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TECHNICAL EVALUATION REPORT

CONTROL OF HEAVY LOADS

CAROLINA POWER AND LIGHT COMPANY
H. B. ROBINSON PLANT UNIT 2

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Prepared by
Franklin Research Center
20th and Race Street
Philadelphia, PA 19103

Author: D. J. Vito
FRC Group Leader: I. H. Sargent

Prepared for
Nuclear Regulatory Commission
Washington, D.C. 20555

Lead NRC Engineer: F. Clemenson

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DESIGNATED ORIGINAL
Certified By C. H. Parrish

Franklin Research Center
A Division of The Franklin Institute
The Benjamin Franklin Parkway, Phila., Pa. 19103 (215) 448-1000

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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. D. J. Vito 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 the Franklin Research Center (FRC) review of general load handling policy and procedures at the Carolina Power and Light Company's (CP&L) H. B. Robinson Plant Unit 2. This evaluation was performed with the following objectives:

- o 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
- o 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 assure 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.

The approach used to develop the staff guidelines for minimizing the potential for a load drop was based on defense-in-depth and the intent of the guidelines in to ensure that licensees of all operating nuclear power plants perform the following:

1. provide sufficient operator training, handling system design, load handling instructions, and equipment inspection to assure reliable operation of the handling system

2. 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

3. provide mechanical stops or electrical interlocks to prevent movement of heavy loads over irradiated fuel or in proximity to equipment associated with redundant shutdown paths.

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].

2. EVALUATION AND RECOMMENDATIONS

The evaluation of load handling at Robinson Unit 2 is divided into two categories. These categories deal separately with the general guidelines of Section 5.1.1 and the recommended interim protection measures of Section 5.3 of NUREG-0612. Applicable guidelines are referenced in each category. Conclusions and recommendations are provided in the summary for each guideline.

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 for handling 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.

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 at Robinson Unit 2 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 as subject to the general guidelines of NUREG-0612:

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

b. Evaluation

The Licensee's identification of load handling systems subject to the general guidelines of NUREG-0612 is acceptable with one exception: the spent fuel pool filter monorail and hoist. Although loads typically handled by this device would not be heavy loads as defined by NUREG-0612, the handling device is capable of carrying a 2-ton load, which is well in excess of the heavy load weight limit. Some type of administrative controls should be imposed to ensure that heavy loads are not handled by this device.

c. Conclusion and Recommendations

CP&L's evaluation of NUREG-0612 applicability for load handling systems at Robinson Unit 2 substantially meets the intent of NUREG-0612. In order to fully comply with NUREG-0612, the Licensee should provide additional information to support the exclusion of the spent fuel pool filter monorail and hoist from the general guidelines of NUREG-0612.

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 has stated that safe load paths for the movement of heavy loads in the reactor containment building, fuel handling building, new fuel and RHR area, and the 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 going around fuel and safety-related equipment.

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).

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

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

b. Evaluation

Safe load paths at Robinson Unit 2 are adequately defined in drawings and procedures to meet the intent of NUREG-0612, Section 5.1.1(1). However, the Licensee's contention that numerous floor markings will cause confusion rather than contribute to assuring safe load handling is not acceptable. Load path markings should be used by crane operators and their supervisors as a means of monitoring the proper execution of load handling evolutions and clearly identifying those areas where movements of heavy loads will occur. Load path markings will alert personnel not involved in load handling to keep these pathways clear of non-related equipment in order to avoid interference when load handling is in progress. By consolidating various heavy load paths, the Licensee should be able to develop a system of heavy load paths that is not overly complex or confusing to operators and supervisors and which would contribute to the general safety of plant personnel by minimizing interference with load movements.

In addition, the Licensee has not provided information to verify that deviations from established load paths require written alternatives that must be approved by the plant safety review committee.

c. Conclusion and Recommendations

Robinson Unit 2 does not comply with Guideline 1. In order to fulfill the criteria of this guideline, the Licensee should perform the following:

1. Clearly mark safe load paths in areas where loads are handled.

2. Verify that deviations from established load paths require written alternatives that are approved by the plant safety review committee.

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 has 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

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. However, the Licensee should ensure that appropriate documentation is available to support using Westinghouse procedures for handling the inservice inspection tool.

c. Conclusion and Recommendations

Robinson Unit 2 complies with Guideline 2 of NUREG-0612.

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' [5]."

a. Summary of Licensee Statements and Conclusions

The Licensee has 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

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.

c. Conclusion and Recommendations

Robinson Unit 2 complies with Guideline 3 of NUREG-0612.

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' [6]. 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 has stated that the special lifting devices at Robinson Unit 2 were designed in accordance with accepted industry standards and good engineering practices. ANSI N14.6-1978 was not in existence when Robinson Unit 2 was designed. However, special lifting devices are inspected and maintained in accordance with ANSI N14.6-1978.

In addition, 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 Licensee is in the process of confirming the design criteria used for all special lifting devices at Robinson Unit 2.

b. Evaluation

Although the Licensee has stated that the redundant design of the spent fuel cask redundant lifting yoke meets the intent of ANSI N14.6-1978, Section 5.1.4 of NUREG-0612 states that the single-failure-proof design is a satisfactory response in addition to satisfactorily meeting the general guidelines of Section 5.1.1. As such, an evaluation of ANSI N14.6-1978 has identified several areas of concern which must be addressed when considering load handling reliability. Therefore, the Licensee should consider the following criteria in evaluating Robinson Unit 2 special lifting devices:

Section 3.1:
a. limitations on the use of the lifting devices (3.1.1)
b. identification of critical components and definition of critical characteristics (3.1.2)
c. signed stress analyses which demonstrate appropriate margins of safety (3.1.3)
d. indications of permissible repair procedures (3.1.4)

Section 3.2:
a. use of stress design factors of 3 for minimum yield strength and 5 for for ultimate strength (3.2.1)
b. similar stress design factors for load bearing pins, links, and adapters (3.2.4)
c. slings used comply with ANSI B30.9-1971 (3.2.5)
d. subjecting materials to dead weight testing or Charpy impact testing (3.2.6)

Section 3.3:
a. consideration of problems related to possible lamellar tearing (3.3.1)
b. design shall assure even distribution of the load (3.3.4)
c. retainers fitted for load-carrying components which may become inadvertently disengaged (3.3.5)
d. verification that remote actuating mechanisms securely engage or disengage (3.3.6)

Section 4.1:
a. verify selection and use of material (4.1.3)
b. compliance with fabrication practices (4.1.4)
c. qualification of welders, procedures, and operators (4.1.5)
d. provisions for a quality assurance program (4.1.6)
e. provisions for identification and certification of equipment (4.1.7)
f. verification that materials or services are produced under appropriate controls and qualifications (4.1.9)

Section 5.1:
a. implementation of a periodic testing schedule and a system to indicate the date of expiration (5.1.3)
b. provisions for establishing operating procedures (5.1.4)
c. identification of subassemblies which may be exchanged (5.1.5)
d. suitable markings (5.1.6)
e. maintaining a full record of history (5.1.7)
f. conditions for removal from service (5.1.8)

Section 5.2:
a. load test of 150% and appropriate inspection prior to initial use (5.2.1)
b. qualification of replacement parts (5.2.2)

Section 5.3:
a. satisfying annual load tests or inspection requirements (5.3.1)
b. testing following major maintenance (5.3.2)
c. testing after application of substantial stresses (5.3.4)
d. inspections by operating (5.3.6) and non-operating or maintenance personnel (5.3.7).

c. Conclusion and Recommendations

Insufficient information is available to evaluate Robinson Unit 2 compliance with Guideline 4 of NUREG-0612. The Licensee should provide information relative to Sections 3, 4, and 5 of ANSI N14.6-1978 so that a proper review can be performed to ensure that Robinson Unit 2 special lifting devices fully comply with the criteria of Section 5.1.4 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' [7]. 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 has stated that non "special" lifting devices such as slings, shackles, and fittings are in compliance with ANSI B30.9-1971 or other applicable standards such as Federal Specification RR-C-271 for shackles. Slings, shackles, and fittings were sized to maintain a minimum safety factor of 5 based on ultimate strength considering static load. If an allowance of 25% is considered for dynamic loading and applied to the above safety factors, the safety factors are reduced to 2.4 for special lifting devices and to 4.0 for non "special" lifting apparatus. These reduced safety factors are considered acceptable by the Licensee since all lifting equipment is usually inspected prior to each use.

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

b. Evaluation

Although the Licensee has stated that non "special" lifting devices are inspected and maintained in accordance with ANSI B30.9 and that some of these devices are in compliance with ANSI B30.9-1971 insufficient information has been provided to evaluate compliance to Guideline 5 of NUREG-0612. Lifting devices that are not specially designed should be installed and used in accordance with the guidelines of ANSI B30.9-1971. In addition, slings should be selected on the basis of the sum of the static and maximum dynamic loads, marked with the static load which produces the maximum dynamic and static loads, and clearly marked if restricted in use to certain cranes.

c. Conclusion and Recommendations

Robinson Unit 2 does not comply with Guideline 5 of NUREG-0612. In order to comply, the Licensee should perform the following:

1. Verify that all non-specially designed lifting devices subject to NUREG-0612 are installed and used in accordance with ANSI B30.9-1971.

2. Verify that the load used in properly selecting and marking a sling is based upon the sum of the maximum static and maximum dynamic loads.

3. Verify that slings restricted in use to certain crane(s) are clearly marked to so indicate.

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 has 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

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.

c. Conclusion and Recommendations

Robinson Unit 2 complies with Guideline 6 of NUREG-0612.

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' [9]. 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 has stated that the spent fuel cask handling crane is a single-failure-proof crane designed in accordance with CMAA Specification 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. The Licensee is in the process of evaluating the other cranes identified as subject to NUREG-0612.

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. However, insufficient information has been provided to determine if the containment polar crane, solid waste handling crane, and turbine building crane comply with Guideline 7 of NUREG-0612.

c. Conclusion and Recommendations

Robinson Unit 2 partially complies with Guideline 7 of NUREG-0612. In order to fully comply with Guideline 7, the Licensee must evaluate the containment polar crane, solid waste handling crane, and the turbine building crane for compliance with CMAA-70 and ANSI B30.2-1976 or an appropriate alternative.

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 has 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.

b. Evaluation, Conclusion, and Recommendations

The Licensee is not required to implement 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 provided no statement or conclusions regarding this interim protection measure.

b. Evaluation, Conclusion, and Recommendations

The Licensee has not provided sufficient information to enable a determination of compliance with Interim Protection Measure 6 of NUREG-0612.

3. CONCLUDING SUMMARY

This summary is provided to consolidate the conclusions and recommendations of Section 2 and to document the overall evaluation of the handling of heavy loads at Robinson Unit 2. It is divided into two sections, one dealing with general provisions for load handling at nuclear power plants (NUREG-0612, Section 5.1.1) and the other with the staff recommendations for interim protection, pending complete implementation of the guidelines of NUREG-0612 (NUREG-0612, Section 5.3). In each case, recommendations for additional Licensee action, and additional NRC staff action where appropriate, are provided.

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 safe shutdown systems. Compliance with these guidelines is necessary to ensure that load handling system design, administrative controls, and operator training and qualification are such that the possibility of a load drop is very small for the critical functions performed by cranes at nuclear power plants. These guidelines are partially satisfied at Robinson Unit 2. This conclusion is presented in tabular form as Table 3.1. Specific recommendations for achieving full compliance with these guidelines are provided as follows:

Guideline		Recommendation
1	a.	Clearly mark safe load paths in areas where loads are handled.
	b.	Verify that deviations from established load paths require written alternatives that are approved by the plant safety review committee.
2		(Robinson Unit 2 complies with this guideline.)
3		(Robinson Unit 2 complies with this guideline.)
4		Provide sufficient information relative to ANSI N14.6-1978 requirements for special lifting devices.

Table 3.1 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	I	--	--
a. Reactor Vessel Head	57.4	P	C	--	I	--	--	--	--	I
b. Upper Internals	42.7	P	C	--	I	--	--	--	--	I
c. Lower Internals	117.7	P	C	--	I	--	--	--	--	I
d. ISI Tool	5	P	C	--	I	--	--	--	--	I
e. RCP Motor	34.3	P	C	--	--	I	--	--	--	--
f. RCP Internals	21	P	C	--	--	I	--	--	--	--
g. Stud Tensioners	1	P	C	--	--	I	--	--	--	--
h. Studs	0.4	P	C	--	--	I	--	--	--	--
i. Studs and Stud Rack	2.5	P	C	--	--	I	--	--	--	--
j. Head Storage Hatch Cover	25	P	C	--	--	I	--	--	--	--
k. Pump Bay Hatch Cover	42.5	P	C	--	--	I	--	--	--	--

C = Licensee action complies with NUREG-0612 Guideline.
I = Insufficient information provided by the Licensee.
P = Licensee action partially complies with NUREG-0612 Guidelines.
-- = Not applicable.

Table 3.1 (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
l. Pzr. Cover	40	P	C	--	--	I	--	--	--	--
m. Seal Table	11	P	C	--	--	I	--	--	--	--
n. Missile Shield	46.5	P	C	--	--	I	--	--	--	--
o. Missile Shield Frame	28.5	P	C	--	--	I	--	--	--	--
p. Guide Studs	0.75	P	C	--	--	I	--	--	--	--
q. Air Recir. Fan Motor	1.9	P	C	--	--	I	--	--	--	--
2. Spent Fuel Cask Handling Crane (FHB)	125	--	--	C	--	--	C	C	--	--
a. Spent Fuel Cask	7.0	P	C	--	P	--	--	--	C	--
b. Fuel Gates	5.25	P	C	--	--	I	--	--	C	--
c. Removable Siding	1.5	P	C	--	--	I	--	--	C	--
d. Fuel Storage Racks	13	P	C	--	--	I	--	--	C	--
3. Monorail Hoist (Aux. Building)	6	--	--	C	--	--	C	--	--	--
a. RHR Pumps	1.2	P	C	--	--	I	--	--	--	--
b. RHR Motors	1.2	P	C	--	--	I	--	--	--	--

Table 3.1 (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 (Aux. Building) (Boric Acid Batch Room)	2	--	--	C	--	--	C	--	--	--
a. Bulk Boric Acid and Misc. Equip.	1.5	P	C	--	--	I	--	--	--	--
5. Solid Waste Handling Crane (Aux. Building)	5	--	--	C	--	--	C	--	--	--
a. Drummed Waste	<5	P	C	--	--	I	--	--	--	--
6. Turbine Building Crane	145	--	--	C	--	--	C	I	--	--
a. HP Turbine Cover	85	P	C	--	--	I	--	--	--	--
b. HP Rotor	55	P	C	--	--	I	--	--	--	--
c. Nos. 1 & 2 LP Turbine Outer Cover	70	P	C	--	--	I	--	--	--	--
d. LP Inner Cover #2	57.5	P	C	--	--	I	--	--	--	--
e. LP Inner Cover #1	28	P	C	--	--	I	--	--	--	--
f. LP Rotor	100	P	C	--	--	I	--	--	--	--
g. Generator Rotor	144	P	C	--	--	I	--	--	--	--

Guideline		Recommendation
5	a.	Verify that all not-specially-designed lifting devices subject to NUREG-0612 are installed and used in accordance with ANSI B30.9-1971.
	b.	Verify that the load used in properly selecting and marking a sling is based upon the sum of the maximum static and maximum dynamic loads.
	c.	Verify that slings that are restricted in use to a certain crane(s) are clearly marked as such.
6		(Robinson Unit 2 complies with the guideline.)
7		Provide supporting information for the containment polar crane, solid waste handling crane, and turbine building crane.

In addition, the Licensee must provide supporting information for the exclusion of the spent fuel pool filter monorail and hoist from the general guidelines of NUREG-0612.

3.2 INTERIM PROTECTION

The NRC staff has established certain measures (NUREG-0612, Section 5.3) that should be initiated to provide reasonable assurance that handling of heavy loads will be performed in a safe manner until implementation of the general guidelines of NUREG-0612, Section 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 the following actions are necessary to ensure that the staff's measures for interim protection at Robinson Unit 2 are met:

Interim Measure	Recommendation
1	(Robinson Unit 2 complies with this interim protection measure.)
2	Implement the recommendations of Guideline 1 as identified in Section 3.1.
3, 4, 5	(Robinson Unit 2 complies with these interim protection measures.)
6	Implement the criteria of this interim protection measure.

3.3 SUMMARY

The NRC's general guidelines and interim protection measures outlined in NUREG-0612 have been partially complied with at H. B. Robinson Unit 2. The evaluation has noted four areas (load handling procedures, operator training, inspection maintenance and testing, and technical specification revision) where the Licensee has provided sufficient information to demonstrate compliance with the intent of NUREG-0612 criteria. In order to fully comply with NUREG-0612, Licensee action is required on the remaining general guidelines and interim actions.

4. REFERENCES

1. "Control of Heavy Loads at Nuclear Power Plants"
   NRC, July 1980
   NUREG-0612

2. V. Stello, Jr. (NRC)
   Letter to all Licensees
   Subject: Request for Additional Information on Control of Heavy Loads Near Spent Fuel
   NRC, 17 May 1978

3. NRC
   Generic letter 81-07 to H. B. Robinson Unit 2
   22 December 1980

4. E. E. Utley (CP&L)
   Letter to S. A. Varga (NRC)
   Subject: Control of Heavy Loads at Nuclear Power Plants
   12 August 1981

5. "Overhead and Gantry Cranes"
   New York: American Society of Mechanical Engineers, 1976
   ANSI B30.2-1976

6. "Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials"
   New York: American National Standards Institute, Inc., 15 February 1972
   ANSI N14.6-1978

7. "Slings"
   American Society of Mechanical Engineers, 1972
   ANSI B30.9-1971

8. "Specifications for Electric Overhead Traveling Cranes"
   Crane Manufacturers Association of America, Inc., 1975
   CMAA-70