TECHNICAL EVALUATION REPORT

CONTROL OF HEAVY LOADS (C-10)

CAROLINA POWER AND LIGHT COMPANY

H. B. ROBINSON UNIT 2

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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

Mr. C. Bomberger and Mr. I. H. Sargent contributed to the technical preparation of this report through a subcontract with WESTEC Services, Inc.

1. INTRODUCTION

1.1 PURPOSE OF REVIEW

This technical evaluation report documents an independent review of general load handling policy and procedures at the Carolina Power and Light Company's (CP&L) H. B. Robinson Unit 2. This evaluation was performed with the following objectives:

- to assess conformance to the general load handling guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" [1], Section 5.1.1
- to assess conformance to the interim protection measures of NUREG-0612, Section 5.3.

1.2 GENERIC BACKGROUND

Generic Technical Activity Task A-36 was established by the USNRC staff to systematically examine staff licensing criteria and the adequacy of measures in effect at operating nuclear power plants to ensure the safe handling of heavy loads and to recommend necessary changes in these measures. This activity was initiated by a letter issued by the USNRC staff on May 17, 1978 [2] to all power reactor licensees, requesting information concerning the control of heavy loads near spent fuel.

The results of Task A-36 were reported in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The staff's conclusion from this evaluation was that existing measures to control the handling of heavy loads at operating plants, although providing protection from certain potential problems, do not adequately cover the major causes of load handling accidents and should be upgraded.

In order to upgrade measures for the control of heavy loads, the staff developed a series of guidelines designed to achieve a two-part objective using an accepted approach or protection philosophy. The first portion of the objective, achieved through a set of general guidelines identified in NUREG-0612, Section 5.1.1, is to ensure that all load handling systems at

nuclear power plants are designed and operated so that their probability of failure is uniformly small and appropriate for the critical tasks in which they are employed. The second portion of the staff's objective, achieved through guidelines identified in NUREG-0612, Sections 5.1.2 through 5.1.5, is to ensure that, for load handling systems in areas where their failure might result in significant consequences, either (1) features are provided, in addition to those required for all load handling systems, to ensure that the potential for a load drop is extremely small (e.g., a single-failure-proof crane) or (2) conservative evaluations of load handling accidents indicate that the potential consequences of any load drop are acceptably small. Acceptability of accident consequences is quantified in NUREG-0612 into four accident analysis evaluation criteria.

A defense-in-depth approach was used to develop the staff guidelines to ensure that all load handling systems are designed and operated so that their probability of failure is appropriately small. The intent of the guidelines is to ensure that licensees of all operating nuclear power plants perform the following:

- define safe load travel paths through procedures and operator training so that, to the extent practical, heavy loads are not carried over or near irradiated fuel or safe shutdown equipment
- provide sufficient operator training, handling system design, load handling instructions, and equipment inspection to ensure reliable operation of the handling system

Staff guidelines resulting from the foregoing are tabulated in Section 5 of NUREG-0612. Section 6 of NUREG-0612 recommended that a program be initiated to ensure that these guidelines are implemented at operating plants.

1.3 PLANT-SPECIFIC BACKGROUND

On December 22, 1980, the NRC issued a letter [3] to Carolina Power and Light Company (CP&L), the Licensee for H. B. Robinson Unit 2, requesting that the Licensee review provisions for handling and control of heavy loads at Robinson Unit 2, evaluate these provisions with respect to the guidelines of NUREG-0612, and provide certain additional information to be used for an

independent determination of conformance to these guidelines. On August 12, 1981, CP&L responded to this request [4]. Based on this information, a draft technical evaluation report (TER) was prepared and informally transmitted to the Licensee for review and comment. On July 1, 1982, a telephone conference call was held between the NRC and CP&L to discuss the draft TER. In response to this telephone call, CP&L provided additional information on December 15, 1982 [5] and April 16, 1984 [6], which has been incorporated into this final technical evaluation.

2. EVALUATION

This section presents a point-by-point evaluation of load handling provisions at H. B. Robinson Unit 2 with respect to NRC staff guidelines provided in NUREG-0612. Separate subsections are provided for both the general guidelines of NUREG-0612, Section 5.1.1 and the interim measures of NUREG-0612, Section 5.3. In each case, the guideline or interim measure is presented, Licensee-provided information is summarized and evaluated, and a conclusion as to the extent of compliance, including recommended additional action where appropriate, is presented. These conclusions are summarized in Table 2.1.

2.1 GENERAL GUIDELINES

The NRC has established seven general guidelines which must be met in order to provide the defense-in-depth approach for the handling of heavy loads. These guidelines consist of the following criteria from Section 5.1.1 of NUREG-0612:

Guideline 1 - Safe Load Paths
Guideline 2 - Load Handling Procedures
Guideline 3 - Crane Operator Training
Guideline 4 - Special Lifting Devices
Guideline 5 - Lifting Devices (Not Specially Designed)
Guideline 6 - Cranes (Inspection, Testing, and Maintenance)
Guideline 7 - Crane Design.

These seven guidelines should be satisfied for all overhead handling systems and programs in order to handle heavy loads in the vicinity of the reactor vessel, near spent fuel in the spent fuel pool, or in other areas where a load drop may damage safe shutdown systems. The Licensee's verification of the extent to which these guidelines have been satisfied and the evaluation of that verification are contained in the succeeding paragraphs.

Table 2.1. Robinson Unit 2/NUREG-0612 Compliance Matrix

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
1. Containment Polar Crane	115	--	--	C	--	--	C	C	--	--
a. Reactor Vessel Head	57.4	C	C	--	C	--	--	--	--	C
b. Upper Internals	42.7	C	C	--	C	--	--	--	--	C
c. ISI Tool	5	C	C	--	C	--	--	--	--	C
d. RCP Motor	34.3	C	C	--	--	C	--	--	--	--
e. RCP Internals	21	C	C	--	--	C	--	--	--	--
f. Stud Tensioners	1	C	C	--	--	C	--	--	--	--
g. Studs	0.4	C	C	--	--	C	--	--	--	--
h. Studs and Stud Rack	2.5	C	C	--	--	C	--	--	--	--
i. Head Storage Hatch Cover	25	C	C	--	--	C	--	--	--	--
j. Pump Bay Hatch Cover	42.5	C	C	--	--	C	--	--	--	--

C = Licensee action complies with NUREG-0612 Guideline.
R = Licensee has proposed revisions or modifications which are consistent with NUREG-0612 Guidelines.
-- = Not applicable.

Table 2.1 (Cont.)

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
k. Pzr. Cover	40	C	C	--	--	C	--	--	--	--
l. Seal Table	11	C	C	--	--	C	--	--	--	--
m. Missile Shield	46.5	C	C	--	--	C	--	--	--	--
n. Missile Shield Frame	28.5	C	C	--	--	C	--	--	--	--
o. Guide Studs	0.75	C	C	--	--	C	--	--	--	--
p. Air Recir. Fan Motor	1.9	C	C	--	--	C	--	--	--	--
2. Spent Fuel Cask Handling Crane (FHB)	125	--	--	C	--	--	C	C	--	--
a. Spent Fuel Cask	7.0	C	C	--	C	--	--	--	C	--
b. Fuel Gates	5.25	C	C	--	--	C	--	--	C	--
c. Removable Siding	1.5	C	C	--	--	C	--	--	C	--
d. Fuel Storage Racks	13	C	C	--	--	C	--	--	C	--
3. Residual Heat Removal Monorail Hoist	6	--	--	C	--	--	C	--	--	--
a. RHR Pumps	1.2	C	C	--	--	C	--	--	--	--
b. RHR Motors	1.2	C	C	--	--	C	--	--	--	--

Table 2.1 (Cont.)

Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane - Test and Inspection	Guideline 7 Crane Design	Interim Measure 1 Technical Specifications	Interim Measure 6 Special Attention
4. Monorail Hoist (Boric Acid Batch Room)	2	--	--	C	--	--	C	--	--	--
a. Bulk Boric Acid and Misc. Equip.	1.5	C	C	--	--	C	--	--	--	--
5. Solid Waste Handling Crane	5	--	--	C	--	--	C	R	--	--
a. Drummed Waste	<5	C	C	--	--	C	--	--	--	--
6. Turbine Building Crane	145	--	--	C	--	--	C	C	--	--
a. HP Turbine Cover	85	C	C	--	--	C	--	--	--	--
b. HP Rotor	55	C	C	--	--	C	--	--	--	--
c. Nos. 1 & 2 LP Turbine Outer Cover	70	C	C	--	--	C	--	--	--	--
d. LP Inner Cover #2	57.5	C	C	--	--	C	--	--	--	--
e. LP Inner Cover #1	28	C	C	--	--	C	--	--	--	--
f. LP Rotor	100	C	C	--	--	C	--	--	--	--
g. Generator Rotor	144	C	C	--	--	C	--	--	--	--

2.1.1 NUREG-0612, Heavy Load Overhead Handling System

a. Summary of Licensee Statements and Conclusions

The Licensee's review of overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal identified the following load handling systems to be subject to the general guidelines of NUREG-0612:

- o containment polar crane
- o spent fuel cask handling crane (fuel handling building)
- o residual heat removal monorail and hoist (auxiliary building)
- o boric acid batch room monorail and hoist (auxiliary building)
- o solid waste handling crane (auxiliary building)
- o turbine building crane.

The following load handling systems have been excluded from the general guidelines of NUREG-0612 by verification that there is sufficient physical separation between any load impact point and safety-related component to permit a determination by inspection that no heavy load drop can result in damage to any system or component required for plant shutdown or decay heat removal:

- o new fuel handling crane
- o hot machine shop bridge crane.

In addition, the following load handling systems have been excluded from the general guidelines of NUREG-0612 because system capacity/load weight is less than the defined heavy load weight according to Section 1.1 of NUREG-0612:

- o containment manipulator crane
- o monorail and three hoist assembly (underside of head lift rig)
- o spent fuel pool movable bridge
- o new fuel element monorail and hoist
- o spent fuel pool filter monorail and hoist.

The Licensee provided additional information to support the exclusion of the 2-ton, manually operated, spent fuel pool filter monorail and hoist located

directly over the filter it services, on the basis that: (1) it handles no heavy load; (2) its failure would not result in damage to other safety-related equipment; and (3) it is not required to maintain fuel pool cooling. Therefore, the spent fuel monorail and hoist has been excluded from further consideration.

b. Evaluation and Conclusion

The Licensee's identification of load handling systems subject to the general guidelines of NUREG-0612 is acceptable. Exclusion of the remaining handling systems is consistent with the guidance of NUREG-0612 based on the justification provided by the Licensee.

2.1.2 Safe Load Paths [Guideline 1, NUREG-0612, Section 5.1.1(1)]

> "Safe load paths should be defined for the movement of heavy loads to minimize the potential for heavy loads, if dropped, to impact irradiated fuel in the reactor vessel and in the spent fuel pool, or to impact safe shutdown equipment. The path should follow, to the extent practical, structural floor members, beams, etc., such that if the load is dropped, the structure is more likely to withstand the impact. These load paths should be defined in procedures, shown on equipment layout drawings, and clearly marked on the floor in the area where the load is to be handled. Deviations from defined load paths should require written alternative procedures approved by the plant safety review committee."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that safe load paths for the movement of heavy loads in the reactor containment building, fuel handling building, new fuel and residual heat removal (RHR) area, and turbine building are detailed in the following plant drawings:

81022-M-001 Rev A
81022-M-002 Rev A
81022-M-003 Rev A
81022-M-004 Rev B
81022-M-005 Rev A.

Load paths follow the safest and shortest routes with consideration given to avoidance of fuel and safety-related equipment.

Subsequently, the Licensee stated that difficulty was being experienced in adhering to the load paths in the containment, resulting in the need for numerous load path revisions to facilitate movement of the loads. CP&L has reevaluated the containment load paths due to the severe space limitations and the multitude of variations and combinations required to conduct movement of components during maintenance and refueling outages. Revised safe load paths/handling areas have been developed to accommodate the above factors and have been incorporated into revised drawings. These drawings have safe load paths marked and identify nearby equipment required for safe shutdown or new/spent fuel.

The Licensee further stated that, due to the severe space limitations and multitude of load variations and combinations, it is absolutely necessary to handle heavy loads over spent fuel or safety-related equipment. This is done only when there is no other alternative available.

The safe load paths at Robinson Unit 2 are referenced in appropriate plant operating procedures required for each specific heavy load. These procedures refer maintenance and operations personnel to the applicable load path drawing(s). Copies of these drawings will be available on the operating floor/area for reference and use by the signalman. In addition, reference copies of the load path drawings will be located in the polar crane operator's cab. During crane operation training and qualification, operators are instructed regarding the above procedure, including the proper and safe handling of heavy loads and identification of safe load paths. The signalman will "walk down" the load path prior to each lift or, in cases where walking the load paths is not possible, review the load path with the crane operator prior to signaling the crane operator to lift and move the load. A telephone communication system between the polar crane operator and signalman will be available to provide a voice communication link and to provide more precise control of load movement. The telephone system will be installed during the next refueling outage.

In addition, reference to safe load paths is made in procedure MP-1-5, "Operation, Testing and Inspection of Cranes and Material Handling Equipment."

The Licensee also stated that, due to the number of paths and their configurations, marked load paths could possibly cause confusion during maintenance operations and therefore do not contribute to safe load handling.

In response to the question of deviation from defined load paths, the Licensee stated that the maintenance supervisor will be delegated the authority to approve alternate load paths and laydown areas in the containment from the load paths and load handling areas identified on the containment load path drawings. In his absence, the maintenance supervisor's designated alternate will have the authority to approve alternate load paths and laydown areas in the containment. If heavy loads not identified on the current containment load path drawings must be carried over the open reactor vessel when the missile shield has been removed or when the vessel contains fuel, prior Plant Nuclear Safety Committee (PNSC) review must be obtained. Approval of heavy load movement over the open reactor vessel is contingent upon meeting the following minimum conditions:

a. use lifting equipment (lifting apparatus and crane) with a rated capacity at least twice the load to be handled.

b. use a four-point or redundant lifting arrangement to preclude a load drop in the event of a single lift point failure.

b. Evaluation

The Licensee's approach to the designation of specific safe load paths and the definition and depiction of such load paths in procedures and drawings is consistent with the guidance in Section 5.1.1(1) of NUREG-0612.

It is recognized that certain cases may exist for which there are no alternatives to handling heavy loads over spent fuel or safety-related equipment; additionally, it is apparent from the Licensee's response to Guideline 2 that procedures involving such cases will contain adequate precautions and a step-by-step procedure to minimize the potential hazard to fuel and equipment.

The use of a signalman as a visual aid to the crane operator in lieu of permanent load path markings is acceptable provided that the designated

signalman is knowledgeable about the safe load paths and that his duties are clearly defined in appropriate procedures.

Delegation of authority to a maintenance supervisor or his designated alternate for the approval of alternate load paths and laydown areas is an acceptable equivalent to the plant safety review committee provided that such personnel are limited in number and officially designated by this committee. Deviations from these load paths should be subsequently reviewed in accordance with plant guidelines for changes to plant procedures.

c. Conclusion

Development of safe load paths at Robinson Unit 2 is performed in a manner consistent with Guideline 1.

2.1.3 Load Handling Procedures [Guideline 2, NUREG-0612, Section 5.1.1(2)]

> "Procedures should be developed to cover load handling operations for heavy loads that are or could be handled over or in proximity to irradiated fuel or safe shutdown equipment. At a minimum, procedures should cover handling of those loads listed in Table 3-1 of NUREG-0612. These procedures should include: identification of required equipment; inspections and acceptance criteria required before movement of load; the steps and proper sequence to be followed in handling the load; defining the safe path; and other special precautions."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that procedures generally include sections for purpose, responsibility, precautions, special equipment and descriptions, references, and step-by-step instructions. The procedures in use at Robinson Unit 2 meet the intent of NUREG-0612, Section 5.1.1(2). In addition, the Licensee has provided a tabular listing of heavy loads and the applicable procedures for each.

b. Evaluation and Conclusion

Robinson Unit 2 meets the intent of Guideline 2 based on the Licensee's certification that the requirements of Section 5.1.1(2) of NUREG-0612 are met.

2.1.4 Crane Operator Training [Guideline 3, NUREG-0612, Section 5.1.1(3)]

"Crane operators should be trained, qualified and conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976, 'Overhead and Gantry Cranes' [7]."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that all crane operators and signalmen are trained, qualified, and conduct themselves in accordance with the requirements of ANSI B30.2-1976 with no exceptions.

b. Evaluation and Conclusion

Robinson Unit 2 satisfies the requirements of Section 5.1.1(3) of NUREG-0612 based on the Licensee's certification of conformance to ANSI B30.2-1976 for operator training, qualification, and conduct, with no exceptions.

2.1.5 Special Lifting Devices [Guideline 4, NUREG-0612, Section 5.1.1(4)]

"Special lifting devices should satisfy the guidelines of ANSI N14.6-1978, 'Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials' [8]. This standard should apply to all special lifting devices which carry heavy loads in areas as defined above. For operating plants certain inspections and load tests may be accepted in lieu of certain material requirements in the standard. In addition, the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on characteristics of the crane which will be used. This is in lieu of the guideline in Section 3.2.1.1 of ANSI N14.6 which bases the stress design factor on only the weight (static load) of the load and of the intervening components of the special handling device."

a. Summary of Licensee Statements and Conclusions

The Licensee identified the following special lifting devices to be subject to compliance with the criteria of NUREG-0612:

1. reactor vessel (RV) head lifting rig
2. internals lifting rig

3. reactor coolant pump (RCP) motor lift sling
4. spent fuel cask redundant lifting yoke
5. fuel storage rack lifting frame and slings (to be sized later)
6. in-service inspection/removable lifting tool handling tool.

The spent fuel cask redundant lifting yoke is of a redundant design and the crane on which it is used is single-failure proof. Therefore, a load drop with regard to the handling of the cask is not considered credible. The cask redundant lifting yoke meets the intent of ANSI N14.6-1978.

The in-service inspection/removable lifting tool has been designed in accordance with and meets the requirements of ANSI N14.6-1978. Westinghouse has confirmed this in writing to CP&L: "The weakest link of the rig has a safety factor of 10.24 based on ultimate tensile strength and 6.65 based on yield strength of the materials used. The safety factors of all other components are greater than those stated for the weakest link. The computations were performed assuming max load (static) 10,500 pounds." This special lifting tool is supplied by Westinghouse during in-service inspection. Procedures for use, inspection, and testing provided by Westinghouse during in-service inspection, will be incorporated into plant procedures prior to performing the inspection.

The Licensee stated that the remaining special lifting devices at Robinsion Unit 2 were designed, constructed, and delivered prior to the existence of ANSI N14.6-1978. Their design met the accepted industry standards and engineering practices of that time. Information relative to compliance with the design and construction requirements of ANSI N14.6 is not available from the suppliers in some cases. CP&L considers the existing special lifting devices to be of adequate design; the performance record during the past 11 years provides substantial verification of their design adequacy. However, as a result of the reevaluation of safe load paths and the necessity to handle loads over the reactor and safe shutdown equipment in the containment, implementation of the inspection, testing, and maintenance requirements discussed herein will provide satisfactory assurance that design integrity does not deteriorate and that the probability for a load drop continues to remain at acceptable limits.

CP&L stated that plant operating and maintenance procedures, which address the inspection, testing, and maintenance of special lifting devices, will be implemented. Special lifting devices will be nondestructively examined in accordance with ANSI N14.6. In addition, prior to use each outage, a visual examination will be made and documented. A nondocumented visual examination will be made by the crane operator or signalman in accordance with ANSI B30.2 prior to each use.

The Licensee provided, in tabular form, a comparison of special lifting rig design to the requirements of Sections 3, 4, and 5 of ANSI N14.6-1978. This comparison indicates that the spent fuel cask redundant lift yoke, reactor coolant pump motor lift sling, internals lifting rig, and reactor vessel lifting rigs were subjected to initial load tests of at least 125%.

b. Evaluation

The continuing compliance testing, inspection, and maintenance program for special lifting devices at Robinson Unit 2 meets the intent of NUREG-0612 on the basis of the Licensee's commitment to Section 5 of ANSI N14.6-1978. Further, the initial load testing of 150% for the spent fuel cask redundant lift yoke and 125% for RCP motor lift sling, internals lifting rig, and RV head lifting rig, respectively, sufficiently stressed the special lifting devices to provide an adequate guarantee of the device's structural integrity. Although it cannot be determined if the specific requirements of ANSI N14.6-1978 for component design and fabrication have been satisfied for these lifting devices, performance of load tests and implementation of a rigorous program for inspection and maintenance aid in the assurance that these devices will provide a high degree of load handling reliability.

A review of design information provided indicates that the lifting devices evaluated by the Licensee satisfy the design criteria of ANSI N14.6-1978 in that all stress design factors are greater than 3 for yield stress and greater than 5 for ultimate strength. The Licensee has also indicated that the effect of dynamic loading imposed by cranes is negligible due to slow hook speeds. Therefore, these lifting devices satisfactorily accommodate dynamic loads while maintaining an acceptable stress design margin.

c. Conclusion

Design of special lifting devices and programs for continuing compliance at H. B. Robinsion Unit 2 are consistent with Guideline 4 of NUREG-0612.

2.1.6 Lifting Devices (Not Specially Designed) [Guideline 5, NUREG-0612, Section 5.1.1(5)]

"Lifting devices that are not specially designed should be installed and used in accordance with the guidelines of ANSI B30.9-1971, 'Slings' [9]. However, in selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating identified on the sling should be in terms of the 'static load' which produces the maximum static and dynamic load. Where this restricts slings to use on only certain cranes, the slings should be clearly marked as to the cranes with which they may be used."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that all nonspecial lifting devices subject to NUREG-0612 are installed and used in accordance with ANSI B30.9-1971. Selection of nonspecial lifting devices will be based on the sum of the static load plus at least 15% for unanticipated dynamic loading and other unknowns. Slings will be tagged to indicate their maximum capacity. With the exception of several slings (i.e., turbine components, etc.), CP&L does not limit the use of slings to specific cranes or loads. Slings which are restricted for specific uses such as the above will be clearly marked and personnel will be instructed accordingly. When loads must be handled over spent fuel or equipment required to maintain safe shutdown, personnel will be instructed by a plant procedure and by attached load path drawings to use increased safety factors and four-point or redundant lifting arrangements. Safety factors will be increased by doubling the static load and adding a 15% dynamic load allowance. The resultant load will be used to select proper sling size from standard sling charts. Where it is impossible to obtain a safety factor of 10, the lifts will be considered on a case-by-case basis and will be described in a written procedure properly approved by plant management.

Lifting devices are inspected and maintained in accordance with ANSI B30.9 and ANSI B30.10.

b. Evaluation and Conclusion

Sling usage at Robinson Unit 2 satisfies the requirements of Section 5.1.1(5) of NUREG-0612 based on the Licensee's certification of compliance with the requirements of ANSI B30.9-1971.

2.1.7 Cranes (Inspection, Testing, and Maintenance) [Guideline 6, NUREG-0612, Section 5.1.1(6)]

"The crane should be inspected, tested, and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' with the exception that tests and inspections should be performed prior to use where it is not practical to meet the frequencies of ANSI B30.2 for periodic inspection and test, or where frequency of crane use is less than the specified inspection and test frequency (e.g., the polar crane inside a PWR containment may only be used every 12 to 18 months during refueling operations, and is generally not accessible during power operation. ANSI B30.2, however, calls for certain inspections to be performed daily or monthly. For such cranes having limited usage, the inspections, test, and maintenance should be performed prior to their use)."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that the crane inspection, testing, and maintenance program now in effect at Robinson Unit 2 is in compliance with ANSI B30.2-1976, Chapter 2-2, and the Occupational Safety and Health Standards, Section 176 of 29CFR1910.

b. Evaluation and Conclusion

Robinson Unit 2 satisfies the criteria of Section 5.1.1(6) of NUREG-0612 based on the Licensee's certification of compliance with ANSI B30.2-1976 for crane inspection, testing, and maintenance.

2.1.8 Crane Design [Guideline 7, NUREG-0612, Section 5.1.1(7)]

"The crane should be designed to meet the applicable criteria and guidelines of Chapter 2-1 of ANSI B30.2-1976, 'Overhead and Gantry Cranes,' and of CMAA-70, 'Specifications for Electric Overhead Traveling Cranes' [10]. An alternative to a specification in ANSI B30.2 or CMAA-70 may be accepted in lieu of specific compliance if the intent of the specification is satisfied."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that the spent fuel cask handling crane is a single-failure-proof crane designed in accordance with CMAA-70, ANSI B30.2, and OSHA 1910.179. Detailed information regarding design of this crane was transmitted to the NRC via CP&L letter No. N6-74-1246 dated October 17, 1974.

CP&L performed a detailed technical evaluation of the containment polar, turbine building, and solid waste handling cranes to determine whether the design and safety features are comparable with the current requirements of ANSI B30.9-1976 and CMAA-70 and to identify areas of variance.

Based on this evaluation, the Licensee stated that the design of the cranes identified above substantially meets the current requirements of CMAA-70 and Chapter 2-1 of ANSI B30.2.

The 5-ton bridge crane and monorail used for the solid waste handling complies with EOCI-61 for the bridge and HMI-100 for the electric wire rope hoist. The design information of this crane, and vendor information as available, did not provide any specific information on other codes and standards. The hoist is a P&H standard product (not specially designed) and meets or exceeds current requirements of AMI-100 and ANSI B30.16, "Overhead Hoists." It is supplied with redundant limit switches and has a minimum factor of safety of 5 based on ultimate strength of material.

b. Evaluation

The spent fuel cask handling crane at Robinson Unit 2 satisfies Section 5.1.1(7) of NUREG-0612 based on the Licensee's certification that the crane was designed in accordance with CMAA-70 and ANSI B30.2. The containment polar crane and turbine building crane substantially comply with Guideline 7 of NUREG-0612 based on the detailed technical evaluation performed by the Licensee. The solid waste handling crane design is also acceptable based upon the Licensee's statements that its design exceeds equivalent design standards.

c. Conclusion

Crane design at Robinson Unit 2 is consistent with Guideline 7 of NUREG-0612.

2.2 INTERIM PROTECTION MEASURES

The NRC has established six interim protection measures to be implemented at operating nuclear power plants to provide reasonable assurance that no heavy loads will be handled over the spent fuel pool and that measures exist to reduce the potential for accidental load drops to impact on fuel in the core or spent fuel pool. Four of the six interim measures of the report consist of Guideline 1, Safe Load Paths; Guideline 2, Load Handling Procedures; Guideline 3, Crane Operator Training; and Guideline 6, Cranes (Inspection, Testing, and Maintenance). The two remaining interim measures cover the following criteria:

1. heavy load technical specifications
2. special review for heavy loads handled over the core.

Licensee implementation and the evaluation of these last two interim protection measures are contained in the succeeding paragraphs of this section.

2.2.1 Technical Specifications [Interim Protection Measure 1, NUREG-0612, Section 5.3(1)]

"Licenses for all operating reactors not having a single-failure-proof overhead crane in the fuel storage pool area should be revised to include a specification comparable to Standard Technical Specification 3.9.7, 'Crane Travel - Spent Fuel Storage Pool Building,' for PWR's and Standard Technical Specification 3.9.6.2, 'Crane Travel,' for BWR's, to prohibit handling of heavy loads over fuel in the storage pool until implementation of measures which satisfy the guidelines of Section 5.1."

a. Summary of Licensee Statements and Conclusions

The Licensee noted that the spent fuel cask handling crane is a single-failure-proof crane. Information detailing this fact was transmitted to the NRC via CP&L letter No. NG-74-1246 dated October 17, 1974 and is documented in 3.2-1 of NUREG-0612..

b. Evaluation and Conclusion

The Licensee satisfies the requirements of Interim Protection Measure 1 on the basis of certification that the spent fuel pool cask handling crane is a single-failure-proof crane.

2.2.2 Administrative Controls [Interim Protection Measures 2, 3, 4, and 5, NUREG-0612 Sections 5.3(2)-5.3(5)]

"Procedural or administrative measures [including safe load paths, load handling procedures, crane operator training, and crane inspection]... can be accomplished in a short time period and need not be delayed for completion of evaluations and modifications to satisfy the guidelines of Section 5.1 of [NUREG-0612]."

a. Summary of Licensee Statements and Conclusions

Summaries of Licensee statements and conclusions are contained in discussions of the respective general guidelines in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7, respectively.

b. Evaluations, Conclusions, and Recommendations

The evaluations, conclusions, and recommendations of this review are contained in discussions of the respective general guidelines in Sections 2.1.2, 2.1.3, 2.1.4, and 2.1.7.

2.2.3 Special Reviews for Heavy Loads Over the Core [Interim Protection Measure 6, NUREG-0612, Section 5.3(6)]

"Special attention should be given to procedures, equipment, and personnel for the handling of heavy loads over the core, such as vessel internals or vessel inspection tools. This special review should include the following for these loads: (1) review of procedures for installation of rigging or lifting devices and movement of the load to assure that sufficient detail is provided and that instructions are clear and concise; (2) visual inspections of load bearing components of cranes, slings, and special lifting devices to identify flaws or deficiencies that could lead to failure of the component; (3) appropriate repair and replacement of defective components; and (4) verify that the crane

operators have been properly trained and are familiar with specific procedures used in handling these loads, e.g., hand signals, conduct of operations, and content of procedures."

a. Summary of Licensee Statements and Conclusions

The Licensee stated that a review of plant procedures was performed and a checklist used to record the results. Recommended changes were implemented and are included in the plant Interim Action Report. The recommended changes include inclusion of and/or guideline instructions for load path identification, inspection of lifting devices, use of qualified operators, replacement or repair of defective lifting components and use of only approved repair parts and approved repair procedures.

b. Evaluation

H. B. Robinson Unit 2 satisfies the requirements of this interim measure. Procedures and operator training have been reviewed and upgraded as appropriate. Inspection of lifting devices and approved repair procedures have been implemented.

c. Conclusion

H. B. Robinson Unit 2 complies with Interim Protection Measure 6.

3. CONCLUSION

This summary is provided to consolidate the results of the evaluation contained in Section 2 concerning individual NRC staff guidelines into an overall evaluation of heavy load handling at H. B. Robinson Unit 2. Overall conclusions and recommended Licensee actions, where appropriate, are provided with respect to both general provisions for load handling (NUREG-0612, Section 5.1.5) and completion of the staff recommendations for interim protection (NUREG-0612, Section 5.3).

3.1 GENERAL PROVISIONS FOR LOAD HANDLING

The NRC staff has established seven guidelines concerning provisions for handling heavy loads in the area of the reactor vessel, near stored spent fuel, or in other areas where an accidental load drop could damage equipment required for safe shutdown or decay heat removal. The intent of these guidelines is twofold. A plant conforming to these guidelines will have developed and implemented, through procedures and operator training, safe load travel paths such that, to the maximum extent practical, heavy loads are not carried over or near irradiated fuel or safe shutdown equipment. A plant conforming to these guidelines will also have provided sufficient operator training, handling system design, load handling instructions, and equipment inspection to ensure reliable operation of the handling system. As detailed in Section 2, it has been found that load handling operations at H. B. Robinson Unit 2 can be expected to be conducted in a highly reliable manner consistent with the staff's objectives as expressed in these guidelines.

3.2 INTERIM PROTECTION MEASURES

The NRC staff has established (NUREG-0612, Article 5.3) that certain measures should be initiated to provide reasonable assurance that handling of heavy loads will be performed in a safe manner until final implementation of the general guidelines of NUREG-0612, Article 5.1 is complete. Specified measures include the implementation of a technical specification to prohibit

the handling of heavy loads over fuel in the storage pool; compliance with Guidelines 1, 2, 3, and 6 of NUREG-0612, Section 5.1.1; a review of load handling procedures and operator training; and a visual inspection program, including component repair or replacement as necessary of cranes, slings, and special lifting devices to eliminate deficiencies that could lead to component failure. Evaluation of information provided by the Licensee indicates that measures have been properly implemented which ensure compliance with the staff's measures for interim protection at H. B. Robinson Unit 2.

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