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May 29, 2012

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

Attention: Mr. Jeffrey A. Ciocco

Docket No. 52-021
MHI Ref: UAP-HF-12133

Subject: MHI's 2nd Amended Response to US-APWR DCD RAI No. 616-4865 Revision 0 (SRP 09.01.05)

References:
1) "Request for Additional Information No. 616-4865 Revision 0, SRP Section 09.01.05 – Overhead Heavy Load Handling Systems – Application Section: 9.1.5", dated August 13, 2010.
2) "MHI's Response to US-APWR DCD RAI No. 616-4865 Revision 0", MHI Ref: UAP-HF-10255, dated September 22, 2010.
3) "Revised Responses for US-APWR DCD RAI Nos. 132, 156, 195, 242, 255, 318, 372, 424, 582 and 616", MHI Ref: UAP-HF-11175, dated June 7, 2011.

With this letter, Mitsubishi Heavy Industries, Ltd. ("MHI") transmits to the U.S. Nuclear Regulatory Commission ("NRC") a document entitled "Amended Response to Request for Additional Information No.616-4865 Revision 0."

Enclosed is the response to a question contained within Reference 1 that amends the response that was previously transmitted in Reference 2 and then revised in Reference 3. The RAI response itself is unchanged from that transmitted in Reference 3, but is being resubmitted to include additional markup pages to the Design Certification Document ("DCD") that were not included in Reference 3.

Please contact Mr. Joseph Tapia, General Manager of Licensing Department, Mitsubishi Nuclear Energy Systems, Inc. if the NRC has questions concerning any aspect of this submittal. His contact information is provided below.

Sincerely,

Y. Ogata

Yoshiki Ogata,
Director- APWR Promoting Department
Mitsubishi Heavy Industries, LTD.

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NRO

Enclosure:

1. Amended Response to Request for Additional Information No. 616-4865 Revision 0

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Enclosure 1

UAP-HF-12133
Docket No. 52-021

Amended Response to Request for Additional Information No. 616-4865 Revision 0

May 2012

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

05/29/2012

US-APWR Design Certification
Mitsubishi Heavy Industries
Docket No. 52-021

RAI NO.:	**NO. 616-4865 REVISION 0**
SRP SECTION:	**09.01.05 – OVERHEAD HEAVY LOAD HANDLING SYSTEM**
APPLICATION SECTION:	**09.01.05**
DATE OF RAI ISSUE:	**08/13/2010**

QUESTION NO.: 09.01.05- 18

GDC 2 and GDC 4 require Overhead Heavy Load Handling Systems (OHLHS) to be designed with the ability to withstand the effects of an earthquake and effects of a dropped load. NUREG-0612 and SRP Section 9.1.5.III.4 provide guidance for ensuring the OHLHS is designed to be a highly reliable load handling system or demonstrate by analysis that the potential consequence of a dropped load is acceptably low.

In RAI 9.1.5-01, the NRC staff requested the applicant to provide details (i.e. single failure-proof, loads, location, seismic category, etc.) for the OHLHS cranes located in areas throughout the plant where any load drop could result in damage to SSCs important to safety. In the response to RAI 9.1.5-01, the applicant clarified that, except for the polar crane and spent fuel cask handling crane, the cranes and hoists listed in Table 9.1.5-3 are not designed as single failure-proof.

Based on the staff's review of the applicant's RAI response, the applicant provided sufficient justification for the use of non-single failure-proof cranes, with the exception of the use of Hatch Hoist. In response to RAI 9.1.5-01, Table 9.1.5-3 was revised to include the Equipment Hatch Hoist as equipment that is located over Safe Shutdown Equipment (SSE). However, the RAI response did not specify which SSE would be located beneath the Hatch Hoist. Furthermore, the RAI-response indicated that the use of the Hatch Hoist would be controlled by heavy load handling procedures. If use of procedures is the applicant's only credited method to justify not handling loads when a postulated load drop could result in unacceptable consequences (since the Hatch Hoist is purported to handle critical loads over SSEs), this does not sufficiently meet the guidance of SRP 9.1.5.III.4.

Therefore, the applicant is requested to provide the following information:

- Identification of the SSEs located beneath the Hatch Hoist that could be impacted by a potential load drop from the Equipment Hatch Hoist.
- Justification for how the SRP 9.1.5.III.4 guidance would be met for Equipment Hatch Hoist.

Reference: MHI's Responses to US-APWR DCD RAI No. 292-2232; MHI Ref: UAP-HF- 09260; dated May 25, 2009; ML091490219.

ANSWER:

The equipment hatch hoist is a winch-type drum hoist that is base mounted to supports attached to the inner surface of the PCCV wall at a location approximately thirty feet above the equipment hatch. It has no arm, boom, bridge, trolley, or other mechanism by which it might move its load in a horizontal direction.

The sole function of the equipment hatch hoist is to raise and lower the equipment hatch between its operating position at the equipment hatch opening and its storage position above the equipment hatch opening. During lifting, the equipment hatch moves vertically and its lateral motion is constrained by guides. Upon reaching its storage location, the equipment hatch is locked into position and the equipment hatch hoist is deenergized. When equipment hatch closure is required, the equipment hatch hoist lowers the equipment hatch to its operating position where it is bolted into place. At no time during raising or lowering of the equipment hatch is there fuel or safety related SSC located or moved beneath the equipment hatch hoist. MHI will not classify the equipment hatch hoist as single failure-proof. The equipment hatch hoist and its associated mounting and guides are classified Seismic Category II.

The equipment hatch hoist performs no safety related function and does not handle loads where inadvertent operation or equipment malfunction, separately or in combination, could cause a significant release of radioactivity, cause a loss of margin to criticality, uncover irradiated fuel in the reactor vessel or spent fuel pool, or damage equipment essential to achieving or maintaining safe shutdown. Thus, the equipment hatch hoist does not meet criteria for inclusion in DCD Section 9.1.5, Overhead Heavy Load Handling System.

US-APWR DCD Revision 3 Tier 2 will be revised to remove reference to the equipment hatch hoist. Since the equipment hatch hoist is a commercially purchased item chosen by the COL licensee, its functional testing prior to operation will be performed by the COL applicant in accordance with accepted good engineering practice.

US-APWR DCD Revision 3 Tier 2 Chapters 3, 9, and 14 will be revised to remove equipment hatch hoist design discussions, figures, tables, table entries, and other design characterizations regarding the equipment hatch hoist.

Impact on DCD

<u>US-APWR DCD Revision 3 Tier 2 will be revised as described in the above answer and shown on the attached markups.</u>

Impact on R-COLA

There is no impact on the R-COLA.

Impact on S-COLA

There is no impact on the S-COLA.

Impact on PRA

There is no impact on the PRA.

Impact on Technical / Topical Reports

There is no impact on the Technical / Topical Reports.

Table 3.2-2 Classification of Mechanical and Fluid Systems, Components, and Equipment (Sheet 40 of 56)

System and Components	Equipment Class	Location	Quality Group	10 CFR 50 Appendix B (Reference 3.2-8)	Codes and Standards(3)	Seismic Category(4)	Notes
Equipment hatch	2	PCCV	B	YES	2	I	
Personnel hatch	2	PCCV	B	YES	2	I	
30. Miscellaneous Plant Equipment							
PCCV polar crane	5	PCCV	N/A	N/A	5	II	The main and auxiliary hoist of the polar crane, the main hoist of the spent fuel cask handling crane ~~and the equipment hatch hoist~~ are designed in accordance with ASME NOG-1 and NUREG-0554 as Type I single-failure-proof cranes.
Spent fuel cask handling crane	5	R/B	N/A	N/A	5	II	
Equipment hatch hoist	5	PCCV	N/A	N/A	5	II	
Miscellaneous cranes and hoists in reactor building	5 or 10	R/B	N/A	N/A	5	II or NS	
Miscellaneous hoists in power source buildings	5	PS/B	N/A	N/A	5	II	
Crane for SWDS in auxiliary building	5	A/B	N/A	N/A	5	NS	
31. Containment Purge System							
Containment high volume purge air handling unit	10	R/B	N/A	N/A	5	NS	
Containment high volume purge air handling unit fan	10	R/B	N/A	N/A	5	NS	
Containment high volume purge air handling unit cooling coil	10	R/B	N/A	N/A	5	NS	
Containment high volume purge air handling unit electric heating coil	10	R/B	N/A	N/A	5	NS	

DCD_09.01.05-18

Attachment

9.1.5 Overhead Heavy Load Handling System

The overhead heavy load handling system (OHLHS) consists of devices used for critical load handling evolutions. A critical load handling evolution is defined as the handling of a heavy load where inadvertent operations or equipment malfunctions, separately or in combination, could:

- Cause a significant release of radioactivity
- Cause a loss of margin to criticality
- Uncover irradiated fuel in the reactor vessel or spent fuel pool
- Damage equipment essential to achieve or maintain safe shutdown

The OHLHS exists in the reactor building, speficically the fuel storage and handling area, and in the pre-stressed concrete containment vessel (PCCV) of the reactor building. The functional arrangement and design characteristics of the OHLHS are discussed in the subsections provided below.

Heavy loads are defined as a load weighing more than one fuel assembly and its handling device. For the US-APWR, a fuel assembly weighs approximately 2,000 lbs with a handling tool weighing approximately 450 lbs. Therefore, for the US-APWR, a heavy load is defined as any load greater than the combined weight of approximately 2,450 lbs. This definition is established as a threshold for invoking the use of the OHLHS. The OHLHS is not used for the handling of new and spent fuel assemblies. New and spent fuel assemblies are handled using the light load handling system (light load handling system) defined in Section 9.1.4

9.1.5.1 Design Bases

The load that, if dropped, that would cause the greatest damage is a function of the area in which the OHLHS is operating. In the containment, this is defined as the integrated reactor head package/internals being lifted and transported to the lay down area. In the fuel handling area, this is defined as a full spent fuel cask being lifted and transported through the fuel handling area. In the area between the PCCV and the fuel handling area, this would be a reactor coolant pump motor.

The OHLHS cranes are designed to meet the criteria specified in CMAA-70, 2000, “Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes” (Ref. 9.1.7-25) and Chapter 2-1 of ASME B30.2-2005, “Overhead and Gantry Cranes” (Ref. 9.1.7-22). The PCCV polar crane main and auxiliary hoist, ~~equipment hatch hoist~~ and the spent fuel cask handling crane main hoist are designed as single-failure-proof ASME NOG-1 Type I cranes in accordance with NUREG-0554, “Single-Failure-Proof Cranes for Nuclear Power Plants”, (Ref. 9.1.7-19) and ASME NOG-1, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)” (Ref. 9.1.7-20), to handle the maximum critical loads for the area in which these cranes operate. The single-failure proof cranes each include at least two holding brakes. Each of the two required holding breakes has a torque rating of at least 125% of the rated load hoisting torque at the point of brake application. The DCD_09.01.05-18 S02

requirements of and follow the recommendations and/or guidelines of the following documents:

Scope	Reference	Reference Title
General requirements	Chapter 5, Section 5.1.1, NUREG-0612	Control of Heavy Loads at Nuclear Power Plants (Ref. 9.1.7-21)
Crane Operators (Training, qualifications, and conduct.)	Chapter 2-3, ANSI/ASME B30.2	Overhead and Gantry Cranes - Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist (Ref. 9.1.7-22)
Inspection, testing, and maintenance.	Chapter 2-2, ANSI/ASME B30.2	Overhead and Gantry Cranes - Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist (Ref. 9.1.7-22)

9.1.5.2 System Description

The primary pieces of equipment used in the OHLHS are the spent fuel cask handling crane in the fuel handling area, ~~equipment hatch hoist in the PCCV~~ and the polar crane in the PCCV. The spent fuel cask handling crane, ~~equipment hatch hoist~~ and the polar crane are designed in accordance with the provisions of NUREG-0554 and ASME NOG-1 as Type I single-failure-proof cranes. Therefore these cranes are designed to retain control of and continue to hold their maximum loads during a SSE. The OHLHS is seismic category II and Equipment Class 5, as described in Section 3.2. DCD_09.01.05-18 S02

Other than the single-failure-proof OHLHS, miscellaneous hoists and cranes with heavy load capacities are installed in safety-related areas of the US-APWR plant. Descriptions and data for all cranes and hoists that have heavy load capacities which are installed over safe shutdown equipment are given in ~~Table 9.1.5-3~~Table 9.1.5-4. The safety evaluations for those cranes and hoists are discussed in Subsection 9.1.5.3. DCD_09.01.05-18

The OHLHS also includes equipment accessories (e.g., slings, and hooks, etc.) instrumentation, physical stops and/or electrical interlocks, and associated administrative controls.

The applicable Codes and Standards are identified in Section 9.1.5.1.

9.1.5.2.1 Physical Arrangement

The areas of the plant in which the spent fuel cask handling crane and polar crane operate are shown in Figures 9.1.5-1 through 9.1.5-4. The specifications for the spent fuel cask handling crane and the polar crane are given in Table 9.1.5-1 and 9.1.5-2. As shown, the spent fuel handling crane has three load handling hooks, the main, the auxiliary, and the suspension crane. The suspension crane is only used for new fuel assembly handling between a new fuel container to the new fuel storage area or between the new fuel storage rack and the basket on the new fuel elevator. Because of this

configuration of the polar crane and by the fact; travel is limited by the circumferential rail on which the polar crane travels.

- For the heavy loads, polar crane movement is limited to exclude the area bounded by the reactor cavity by way of administrative control procedures.

- The polar crane has a seismic restraint system which precludes derailment of the either the hoist trolley or the main bridge box girders during a seismic event.

The polar crane is stored in the parked position during plant operation. The parked position for the polar crane is parallel to the centerline of the C/V running between azimuth 0° and azimuth 180° with the hoist trolley located over the roof of the pressurizer room. The polar crane is designed to be used as a structural component during steam generator (SG) replacement. The driven components are not used during SG replacement.

9.1.5.2.4 ~~Equipment Hatch Hoist~~

DCD_09.01.05-18 S02

~~During refueling. the equipment hatch is transferred up approximately 30 feet and placed in a secured position. The equipment hatch is guided upward by guides to avoid any unanticipated horizontal movement.~~

~~The equipment hatch hoist movement and storage is handled as follows:~~

- ~~The hoist is utilized only to lift the equipment hatch vertically. There are limitations on the speed the equipment hatch may be lifted by the design of the crane as a single failure proof crane and the guides in place to guide the hatch vertically.~~

- ~~The hoist does not move vertically or horizontally.~~

- ~~The equipment hatch hoist is base mounted to its support, which is designed to seismic category II requirements. The hoist supports are supported off the side of the containment.~~

~~The hoist is stored in a parked position and is not utilized for any lifts other than the equipment hatch.~~

9.1.5.3 Safety Evaluation

The OHLHS is evaluated as to its ability to, assure there is no unacceptable release of radiation through mechanical damage to fuel, prevent damage that could compromise ability to maintain adequate degree of sub criticality, uncovering of fuel in the reactor vessel or spent fuel pool, and to prevent damage that could result in loss of essential safe-shutdown functions. This is accomplished by the following:

- Limiting the travel of the spent fuel cask handling machine to the areas shown in Figures 9.1.5-1 through 9.1.5-3 by physical stops on the travel rails of the machine and the hoist carriage. The machine is fabricated and erected in accordance with the requirements of NUREG-0554 (Ref. 9.1.7-19). This is accomplished by procuring the machine in conformance with ASME NOG-1, (Ref. 9.1.7-20). All

lifting devices used for the spent fuel cask are designed and fabricated in accordance with ANSI N14.6 (Ref. 9.1.7-23) with the exception of slings which are supplied in accordance with ANSI/ASME B30.9 "Slings", (Ref. 9.1.7-24). The slings are of metallic material and have dual/redundant load paths or are capable of supporting a load twice the weight of the handled load.

- Fabricating and erecting a polar crane that complies with the requirements of NUREG-0554 (Ref. 9.1.7-19). This is accomplished by designing the crane in conformance with ASME NOG-1 (Ref. 9.1.7-20). All lifting devices are designed and fabricated in accordance with ANSI N14.6 (Ref. 9.1.7-23) with the exception of slings which are supplied in accordance with ANSI/ASME B30.9 (Ref. 9.1.7-24). The slings are of metallic material and have dual/redundant load paths or are capable of supporting a load twice the weight of the handled load.

- ~~Fabricating and erecting equipment hatch hoist that complies with the requirements of NUREG-0554 (Ref. 9.1.7-19). This is accomplished by designing the crane in conformance with ASME NOG-1 (Ref. 9.1.7-20). All slings are supplied in accordance with ANSI/ASME B30.9 (Ref. 9.1.7-24). The slings are of metallic material and have dual/redundant load paths or are capable of supporting a load twice the weight of the handled load.~~ DCD_09.01.05-18 S02

- Administrative control procedures to govern operator training, load handling instructions, and equipment inspection. The administrative control procedures are developed in accordance with ANSI/ASME B30.2 (Ref. 9.1.7-22). Administrative control procedures are also required to be used to assure that the auxiliary hoists of the spent fuel cask handling crane does not handle heavy loads that could have adverse consequences for nuclear safety.

Except for the OHLHS polar crane main and auxiliary hoist, ~~equipment hatch hoist~~ and spent fuel cask handling crane main hoist, miscellaneous cranes and hoists with heavy load capacities as listed in Table 9.1.5-1, 2~~, 3~~ and 4 are not designed as single-failure-proof. However, they are designed as seismic category II equipment to prevent unacceptable structural interaction and failure during an SSE event. The non-single-failure proof cranes and hoists in ~~Table 9.1.5-3~~Table 9.1.5-4 satisfy safety criteria for critical load handling evolutions in the following manner: DCD_09.01.05-18 DCD_09.01.05-18 DCD_09.01.05-18

- The non-single-failure-proof cranes and hoists in ~~Table 9.1.5-3~~Table 9.1.5-4 are not located over or adjacent to fuel assemblies. Therefore, a load handling incident involving the non-single-failure-proof cranes and hoists would not impact fuel assemblies. DCD_09.01.05-18

- The non-single-failure proof cranes and hoists are located over safe shutdown equipment, but the plant configuration provides redundancy by separation of the components to assure that the effects of a single load drop from these cranes and hoists would not jeopardize the ability to achieve or maintain safe shutdown conditions. The hoists associated with the safety injection pumps, CS/RHR pumps, EFW pumps, CCW pumps, and CCW Heat Exchangers are all located on the basement slab of the R/B at floor elevation -26'-4", and each equipment train has its own room. Similarly, separation for other safe shutdown equipment

serviced by non-single-failure proof cranes and hoists is achieved by walls, slabs, and/or adequate physical distance between adjacent equipment trains to assure that redundancy of safe shutdown functions is maintained in the case of a single load drop.

- The non-single-failure proof cranes and hoists are dedicated to servicing particular pieces of safe shutdown equipment (such as pumps, valves, heat exchangers, and chillers) or systems that will be out-of-service when the cranes and hoists are used for handling heavy loads over them. The use of these cranes and hoists is administratively controlled by load handling procedures to prevent overhead load handling that could cause unacceptable damage to the dedicated equipment or systems when in service.

Therefore, load handling incidents involving non-single-failure-proof cranes and hoists listed in ~~Table 9.1.5-3~~Table 9.1.5-4 will not jeopardize safe shutdown functions or cause a significant release of radioactivity, a criticality accident, or inability to cool fuel. DCD_09.01.05-18

To assure proper handling of heavy loads during the plant life, the COL Applicant is to establish a heavy load handling program, including associated procedural and administrative controls, that satisfies commitments made in Subsection 9.1.5 of the DCD, and that meets the guidance of ANSI/ASME B30.2, ANSI/ASME B30.9, ANSI N14.6, ASME NOG-1, CMAA Specification 70-2000, NUREG-0554, NUREG-0612, and NUREG-0800, Section 9.1.5. During the operating life of the plant, it is anticipated that temporarily installed hoists and mobile cranes will also be used for plant maintenance. The heavy load handling program will include temporary cranes and hoists. The heavy load handling program will adopt a defense-in-depth strategy to enhance safety when handling heavy loads. For instance, the program will restrict lift heights to practical minimums and limit lifting activities as much as practical to plant modes in which load drops have the smallest potential for adverse consequences, particularly when critical loads are being handled. Further, prior to the lifting of heavy loads after initial fuel loading, the program will institute any additional reviews as necessary to assure that potential drops of these loads due to inadvertent operations or equipment malfunctions, separately or in combination, will not jeopardize safe shutdown functions, cause a significant release of radioactivity, a criticality accident, or inability to cool fuel within the reactor vessel or spent fuel pool.

9.1.5.4 Inspection and Testing Requirements

The OHLHS components are subjected to various tests and inspections prior to being placed in service and are the subject of an inspection, tests, analyses, and acceptance criteria (ITAAC) program, which is detailed in Chapter 14, Section 14.3.

During fabrication, the quality assurance program of the Manufacturer satisfies the requirements of ASME NQA-1. The manufacturer's inspection and testing program conforms to Sections 7100 and 7200 of ASME NOG-1 (Ref. 9.1.7-20).

Critical welds to support the polar crane main and auxiliary hoist, ~~equipment hatch hoist~~ and spent fuel cask handling crane main hoist are identified and subject to non-destructive examination in accordance with Section 7200 and Paragraph 4251.4 of ASME NOG-1. DCD_09.01.05-18 S02

Prior to operation, the OHLHS is received, stored, and installed in accordance with Sections 7100, 7300, and 7400 of ASME NOG-1 (Ref. 9.1. 7-20). Qualification of the assembled OHLHS is performed in accordance with Section 7500 of ASME NOG-1 (Ref. 9.1.7-20).

No-load testing of the polar crane main and auxiliary hoist, ~~equipment hatch hoist~~ and spent fuel cask handling crane main hoist is performed in accordance with Paragraph 7421 of ASME NOG-1. DCD_09.01.05-18 S02

Periodic tests and inspections of the OHLHS are performed in accordance with Chapter 2-2 of ANSI/ASME B30.2 (Ref. 9.1.7-22).

Inspection and testing of special lifting devices and slings used in conjunction with the polar crane and spent fuel cask handling crane, are performed in accordance with ANSI N14.6 (Ref. 9.1.7-23) and ASME B30.9 (Ref. 9.1.7-24), respectively.

9.1.5.5 Instrumentation Requirements

The OHLHS is equipped with mechanical and electrical limit devices to disengage power to the motors as the load hook approaches its travel limits or to prevent damage to other components when continued operation would potentially damage the OHLHS as required by NUREG-0554 (Ref. 9.1.7-19).

In addition to the limit devices, the control system is designed to include safety devices, which will assure the OHLHS returns to and/or maintains a secure holding position of critical loads in the event of a system fault. These safety devices are in addition to and separate from the control devices used for normal operation of the OHLHS. Emergency stop buttons are strategically placed at various locations to de-energize the OHLHS independent of the system controls. The overload sensing system is designed to be reset when switching the OHLHS between maximum critical load operations and design rate load operations. This resetting is performed remotely from the system controls and is governed by the OHLHS administrative control procedures.

The OHLHS driver control systems are designed using a combination of electrical and mechanical components. The control systems take into account the hoisting (raising and lowering) of the complete range of loads from the load hook itself up to and including the rated load in conjunction with the inertia of moving components, such as the motor armature, shafting and coupling, gear reducer, drum, etc. In general, the OHLHS is not contemplated to be used to lift individual spent fuel elements. The control system has been designed to be adaptable to include manual interlocks, which will preclude trolley and/or bridge movement while a spent fuel assembly is being hoisted free of the reactor vessel or a storage rack. The manual interlocks are controlled by administrative control procedures.

Instrumentation is installed within the motor control circuits to detect and react to malfunctions such as excessive electric current, excessive motor temperature, overspeed, overload, and overtravel. Control devices are installed to absorb the kinetic energy of the rotating components and arrest the hoisting movement should the load line or one of the dual revving systems fail, or should an overload and/or overspeed condition

Table 9.1.5-3 ~~Specification of the Equipment Hatch Hoist~~Deleted DCD_09.01.05-18

~~1. Type~~		~~Base mounted Drum Hoist~~	
~~2. Operating device~~		~~control box~~	
~~3. Component supplied electric power~~		~~Hoist~~	
~~4. Electric power supply~~		~~Power~~	~~: 460V ac, 60 Hz, 3 Phase~~
		~~Main Hoist~~	
~~5. Capacity~~	~~Metric ton~~	~~40~~	
~~6. Lift~~	~~ft in (m)~~	~~29' 6"~~ ~~(8.99 m)~~	
~~7. Hoisting Speed~~	~~m/min~~	~~2.1 or less~~	
~~8. Wire Material~~		~~Carbon steel~~	

Table 9.1.5-4 Cranes and Hoists Installed Over Safe Shutdown Equipment

Crane and Hoist	Crane/Hoist Type		Location	Maximum Load Rating (metric tons)	ASME NOG-1 Type	Single-Failure-proof	Seismic Category
Polar Crane	Top-Running Overhead Bridge Crane	Main hoist	PCCV	270	I	Yes	II
		Auxiliary hoist		50	I	Yes	
Spent Fuel Cask Handling Crane	Top-Running Overhead Bridge Crane	Main hoist	R/B(Fuel handling area)	150	I	Yes	II
		Auxiliary hoist		20	NA	No	
		Suspension hoist		2	NA	No	
MSIV(main steam isolation valve)room crane	Underhung overhead crane		R/B (MS/FW Piping Area hung from roof slab)	10	NA	No	II
~~PCCV Equipment Hatch Hoist~~	~~Base mounted Drum Hoist~~		~~PCCV (above equipment hatch at azimuth 40°)~~	~~40~~	~~I~~	~~Yes~~	~~II~~
Safety Injection Pump(SIP) Room Hoist	Monorail Hoist		R/B(SIP Rooms, Floor EL.-26'-4")	5	NA	No	II
CS/RHR Pump Room Hoist	Monorail Hoist		R/B(CS/RHR Pump Rooms, Floor EL.-26'-4")	5	NA	No	II
EFW Pump Room Hoist	Monorail Hoist		R/B(EFW Pump Rooms, Floor EL.-26'-4")	5	NA	No	II
CCW Pump Hoist	Monorail Hoist		R/B(CCW Rooms, Floor EL.-26'-4")	5	NA	No	II
CCW Heat Exchanger Hoist	Monorail Hoist			2	NA	No	II
Essential Chiller Unit Hoist	Monorail Hoist		East and West PS/B(Basement Floor EL.-26'-4")	3	NA	No	II

DCD_09.01.05-18 S02

Table 14.2-1 Comprehensive Listing of Tests (Sheet 4 of 5)

Section	Test
14.2.12.1.117	Compressed Gas System Preoperational Test
14.2.12.1.118	~~Equipment Hatch Hoist Preoperational Test~~Deleted
14.2.12.1.119	Pressurizer Surge Line HFT Performance Test
14.2.12.2.1.1	RCS Sampling for Fuel Loading
14.2.12.2.1.2	Fuel Loading Instrumentation and Neutron Source Requirements Test
14.2.12.2.1.3	Initial Fuel Loading
14.2.12.2.1.4	Inverse Count Rate Ratio Monitoring for Fuel Loading
14.2.12.2.1.5	Precritical Test Sequence
14.2.12.2.1.6	Rod Drop Time Measurement Test
14.2.12.2.1.7	CRDM Operational Test
14.2.12.2.1.8	Rod Position Indication Test
14.2.12.2.1.9	Rod Control System Test
14.2.12.2.1.10	Reactor Protection System Test
14.2.12.2.1.11	RCS Final Leak Test
14.2.12.2.1.12	Incore Detector Test
14.2.12.2.1.13	RCS Flow Coastdown Test
14.2.12.2.1.14	Operational Alignment of Process Temperature Instrumentation Test
14.2.12.2.2.1	Initial Criticality Test Sequence
14.2.12.2.2.2	Initial Criticality
14.2.12.2.2.3	Determination of Core Power Range for Physics Testing
14.2.12.2.3.1	Low Power Test Sequence
14.2.12.2.3.2	Boron Endpoint Determination Test
14.2.12.2.3.3	Isothermal Temperature Coefficient Measurement Test
14.2.12.2.3.4	RCCA Bank Worth Measurement at Zero Power Test
14.2.12.2.3.5	Pseudo Rod Ejection Test
14.2.12.2.3.6	Operational Alignment of Nuclear Instrumentation Test
14.2.12.2.3.7	Dynamic Automatic Turbine Bypass Control Test
14.2.12.2.3.8	Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test
14.2.12.2.3.9	Natural Circulation Test
14.2.12.2.3.10	Automatic Low Power SG Water Level Control Test
14.2.12.2.4.1	Power Ascension Test Sequence
14.2.12.2.4.2	Power Coefficient Determination Test
14.2.12.2.4.3	Axial Flux Difference Instrumentation Calibration Test and Axial Distribution Oscillation Test
14.2.12.2.4.4	Flux Map Test
14.2.12.2.4.5	RCCA Misalignment Measurement and Radial Power Distribution Oscillation Test
14.2.12.2.4.6	Remote Shutdown Test
14.2.12.2.4.7	Loose Parts Monitoring System Test (Continuation of 14.2.12.1.72)
14.2.12.2.4.8	Automatic Rod Control System Test
14.2.12.2.4.9	Operational Alignment of Process Temperature Instrumentation at Power Test

DCD_09.01.05-18 S02

DCD_3.12-25

C. Test Method

1. Simulate pressure signals to verify alarms.

2. Operate the compressed gas system to verify operation while recording pressure.

3. Loads that are a part of (or support the operation of) portions of loads identified below, which are identified as susceptible to changes in state or loss of operability upon increases in pressure due to component malfunction or failure, are evaluated and tested, as determined appropriate, without exceeding allowable design pressure ratings:

   Nitrogen supplied to the following:

   - SIS Accumulators,
   - CCW Surge Tanks,
   - CVCS Volume Control Tanks,

   Hydrogen supplied to the following:

   - CVCS Volume Control Tanks

D. Acceptance Criteria

1. The compressed gas system (nitrogen gas subsystems and hydrogen gas subsystem only) meets design requirements relating to the supply gas pressure.

2. Loads that are a part of (or support the operation of) portions of loads identified in item C.3 above respond to pressure transients in accordance with design.

14.2.12.1.118 ~~Equipment Hatch Hoist Preoperational Test~~Deleted

DCD_09.01.05-18 S02

A. ~~Objective~~

1. ~~To demonstrate operation of the equipment hatch hoist, associated equipment and accessories.~~

2. ~~To verify the equipment hatch hoist, associated equipment and accessories have completed static testing at 125% and operational testing (dynamic load testing) at 100% of rated load.~~

B. ~~Prerequisites~~

1. ~~Required construction testing is completed.~~

2. ~~Component testing and instrument calibration is completed.~~

3. ~~Test instrumentation is available and calibrated.~~

4. ~~Required support systems are available.~~ DCD_09.01.05-18 S02

C. ~~Test Method~~

1. ~~Verify control circuitry, limit devices, safety devices, and interlocks for the equipment hatch hoist as described in Subsection 9.1.5.5.~~

2. ~~Perform static load testing at 125% of rated load for the equipment hatch hoist, associated equipment and accessories, followed by appropriate inspections.~~

3. ~~Perform operational (dynamic load) testing at 100% of rated load of the equipment hatch hoist, associated equipment and accessories followed by appropriate inspections.~~

4. ~~Testing and inspection includes testing and inspection requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30), and NUREG-0612 (Reference 14.2-21) as applicable.~~

D. ~~Acceptance Criteria~~

1. ~~The equipment hatch hoist and its associated interlocks, limit devices, safety devices and control circuits perform as specified in Subsection 9.1.5.~~

2. ~~The equipment hatch hoist static testing at 125% of rated load and operational (dynamic load) testing at 100% of rated load is completed and the hoist satisfactorily passes inspections in accordance with NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30), and NUREG-0612, (Reference 14.2-21).~~

3. ~~The associated equipment and accessories satisfactorily pass an inspection following static and operational (dynamic load) testing in accordance with NUREG-0612 (Reference 14.2-21) and NUREG-0554 (Reference 14.2-24).~~

4. ~~Testing and inspection demonstrates compliance with testing and inspection requirements specified by NUREG-0554 (Reference 14.2-24), ASME NOG-1 (Reference 14.2-30) and NUREG-0612 (Reference 14.2-21) as applicable.~~

14.2.12.1.119 Pressurizer Surge Line HFT Performance Test

DCD_3.12-25

(Perform on first plant. For subsequent plants, see discussion in Subsection 14.2.8.2.)

Monitoring will be performed to demonstrate the satisfactory response of the pressurizer surge line during the first plant HFT.

A. Objectives

1. Monitoring will be performed to demonstrate the satisfactory response of the pressurizer surge line.

Table 14A-1 Conformance Matrix of RG 1.68 Appendix A Guidance Versus Typical Test Abstracts (Sheet 11 of 17)

RG 1.68 Appendix A	Section Number	Typical Test
1.n.(14) (b)	14.2.12.1.65 14.2.12.1.66 14.2.12.1.67 14.2.12.1.68 14.2.12.1.69	CRDM Cooling System Preoperational Test Reactor Cavity Cooling System Preoperational Test Containment High Volume System Preoperational Test Containment Low Volume Purge System Preoperational Test Containment Fan Coolers System Preoperational Test
1.n.(14) (c)	14.2.12.1.98 14.2.12.1.102 14.2.12.1.111	Class 1E Electrical Room HVAC System Preoperational Test Non-Class 1E Electrical Room HVAC System Preoperational Test Turbine Building Area Ventilation System (Electrical Equipment Area) Preoperational Test
1.n.(14) (d)	-	Not applicable. Class 1E Gas Turbine Generator contains the function.
1.n.(14) (e)	14.2.12.1.99 14.2.12.1.100 14.2.12.1.102 14.2.12.1.103 14.2.12.1.110	Auxiliary Building HVAC System Preoperational Test Main Steam/Feedwater Piping Area HVAC System Preoperational Test Non-Essential Electrical Room HVAC System Preoperational Test, Technical Support Center HVAC System Preoperational Test Turbine Building Area Ventilation System (General Mechanical Area) Preoperational Test
1.n.(14) (f)	14.2.12.1.101	MCR HVAC System Preoperational Test (including MCR Habitability)
1.n.(15)	14.2.12.1.66	Reactor Cavity Cooling System Preoperational Test
1.n.(16)	-	Not applicable. This is not a design feature of the US-APWR.
1.n.(17)	-	Not applicable. This is not a design feature of the US-APWR.
1.n.(18)	-	Not applicable. This is not a design feature of the US-APWR.
1.o.(1)	14.2.12.1.105 ~~14.2.12.1.118~~	Vessel Servicing preoperational Test ~~Equipment Hatch Hoist Preoperational Test~~
1.o.(2)	14.2.12.1.105 ~~14.2.12.1.118~~	Vessel Servicing preoperational Test ~~Equipment Hatch Hoist Preoperational Test~~
1.o.(3)	14.2.12.1.105 ~~14.2.12.1.118~~	Vessel Servicing preoperational Test ~~Equipment Hatch Hoist Preoperational Test~~
2.a	14.2.12.2.1.1	RCS Sampling for Fuel Loading

DCD_09.01.05-18 S02

DCD_09.01.05-18 S02

DCD_09.01.05-18 S02