interlocks to control the transfer path of the new fuel assemblies and to restrict fuel handling loads. The hoist is mechanically restricted from passing over the spent fuel racks.

The safe load handling paths of the cask handling hoist are shown in Figure 9.1.5-6. The design of the hoists and cranes conforms to the requirements of ASME NOG-1, Type II crane, CMAA-70, and Section 2-1 of ASME B30.2. The fuel handling area overhead crane conforms with the requirements of NUREG-0612, NRC RG 1.13 (Reference 11), and NRC SRP 9.1.5 and is designed as seismic Category II in accordance with NRC RG 1.29 (Reference 12). During an SSE, the fuel handling area overhead crane and all its components retain ~~control and hold all loads up to the maximum critical load for all loading~~

structural integrity

~~conditions~~, and the bridge and trolley remain in place on their respective runways with their wheels prevented from leaving the tracks. The crane is not required to be functional during and after the SSE, but structural integrity is preserved.

The design of the fuel handling area overhead crane limits the impact energy of postulated dropped loads on the new fuel storage racks, spent fuel storage racks, fuel transfer system fuel carrier, and SFP. The shipping cask is prevented from traveling over the new fuel storage racks and the spent fuel storage racks by mechanical stops and electrical interlocks. The defined load path prevents the shipping cask from traveling within 4 m (13 ft) of the edge of the SFP and provides reasonable assurance that the shipping cask is not lifted above the operating floor elevation. This restriction on the lift height also precludes passage of the shipping cask over the new fuel racks.

All loads that are handled over the new fuel storage racks, spent fuel storage racks, SFP, and fuel transfer system fuel carrier are limited in weight and lift height so that, if they fall, the resultant impact will not exceed the design impact energy of the fuel storage racks and SFP.

The design impact energy is equal to the postulated drop of a fuel assembly, its handling tool or a combination of both the tool and the fuel assembly, and any other fuel handling component attached to the hoisting cable during fuel assembly handling, from their maximum lifted elevation above the fuel racks during normal handling. The elevation to which the fuel assembly is lifted is limited by interlocks on the fuel handling hoist and the design of the handling tools. The weight that is lifted is limited by load interlocks and/or hoist motor stall torque.

9.1.5.2.2 Containment Polar Crane

The containment polar crane is mounted on a circular rail along the containment inside wall and travels the entire circumference of the containment. The containment polar crane has a main hoist and an auxiliary hoist to handle the various loads during refueling. Provisions are made to provide reasonable assurance of safe heavy load handling in the containment. These provisions include automatic control of the bridge and hoist, automatic control of heavy load limits and lifting height, and a load handling path to prevent any fuel damage from a heavy load drop. The safe load handling paths of the containment polar crane are shown in Figure 9.1.4-9.