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ENCLOSURE 2

REPORT

EVALUATION OF CONFORMANCE WITH NUREG-0612 FOR THE DRYWELL/REACTOR VESSEL HEAD AND DRYER/SEPARATOR SLING LIFTING DEVICES

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INTRODUCTION

NUTECH has completed an evaluation of the Drywell/Reactor Vessel Head and Dryer/Separator Sling Lifting Devices for compliance with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants", and supplementary ANSI Standards. The evaluation involved the review of all available information including procedures, quality and fabrication records for the special lifting devices.

This report summarizes the result of NUTECH's evaluation. The report is formated to address the specific requests for additional information delineated in the Franklin Research Center Technical Evaluation Report dated February 25, 1982.

EVALUATION RESULTS

Table 1 and Table 2 present the results of the NUTECH evaluation of compliance with NUREG-0612 for the Drywell/Reactor Vessel Head and Dryer/Separator Sling Lifting Devices respectively.

TABLE 1

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYWELL AND REACTOR VESSEL HEAD LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
3.1.1	Limitations On Use of Device	The existing procedures do not define any limitations on the use of the lifting device. These procedures should be revised to define any and all operational and design limitations associated with the lifting device.
3.1.2	Identification of Critical Components and Definition of Critical Characteristics	A review of the Drywell/Reactor Vessel Head Lifting Device quality records indicates that no design specification exists. In accordance with the ANSI N14.6 requirements, a design specification was prepared that includes a critical items list. The relevant material specification for each critical item is also defined. (Attachment 1)
3.1.3	Signed Stress Analysis Demonstrating the Adequacy of the Lifting Device	A stress analysis report for this lifting device has been prepared. This report demonstrates the adequacy of the device and its components for loads that it must withstand and further demonstrates compliance with the ANSI design factors. (Attachment 2)
3.1.4	Indication of Permissible Repair Procedures	Existing procedures do not address repair procedures for the lifting device. These procedures should be revised to specify maintenance and repair procedures.
3.2.1	Use of Stress Design Factors of 3 for Minimum Yield Strength and 5 for Ultimate Strength	All major components of the lifting device exceed these factors of safety. (Attachment 2)

TABLE 1 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYWELL AND REACTOR VESSEL HEAD LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
3.2.4	Similar Stress Design Factors for Load Bearing Pins, Links and Adapters	The load bearing pins for this device exceed the factors of safety required in Section 3.2.1. This device has no load bearing links or adapters
3.2.5	Slings Used Comply With ANSI B30.9-1971	No slings are used for this device (strongback design).
3.2.6	Drop Weight Testing or Charpy Impact Testing for Load Bearing Members	No documentation of impact or drop weight tests is available.
3.3.1	Consideration of Potential Lamellar Tearing Problems	Based on the materials, plate thicknesses and weld sizes used in this device, lamellar tearing is not considered to be a potential concern.
3.3.4	Design Shall Assume Even Distribution of Load	The design of the strongback is symmetric about two perpendicular planes with four (4) equal length legs. Because of this geometry, there should exist an essentially equal distribution of load to the four (4) legs.
3.3.5	Retainers Fitted for Load Carrying Components Which May Become Disengaged	Double acting ball lock pins are installed in the two (2) hook pins. The hook pins are the only load carrying components that could inadvertantly become disengaged.
3.3.6	Verification that Remote Actuating Mechanisms Securely Engage or Disengage	This device has no remote actuating mechanisms.

TABLE 1 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYWELL AND REACTOR VESSEL HEAD LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
4.1.3	Verification of Selection and Use of Material	Certificates of compliance exist for most materials.
4.1.4	Compliance with Fabrication Practice	According to the available documentation, the fabrication practices specified on the design drawing were followed.
4.1.5	Qualification of Welders, Procedures and Operators	According to the quality records weld procedures and welders were qualified in accordance with Section IX, ASME Boiler Pressure Vessel Code
4.1.6	Provisions for a Quality Assurance	There is no documentation which defines what regulations the fabricator's quality assurance program was based on.
4.1.7	Provisions for Identification and Certification of Materials	Certificates of compliance exist for most materials.
4.1.9	Verification that Materials or Services are Produced Under Appropriate Controls and Qualifications	Existing documentation indicates that the required ultrasonic and magnetic particle inspections were performed. These inspections were called out on the design drawing.
5.1.3	Implementation of a Periodic Testing Schedule and a System to Indicate the Date of Expiration	Existing procedures for the removal and installation of the Drywell and Reactor Vessel Heads require that visual inspections be performed on the lifting device prior to usage. These procedures should be revised to require verification of continued compliance by periodic load tests or NDE methods.

TABLE 1 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYWELL AND REACTOR VESSEL HEAD LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
5.1.4	Provisions for Establishing Operating Procedures	Procedures currently exist for the removal and installation of the Drywell and Reactor Vessel Heads. However, these procedures only provide detailed information regarding the use of the Drywell and Reactor Vessel Head Lifting Device, and do not provide information regarding limitations (i.e., temperature, load capacity, etc.) and maintenance guidelines. These procedures should be revised to incorporate this information.
5.1.5.1	Identification of Subassemblies which may be Exchanged	Although the existing procedures do not address this concern, discussions with the NSP staff indicate that it is NSP's practice to replace with a new component, rather than exchange, any component exhibiting wear or damage.
5.1.5.2	Suitable Markings	The Drywell and Reactor Vessel Head Lifting Device is provided with an identification plate.
5.1.5	Maintaining a Full Record of History	Records of a proof load test accomplished prior to use were reviewed. Completed work request authorizations and outage records exist that provide documentation of the maintenance and operational history. These records were not reviewed as part of this evaluation. To comply with the intention of the ANSI Standard a more formal record system may have to be implemented.

TABLE 1 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYWELL AND REACTOR VESSEL HEAD LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
5.1.7	Conditions for Removal From Service	The procedures for the removal and installation of the Drywell and Reactor Vessel Head do not specify the conditions upon which a device would be removed from service. The procedures should be revised to explicitly state the conditions which would necessitate removal of this lifting device from service.
5.2.1	Load Test to 150% With Appropriate Inspections Prior to Initial Use	Available documentation indicates that the Drywell and Reactor Vessel Head Lifting Device was proof load tested to 125% of rated capacity. The design drawing references lifting device rated capacities of 52 and 60 tons for the Drywell and Reactor Vessel Heads respectively. Since these rated capacities are 130% and 133% of the actual service loads, the proof load test in reality was 163% and 167%, respectively, of the required service loading. It is our opinion that this meets the intent of the ANSI requirement. In addition, a dimensional check and magnetic particle inspection of welds were accomplished prior to initial use of the device.
5.2.2	Qualification of Replacement Parts	No procedures currently exist that address maintenance and replacement of device components. Procedures should be revised to incorporate these requirements.
5.3	Testing to Verify Continued Compliance	See response to 5.1.3

TABLE 2

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
3.1.1	Limitations On Use of Device	The existing procedures do not define any limitations on the use of the lifting device. These procedures should be revised to define any and all operational and design limitations associated with the lifting device.
3.1.2	Identification of Critical Components and Definition of Critical Characteristics	A review of the Dryer/Steam Separator Lifting Device quality records indicates that no design specification exists. In accordance with the ANSI N14.6 requirements, a design specification was prepared that includes a critical items list. The relevant material specification for each critical item is also defined. (Attachment 3)
3.1.3	Signed Stress Analysis Demonstrating the Adequacy of the Lifting Device	A stress analysis report for this lifting device has been prepared. This report demonstrates the adequacy of the device and its components for loads that it must withstand and further demonstrates compliance with the ANSI design factors. (Attachment 2)
3.1.4	Indication of Permissible Repair Procedures	Existing procedures do not address repair procedures for the lifting device. These procedures should be revised to specify maintenance and repair procedures.
3.2.1	Use of Stress Design Factors of 3 for Minimum Yield Strength and 5 for Ultimate Strength	All major components of the lifting device exceed these factors of safety. (Attachment 2)

TABLE 2 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
3.2.4	Similar Stress Design Factors for Load Bearing Pins, Links and Adapters	The load bearing pins for this device exceed the factors of safety required in Section 3.2.1. This device has no load bearing links or adapters.
3.2.5	Slings Used Comply With ANSI B30.9-1971	General Electric Drawing No. 730E497 calls out 1½" Diamter, 6x19 wire rope, non-lubricated, corrosion resistant steel by J. A. Roebling Corporation or equal. Since this time, Roebling's wire rope stock has been acquired by Bethlehem Steel thus making it not possible to obtain original data from Roebling. Based on guidelines in Federal Specification RRW-410-C, the breaking strength for 1½" diamter, 6x19 galvanized wire rope with a fiber core is 82.8 tons. This value was used in the stress analysis. (Attachment 2)
3.2.6	Drop Weight Testing or Charpy Impact Testing for Load Bearing Members	No documentation of impact or drop weight tests is available.
3.3.1	Consideration of Potential Lamellar Tearing Problems	Based on the materials, plate thicknesses and weld sizes used in this device, lamellar tearing is not considered to be a potential concern.
3.3.4	Design Shall Assume Even Distribution of Load	The design of the sling is symmetric about two(2) perpendicular planes with equal length wide flanges and slings. Because of this, there should exist an essentially equal distribution of load to the four (4) slings.

TABLE 2 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
3.3.5	Retainers Fitted for Load Carrying Components Which May Become Disengaged	Double acting ball lock pins are installed in the two (2) hook pins. The four (4) socket pins are retained in position by threaded ½" diameter rods extending from double acting cylinders which are used to position the socket pins.
3.3.6	Verification that Remote Actuating Mechanisms Securely Engage or Disengage	Positioning of the four (4) socket pins is accomplished through use of double acting cylinders. Position indication mechanisms are installed above each socket pin to verify engagement or disengagement of the pin.
4.1.3	Verification of Selection and Use of Material	Certificates of compliance exist for most materials.
4.1.4	Compliance with Fabrication Practice	According to the available documentation, the fabrication practices specified on the design drawing were followed.
4.1.5	Qualification of Welders, Procedures and Operators	According to the quality records weld procedures and welders were qualified in accordance with Section IX, ASME Boiler Pressure Vessel Code.
4.1.6	Provisions for a Quality Assurance Program	There is no documentation which defines what regulations the fabricator's quality assurance program was based on.
4.1.7	Provisions for Identification and Certification of Materials	Certificates of compliance exist for most materials.

TABLE 2 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
4.1.9	Verification that Materials or Services are Produced Under Appropriate Controls and Qualifications	Documentation indicates that the required ultrasonic inspections of the pin material were performed. These inspections were called out of the design drawing.
5.1.3	Implementation of a Periodic Testing Schedule and a System to Indicate the Date of Expiration	Existing procedures for the removal and installation of the Dryer and Steam Separator require that visual inspections be performed on the lifting device prior to usage. These procedures should be revised to require verification of continued compliance by periodic load tests or NDE methods.
5.1.4	Provisions for Establishing Operating Procedures	Procedures currently exist for the removal and installation of the Dryer and Steam Separator. However, these procedures only provide detailed information regarding the use of the Dryer and Steam Separator Sling Lifting Device, and do not provide information regarding limitations (i.e., temperature, load capacity, etc.) and maintenance guidelines. These procedures should be revised to incorporate this information.
5.1.5.1	Identification of Subassemblies which may be Exchanged	Although the existing procedures do not address this concern, discussions with the NSP staff indicate that it is NSP's practice to replace with a new component, rather than exchange, any component exhibiting wear or damage.

TABLE 2 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
5.1.5.2	Suitable Markings	The Dryer and Steam Separator Lifting Device is Provided with an identification plate.
5.1.6	Maintaining a Full Record of History	Records of a proof load test accomplished prior to use were reviewed. Completed work request authorizations and outage records exist that provide documentation of the maintenance and operational history. These records were not reviewed as part of this evaluation. To comply with the intention of the ANSI Standard a more formal record system may have to be implemented.
5.1.7	Conditions for Removal from Service	The procedures for the removal and installation of the Dryer and Steam Separator do not specify the conditions upon which a device would be removed from service. The procedures should be revised to explicitly state the conditions which would necessitate removal of this lifting device from service.
5.2.1	Load Test to 150% With Appropriate Inspections Prior to Initial Use	A written procedure for proof load testing this device to the rated capacity (48 tons) was found in the quality records for this device. 48 tons is 145% of the maximum service load for this device. The test procedure also calls out a number of dimensional checks to verify that no permanent deformation occurred during testing. In addition, the design drawing calls for magnetic particle inspection before and after proof load testing. However, there is no documentation in the form of test results that substantiate the load test was actually performed. Assuming

TABLE 2 (continued)

EVALUATION OF CONFORMANCE WITH ANSI N14.6-1978
FOR THE DRYER AND STEAM SEPARATOR SLING LIFTING DEVICE

ANSI N14.6-1978 REQUIREMENTS		NUTECH EVALUATION OF CONFORMANCE
Section	Description	
		that this test was performed, it is our opinion that the intent of the ANSI requirement was met.
5.2.2	Qualification of Replacement Parts	No procedures currently exist that address maintenance and replacement of device components. Procedures should be revised to incorporate these requirements.
5.3	Testing to Verify Continued Compliance	See response to 5.1.3

Attachments

1. Design Specification for the Reactor Vessel Head Lifting Device.

2. Report, "Evaluation of Selected Special Lifting Devices for Compliance with NUREG-0612.

3. Design Specification for the Dryer and Steam Separator Sling Lifting Devices.