

CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS  
SHEARON HARRIS NUCLEAR POWER PLANTS UNITS 1 AND 2  
(Phase I)

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## ABSTRACT

The Nuclear Regulatory Commission (NRC) has requested that all nuclear plants, either operating or under construction, submit a response of compliancy with NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." EG&G Idaho, Inc., has contracted with the NRC to evaluate the responses of those plants presently under construction. This report contains EG&G's evaluation and recommendations for Shearon Harris Power Plants Units 1 and 2.

## EXECUTIVE SUMMARY

Shearon Harris Nuclear Power Plants Units 1 and 2 does not totally comply with the guidelines of NUREG-0612. In general, compliance is insufficient in the following areas:

- o Actions for all guidelines, although statements are made indicating action will be taken that will be consistent with guidelines 2, 3, and 6.
- o There is no commitment made or action indicated to develop consistency with Safe Load Paths, Guideline 1.
- o The information for Guidelines, 4 on Special Lifting Devices, 5 Lifting Devices not specially designed and part of Guideline 7 on Crane Design is insufficient to show consistency with the Guidelines.

The main report contains recommendations which will aid in bringing the above items into compliance with the appropriate guidelines.

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CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS  
SHEARON HARRIS NUCLEAR POWER PLANTS UNITS 1 AND 2  
(Phase I)

1. INTRODUCTION

1.1 Purpose of Review

This technical evaluation report documents the EG&G Idaho, Inc., review of general load-handling policy and procedures at Shearon Harris Nuclear Power Plants Units 1 and 2 (SHNPP). This evaluation was performed with the objective of assessing conformance to the general load-handling guidelines of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" [1], Section 5.1.1.

1.2 Generic Background

Generic Technical Activity Task A-36 was established by the U.S. Nuclear Regulatory Commission (NRC) 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 to these measures. This activity was initiated by a letter issued by the NRC staff on May 17, 1978 [2], to all power reactor applicants, 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-phase 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, Article 5.1.1, is to ensure that all load-handling systems at nuclear power plants are designed and operated such 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, Articles 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 (a) 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 (b) 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 is summarized as follows:

- o Provide sufficient operator training, handling system design, load-handling instructions, and equipment inspection to assure reliable operation of the handling system
- o 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
- o 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.

### 1.3 Plant-Specific Background

On December 22, 1980, the NRC issued a letter [3] to Carolina Power and Light Company, the applicant for SHNPP requesting that the applicant review provisions for handling and control of heavy loads at SHNPP, 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 June 26, 1981, September 23, 1981 and September 19, 1983, Carolina Power and Light Company provided the initial responses [4], [5], and [5a] to this request.



## 2. EVALUATION AND RECOMMENDATIONS

### 2.1 Overview

The following sections summarize Carolina Power and Light Company's review of heavy load handling at SHNPP accompanied by EG&G's evaluation, conclusions, and recommendations to the applicant for bringing the facilities more completely into compliance with the intent of NUREG-0612. Carolina Power and Light Company's review of the facilities does not differentiate between the two units so it is assumed that both units are of identical design. The applicant has indicated the weight of a heavy load for this facility (as defined in NUREG-0612, Article 1.2) as 1750 pounds.

### 2.2 Heavy Load Overhead Handling Systems

This section reviews the applicant's list of overhead handling systems which are subject to the criteria of NUREG-0612 and a review of the justification for excluding overhead handling systems from the above mentioned list.

#### 2.2.1 Scope

"Report the results of your review of plant arrangements to identify all overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal (taking no credit for any interlocks, technical specifications, operating procedures, or detailed structural analysis) and justify the exclusion of any overhead handling system from your list by verifying that there is sufficient physical separation from any load-impact point and any 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."



A. Summary of Applicant's Statements

The applicant's review of overhead handling systems identified the cranes and hoists shown in Table 2.1 as those which handle heavy loads in the vicinity of irradiated fuel or safe shutdown equipment.

The applicant has also identified fourteen other cranes that have been excluded from satisfying the criteria of the general guidelines of NUREG-0612. These are identified in Table 2.2 and the basic reason to satisfy the exclusion is given.

B. EG&G Evaluation

The criteria given in the Scope, 2.2.1 above was used as the basis on which Shearon Harris segregated the overhead handling systems into the nonexempt and exempt categories. This permitted development of Tables 2.1 and 2.2. Both of the categories were justified in a satisfactory manner to qualify for the nonexempt or exempt status.

C. EG&G Conclusions and Recommendations

Based on the information provided, EG&G concludes that the applicant has included all applicable hoists and cranes in their list of handling systems which must comply with the requirements of the general guidelines of NUREG-0612.

2.3 General Guidelines

This section addresses the extent to which the applicable handling systems comply with the general guidelines of NUREG-0612, Article 5.1.1. EG&G's conclusions and recommendations are provided in summaries for each guideline.

TABLE 2.1. SHEARON HARRIS UNITS 1 AND 2 NONEXEMPT HEAVY LOAD-HANDLING SYSTEMS

<u>Building and Hoisting System</u>	<u>Rating</u>
Containment	
Circular Bridge Crane	250 Ton
Circular Bridge Auxiliary	50 Ton
Jib Crane	5 Ton
Manipulator Crane	Not in submittal
Fuel Handling	
FHB Bridge Crane	Not in submittal
FHB Cask Crane	150 Ton
FHB Auxiliary Crane	12 Ton
Diesel Generator	
Diesel Generator Bridge Crane	4 Ton
Turbine	
Turbine Building Gantry Crane	215 Ton
Turbine Building Gantry Auxiliary	50 Ton
Reactor Auxiliary	
Item 2 Motorized Trolley <sup>a</sup>	3 Ton
Item 3 Motorized Trolley <sup>a</sup>	3 Ton
Item 6 Hand Geared Trolley	3 Ton
Item 14 Motorized Trolley <sup>a</sup>	3 Ton

a. Subsequent information, see Section 2.3.7 below indicates that these 3 hoisting systems will qualify for exemption.

TABLE 2.2. SHEARON HARRIS UNITS 1 AND 2 EXEMPT HEAVY LOAD HANDLING SYSTEMS

Identification	Capacity and Type	Comment on Basis for Exclusion
Containment Building		
Miscellaneous Hoist Item 17	10 Ton Motorized Trolley	Load drop could not damage any system or component required for safe shutdown  Operates outside of Containment Building and does not pass over any equipment required for safe shutdown or decay heat removal.
Equipment Removal Crane	50 Ton Main Crane	
Equipment Removal Crane Auxiliary	10 Ton Auxiliary	
Waste Processing Building (contains no equipment for safe shutdown or waste heat removal)		
WPB Bridge Crane	1 Ton Crane	Load drop exposes no equipment required for safe shutdown or decay heat removal.
Miscellaneous Item 1	10 Ton Hoist, Motorized Trolley	Extends into Rea. Aux. Bldg. does not approach Safety related equipment  Items 1, 7, 8, 9, 10, and 15 are in the Waste Process Building which contains no equipment required for safe shutdown or decay heat removal.
Miscellaneous Item 7	2 Ton Hoist, Motorized Trolley	
Miscellaneous Item 8	7-1/2 Ton Hoist, Motorized Trolley	
Miscellaneous Item 9	1 Ton Hoist, Hand Geared Trolley	
Miscellaneous Item 10	1 Ton Hoist, Hand Geared Trolley	
Miscellaneous Item 15	1 Ton Hoist, Hand Geared Trolley	
Reactor Auxiliary Building		
Miscellaneous Item 4	3 Ton Motorized Trolley .	Load drop could not damage any equipment required for safe shutdown or decay heat removal.
Fuel Handling Building		
Miscellaneous Item 5	2 Ton Hoist, Hand Geared Trolley	Load drop could not damage any equipment required for safe shutdown or decay heat removal.
Turbine Building		
Miscellaneous Item 11	5 Ton Motorized Trolley	Load drop could not damage any equipment required for safe shutdown or decay heat removal.
Miscellaneous Item 12	5 Ton Motorized Trolley	

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:

- o Guideline 1--Safe Load Paths
- o Guideline 2--Load-Handling Procedures
- o Guideline 3--Crane Operator Training
- o Guideline 4--Special Lifting Devices
- o Guideline 5--Lifting Devices (not specially designed)
- o Guideline 6--Cranes (Inspection, Testing, and Maintenance)
- o 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 succeeding paragraphs address the guidelines individually.

#### 2.3.1 Safe Load Paths [Guideline 1, NUREG-0612, Article 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 Applicant's Statements

As SHNPP is still in the construction phase, safe load paths have not yet been developed. Drawings are provided which show the limits of travel of each overhead handling system listed in Table 2.1.

B. EG&G Evaluation

The applicant makes no commitment relative to this guideline, however it appears the basic need is understood. Since the plant is under construction the recognized need should be developed in advance of fuel loading. This will permit development of the most suitable methods to accomplish load path identification e.g., paths painted on the floor, pylon markers set to identify paths, workers walking ahead of the load, etc. Advance development of the plans will permit their incorporation in procedures with a minimum effort.

C. EG&G Conclusions and Recommendations

1. Current action or commitments are not consistent with Guideline 1
2. Establish and execute a plan for marking safe load paths in a manner consistent with the requirements of Guideline 1.

2.3.2 Load-Handling Procedures [Guideline 2, NUREG-0612, Article 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 Applicant's Statements

Procedures for load handling operations have not yet been developed; but at such time that they are, the recommendations of NUREG 0612 will be followed. Any deviation from the recommendations of NUREG will be documented at such time.

B. EG&G Evaluation

The basic commitment stated is appropriate and alone is consistent with the guideline. The concept of deviation, even with documentation is inconsistent with NUREG 0612 Guideline 2. An acceptable approach is to use separate procedures for each major lift (e.g., RV head, core internals, fuel cask) and a general procedure for handling the other heavy loads as long as load specific details, such as load paths, and equipment requirements, are provided in attachments or enclosures to the general procedure.

C. EG&G Conclusions and Recommendations

- (1) Deviations are not consistent with the guideline.
- (2) Proceed with procedure development following the recommendations of NUREG 0612.

2.3.3 Crane Operator Training [Guideline 3, NUREG-0612, Article 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' [6]."



A. Summary of Applicant's Statements

The procedures involved for training, qualification, and conduct have not yet been developed for SHNPP, but at such time that they are, the recommendations of NUREG-0612 and ANSI B30.2 will be followed. Any deviations from the recommendations will be documented at such time.

B. EG&G Evaluation

Here also, as evaluated in 2.3.2 above the commitment to follow the recommendations of NUREG-0612 and ANSI B30.2 is consistent with the guideline. However the documentation of deviations is not.

C. EG&G Conclusions and Recommendations

SHNPP should strive to maintain consistency with the guidelines for training, qualification, and conduct of operators in all respects. Deviations per se are not acceptable, so, when recognized, an acceptable alternate approach consistent with the intent of the guideline should be developed.

2.3.4 Special Lifting Devices [Guideline 4, NUREG-0612, Article 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' [7]. 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) or the load and of the intervening components of the special handling device."



A. Summary of Applicant's Statements

Most of the lifting devices for use at SHNPP have either not been delivered or constructed yet. Thus the information required for a complete response is not available at this time. The information that is available shows:

- o Internals Lifting Rig is built and on site. It received a load test at 125% of load design capacity.
- o Spent Fuel Storage Rack Lifting Rig has been contracted for, but not yet designed. It is to be single failure proof, remotely operated and designed in conformance with latest codes and standards as of December 1980.

B. EG&G Evaluation

This guideline relates only to specially designed lifting devices. It calls for stress design factors meeting ANSI N14.6 using combined static and dynamic loads. These conditions are more than code requirements for static load only. Also, the intervening component loads must be considered.

C. EG&G Conclusions and Recommendations

- (1) Consideration of the special requirements must be given the design of these and any other special lifting devices sufficiently in advance of need to assure that the devices controlled by this guideline are consistent with ANSI N14.6 and are designed for static and dynamic loads.

- (2) When special lifting devices are used with single failure proof cranes and handles heavy loads over vital safety equipment the design of any other components (shackles, turnbuckles) should meet NUREG 0612 Article 5.1.6 requirements also.
- (3) The information in 2.3.4 plus the EG&G Evaluations and Conclusions above should be followed during the continuing development of Special Lifting Devices to assure consistency with Guideline 4.

2.3.5 Lifting Devices (Not Specially Designed) [Guideline 5, NUREG-0612, Article 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' [8]. 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 Applicant's Statements

This guideline has not been addressed in present submittals, except in the general sense, "that procedures have not been developed for SHNPP, but at such time as they are, recommendations of NUREG 0612 will be followed."

B. EG&G Evaluation

Indirectly, the reference to procedures that incorporate recommendations of NUREG 0612 can be a commitment to comply with the requirements concerning lifting devices. Since the statements at this time are not specific and are vague the following recommendations (in C. below) are offered to aid in providing a more acceptable subsequent response.

C. EG&G Conclusions and Recommendations

- (1) Information on regular lifting device selection should begin with a review of ANSI B30.9, then, show static loads, and the basis for the dynamic loads that are included. For loads requiring devices larger than those listed in the tables of ANSI B30.9 provide information that confirms the device load rating and its safety factor.
- (2) In looking ahead to Phase II evaluations, be sure those devices used with single failure proof hoists, such as the FHB Auxiliary Crane, meet NUREG 0612 Article 5.1.6 requirements.

2.3.6 Cranes (Inspection, Testing, and Maintenance) [Guideline 6, NUREG-0612, Article 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 Applicant's Statements

The procedure for inspection, testing and maintenance have not been developed for SHNPP but at such times that they are the recommendations of NUREG 0612 and ANSI B30.2 will be followed. Any exceptions to the standard will be documented.

B. EG&G Evaluation

The commitment, exclusive of the last sentence, is consistent with the guideline. Since some of this guideline requirement must occur prior to use and the primary guides are in the appropriate ANSI B30 code series prompt action may be necessary to assure that SHNPP meets its commitment. The documentation of exceptions is not consistent with requirements. Methods or alternate actions to rectify the exception is what constitutes an acceptable, consistent response.

C. EG&G Conclusions and Recommendations

Take actions as necessary during the construction phase of plant work to assure that the cranes and hoists meet initial testing and inspection requirements. Thereafter establish programs that keep the cranes and hoists in compliance with appropriate codes and regulations. SHNPP should make a commitment to assure that exceptions are adjusted by alternate actions to bring them into consistency with requirements.

2.3.7 Crane Design [Guideline 7, NUREG-0612, Article 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 Applicant's Statements

At SHNPP the Circular Bridge Crane, Manipulator Crane, FHB Bridge Crane, FHB Cask Crane, and FHB Auxiliary Crane are part of the fuel handling system. These cranes are designed in conformance with Regulatory Guide 1.13 as detailed in

Section 1.8 of the SHNPP FSAR. Codes and Standards adhered to, including CMAA Specification 70 and ANSI B30.2, are given in FSAR Section 9.1.4.2.8. Specific information in addition to the above general comment, is provided for individual cranes as follows:

#### Containment Building

- o Circular Bridge Crane--the Ebasco specification CAR-SH-AS-2 requires compliance with CMAA 70.
- o The Jib Crane--can be mounted on any one of six base plates. Design was to Ebasco specification CAR-SH-AS-5B which requires that all cranes trolleys and hoists included comply with Hoist Manufacturing Institute, CMAA Specification 74 (Under Running Single Girder Electric Overhead Traveling Cranes) the specification for Underhung Cranes of the Monorail Manufacturing Association and applicable parts of ANSI. Also the design calls for ability to withstand Safe Shutdown Earthquake Events.
- o Manipulator Crane is described in the FSAR and in Westinghouse Specification 677055.

#### Fuel Handling Building

- o FHB Bridge Crane is described in the FSAR and in Westinghouse specification 676470
- o FHB Cask Crane is described in the FSAR. Ebasco specification CAR-SH-AS-4 requires compliance with CMAA 70 and OSHA title 29 CFR which contains ANSI B30.2.

- o FHB Auxiliary is described in the FSAR. Ebasco specification CAR SH AS 47 requires compliance with CMAA 70 and ANSI B30.2 and that the crane be single failure proof.

#### Diesel Generator Building

- o D. G. Bridge Crane is designed to Ebasco specification CAR SH AS 58 which requires crane, trolley and hoist to comply with standards of the Hoist Manufacturing Institute, CMAA 74, the Specifications for Underhung Cranes of the Monorail Manufacturing Association, and parts of ANSI. Also, the specifications call for the crane to withstand a safe shutdown earthquake.

#### Turbine Building

- o The Turbine Gantry Crane was built to Ebasco specification CAR SH AS 3 which complies with CMAA 70. Additionally, seismic and weather considerations are specified.

#### Reactor Auxiliary Building

- o Items 2, 3, 6, and 14 are 3 ton hoists and trolleys built to Ebasco specification CAR SH AS 14 requiring the trolley hoists to comply with standards of the Hoist Manufacturing Institute and applicable parts of ANSI. "Items 2, 3, and 14 will be used only when the component each one serves is taken out of service, thus posing no threat to safety-related equipment in the event of a load drop."



B. EG&G Evaluation

The five cranes identified in the general comment above if built to the design standards called for will be consistent with Guideline 7 requirements. Specific information, provided by SHNPP, expands the general comment to show:

- o The Containment Building Jib crane scheduled design will meet the intent of Guideline 7
- o The FHB Cask Crane although covered in the general comment is reiterated in the specific comments to show that it is consistent with Guideline 7
- o The FHB Auxiliary Crane reiteration in the specific information is consistent with Guideline 7
- o The Diesel Generator Building Bridge Crane specific details show that its design is consistent with the intent of Guideline 7
- o The Reactor Auxiliary building Trolleys 2, 3, and 14 specific information shows that their load handling is confined to serving components that are out of service and load drops cannot damage safety related equipment. Additionally, their commitment that this is the only use to be made of these units qualifies them for exemption from the coverage required by Guideline 7.

Summarizing the material presented and comparing it with the list of Overhead Handling systems (Table 2.1) of concern indicates that there is insufficient information to assure consistency with Guideline 7 for:



- o The Containment Building Circular Bridge Auxiliary Crane
- o The Turbine Building Gantry Crane
- o The Turbine Building Gantry Auxiliary Crane
- o The Auxiliary Building Item 6 (3 ton hoist with hand geared trolley).

C. EG&G Conclusions and Recommendations

Additional information is needed concerning the four cranes listed in the summary of B above. The Turbine Building Gantry Crane needs an indication of compliance with ANSI B30.2. The other three cranes need information to show consistency with both CMAA 70 and ANSI B30.2 (ANSI B30.16 is acceptable for the Item 6 hand geared trolley).

2.4 Interim Protection Measures

The NRC staff has established (NUREG-0612, Article 5.3) that six 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. Four of these six interim measures consist of general 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:

- o Heavy load technical specifications
- o Special review for heavy loads handled over the core.

Applicant implementation and evaluation of these interim protection measures is contained in the succeeding paragraphs of this section.

#### 2.4.1 Interim Protection Measure 1--Technical Specifications

"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 PWRs and Standard Technical Specification 3.9.6.2, 'Crane Travel,' for BWRs, 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 Applicant's Statements

It should be noted that SHNPP is currently in the construction phase--Items not answerable at this time will be resolved prior to receipt of an operating license for SHNPP.

##### B. EG&G Evaluation

Since the interim protective Measure 1 is applicable for a licensed operating reactor, it does not apply to SHNPP at this time.

##### C. EG&G Conclusions and Recommendations

No recommendations.

#### 2.4.2 Interim Protection Measures 2, 3, 4, and 5 - Administrative Controls

"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 Applicant's Statements

Summaries of applicant's statements are contained in discussions of the respective general guidelines in Sections 2.3.1, 2.3.2, 2.3.3, and 2.3.6, respectively.

B. EG&G Evaluations, Conclusions, and Recommendations

EG&G evaluations, conclusions, and recommendations are contained in discussions of the respective general guidelines in Sections 2.3.1, 2.3.2, 2.3.3, and 2.3.6.

2.4.3 Interim Protection Measure 6--Special Review for Heavy Loads Over the Core

"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: (a) 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; (b) 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; (c) appropriate repair and replacement of defective components; and (d) 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 Applicant's Statements

Interim protective Measure 6 was not addressed and is not applicable as SHNPP is currently under construction.

B. EG&G Evaluation

SHNPP which is under construction is not expected to meet the interim measures aimed at operating plants.

C. EG&G Conclusions and Recommendations

No interim recommendations, for the plant under construction.

### 3. CONCLUDING SUMMARY

#### 3.1 Applicable Load-Handling Systems

The list of cranes and hoists supplied by the applicant as being subject to the provisions of NUREG-0612 apparently is complete (see Section 2.2.1).

#### 3.2 Guideline Recommendations

Compliance with the seven NRC guidelines for heavy load handling (Section 2.3) are partially satisfied at SHNPP. This conclusion is represented in tabular form as Table 3.1. Specific recommendations to aid in compliance with the intent of these guidelines are provided as follows:

<u>Guideline</u>	<u>Recommendation</u>
1. Section 2.3.1 Safe Load Paths	a. Take action to expand the area of the crane coverage into the safe load paths as specified.  b. Specify method(s) to be used for marking safe load paths, mark them and revise plant layout drawings to show the paths.
2. Section 2.3.2 Load Handling Procedures	a. Expedite the commitment that is made to develop load handling procedures according to NUREG 0612.

TABLE 3.1. SHEARON HARRIS NUCLEAR POWER PLANTS UNIT 1 AND UNIT 2 NUREG-0612 COMPLIANCE MATRIX

Equipment Designation	Heavy Load Information	Guidelines						
		1	2	3	4	5	6	7
		Safe Load Paths	Procedures	Crane Operator Training	Special Lifting Devices	Slings	Crane Inspection Test Maintenance	Crane Design
Containment Building								
Circular Bridge Crane	250 Ton	I	C	C	I	I	C	C
Circular Bridge Auxiliary Jib Crane	50 Ton	I	C	C	I	I	C	I
Manipulator Crane	5 Ton	I	C	C	I	I	C	C
		I	C	C	I	I	C	C
Fuel Handling Building								
Bridge Crane		I	C	C	I	I	C	C
Cask Crane	150 Ton	I	C	C	I	I	C	C
Auxiliary Crane	12 Ton	I	C	C	I	I	C	C
Diesel Generator Building								
DG Bridge Crane	4 Ton	I	C	C	I	I	C	C
Turbine Building								
TB Gantry Crane	250 Ton	I	C	C	I	I	C	I
TB Gantry Auxiliary	50 Ton	I	C	C	I	I	C	I
Reactor Auxiliary Building								
Item 2 Motorized Trolley	3 Ton	I	C	C	I	I	C	R
Item 3 Motorized Trolley	3 Ton	I	C	C	I	I	C	R
Item 6 Hand Geard Trolley	3 Ton	I	C	C	I	I	C	R
Item 14 Motorized Trolley	3 Ton	I	C	C	I	I	C	R

C = Applicant action or commitment is consistent with NUREG-0612 Guideline.

NC = Applicant action is not consistent with NUREG-0612 guideline.

R = Applicant proposes revision or modification that is consistent with Intent of guideline.

I = Insufficient information provided by the applicant.



Guideline	Recommendation
3. Section 2.3.3 Crane Operator Training	<p>a. A commitment is made to provide operator training that is consistent with NUREG 0612 requirements.</p> <p>b. Deviations from requirements should not be permitted.</p>
4. Section 2.3.4 Special Lifting Devices	<p>Only partial information is provided. Indicate the number of special lifting devices and for each, provide the information Guideline 4 requires. Special lifting devices components used with single failure proof cranes require special consideration given in NUREG 0612 Article 5.1.6.</p>
5. Section 2.3.5 Lifting Devices Not Specially Designed	<p>Sufficient information or specific commitments have not been made for evaluation. The Guideline should be followed and reported. Sling selection should be based on static and dynamic loads.</p> <p>Slings used with single failure proof cranes should meet NUREG 0612 Article 5.1.6.</p>
6. Section 2.3.6 Crane Inspection, Testing and Maintenance	<p>Action is needed to assure that the commitment for inspection, and testing are accomplished during construction. Subsequently programs for inspection, testing and maintenance need to be specified. Exceptions to code</p>



<u>Guideline</u>	<u>Recommendation</u>
	requirements should be adjusted by alternate actions consistent with the guidelines.
7. Section 2.3.7 Crane Design	<p>Insufficient information is provided to show consistency with requirements for:</p> <ul style="list-style-type: none"> <li>o The Containment Building Auxiliary Crane</li> <li>o The Turbine Building Gantry Crane</li> <li>o The Turbine Building Gantry Auxiliary Crane</li> <li>o The Auxiliary Building Item 6 (hand geared hoist).</li> </ul>

### 3.3 Interim Protection

EG&G's evaluation of information provided by the applicant indicates that the following actions are necessary to ensure that the six NRC staff measures for interim protection at SHNPP are met:

<u>Interim Measure</u>	<u>Recommendation</u>
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The SHNPP is under construction so interim protection measures are not applicable.

### 3.4 Summary

None

#### 4. REFERENCES

1. NUREG-0612, Control of Heavy Loads at Nuclear Power Plants, NRC.
2. V. Stello, Jr. (NRC), Letter to all applicants. Subject: Request for Additional Information on Control of Heavy Loads Near Spent Fuel, NRC, 17 May 1978.
3. USNRC, Letter to Carolina Power and Light Company. Subject: NRC Request for Additional Information on Control of Heavy Loads Near Spent Fuel, NRC, 22 December 1980.
4. E. E. Utley, Executive V.P. Power Supply and Engineering and Construction, Carolina Power and Light Co. to Director Division of Licensing USNRC, Washington, DC 20555, June 26, 1981.
5. M. A. McDuffie Senior V.P. Engineering and Construction Carolina Power and Light Company, to Mr. Darrell G. Eisenhut Director Division of Licensing. USNRC, Washington, DC 20555, September 23, 1981.
- 5a. M. A. McDuffie Senior V.P. Nuclear Generation, Carolina Power and Light Company, to Harold R. Denton Director office of Nuclear Regulation USNRC Washington, DC 20555, September 19, 1983.
6. ANSI B30.2-1976, "Overhead and Gantry Cranes."
7. ANSI N14.6-1978, "Standard for Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or more for Nuclear Materials".
8. ANSI B30.9-1971, "Slings."
9. CMAA-70, "Specifications for Electric Overhead Traveling Cranes."