CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS
CALLAWAY PLANT UNITS 1 AND 2

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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 compliance 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 the Callaway Plant Units 1 and 2.

EXECUTIVE SUMMARY

The Callaway Plant Units 1 and 2 do not totally comply with the guidelines of NUREG-0612. In general, additional evaluations are required in the following areas:

- Safe load paths
- Load handling procedures

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

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TECHNICAL EVALUATION REPORT
FOR
CALLAWAY PLANT UNITS 1 AND 2

1. INTRODUCTION

1.1 Purpose of Review

This technical evaluation report (TER) documents the EG&G Idaho, Inc. review of general load handling policy and procedures at Union Electric Company's Callaway Plant Units 1 and 2. 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 ensure 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 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-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 (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 is summarized as follows:

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

- 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 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 Union Electric Company, the Licensee for Callaway Plant Units 1 and 2, requesting that the Licensee review 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 22, 1981, the Standardized Nuclear Unit Power Plant System Executive Director provided the initial response[4] to this request.

2. EVALUATION AND RECOMMENDATIONS

2.1 Overview

The following sections summarize Union Electric Company's review of heavy load handling at Callaway Plant Units 1 and 2 accompanied by EG&G's evaluation, conclusions and recommendations to the Licensee for bringing the facilities more completely into compliance with the intent of NUREG-0612. The Licensee has indicated the weight of a heavy load for this facility (as defined in NUREG-0612, Article 1.2) as 1600 pounds.

2.2 Heavy Load Overhead Handling Systems

This section reviews the Licensee'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 aforementioned list.

2.2.1 Scope

Report the results of the Licensee's 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.

2.2.1.1 Summary of Licensee Evaluation on Overhead Handling Systems

The Licensee'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.

In Table 2.2, the Licensee has identified other cranes that have been excluded from satisfying the criteria of the general guidelines of NUREG-0612. These various overhead handling devices were reviewed by the Licensee to the criteria of NUREG-0612 and were excluded based on sufficient physical separation from any load-impact point that could damage any system or component required for plant shutdown or decay heat removal.

2.2.1.2 EG&G Evaluation, Conclusions and Recommendations for Overhead Handling Systems

The Licensee's response indicates that the overhead handling devices at the Callaway Plant Units 1 and 2 are listed in Tables 2.1 and 2.2. Figures 1 through 19 of Reference 4 identify the locations of all applicable overhead handling systems in the plant and their proximity to safety-related components. EG&G concludes that the Licensee's list of cranes and hoists in the aforementioned tables is complete and satisfies the requirements of NUREG-0612.

The Licensee reviewed the Standardized Nuclear Unit Power Plant System (SNUPPS) plant arrangement and indicated that based on physical separation, no load drops in the radwaste and turbine buildings could result in damage to any system or component required

IRRADIATED FUEL OR

TABLE 2.1 OVERHEAD HANDLING DEVICES IN VICINITY OF SAFE SHUTDOWN EQUIPMENT
CALLAWAY PLANT UNITS 1 AND 2 (FUEL HANDLING CRANE DATA[1])

Parameters	Name of Crane			
	Polar Crane	Cask Handling Crane	Spent Fuel Pool Bridge Crane	Refueling Machine
Capacity of main hoist	260 tons	150 tons	2 tons	2.4 tons
Capacity of auxiliary monorail hoist (const)	25 tons	5 tons		
Capacity of auxiliary monorail hoist (normal)	25 tons	5 tons and 2 tons[2]		
Capacity of main trolley	260 tons	130 tons	2 tons	1.5 tons
Capacity of lift beam	500 tons			2.4 tons
Maximum main hoist speed (normal)	5 fpm	3.75 fpm	21 fpm	20 fpm
Minimum main hoist speed (normal)	3 fpm	2 fpm	7 fpm	
Maximum auxiliary monorail hoist speed (normal)	40 fpm			
Minimum auxiliary monorail hoist speed (nromal)	3 fpm			
Maximum trolley speed (normal)	51.5 fpm	20 fpm	30 fpm	20 fpm
Minimum trolley speed (normal)	6 fpm	6 fpm	10 fpm	
Maximum bridge speed (normal)	51.5 fpm	20 fpm	30 fpm	40 fpm
Minimum bridge speed (normal)	6 fpm	6 fpm	10 fpm	
Maximum load during plant operation	167.5 tons	125 tons	1,870 lbs	
Normal expected load range	0-167.5 tons	0-125 tons	0-1,870 lbs	
Maximum construction load	475 tons			

TABLE 2.1 CONTINUED

Parameters	Name of Crane: Polar Crane	Cask Handling Crane	Spent Fuel Pool Bridge Crane	Refueling Machine
Maximum main hoist speed (constr)	5 fpm			
Minimum main hoist speed (constr)	3 fpm			
Maximum trolley speed (constr)	51.5 fpm			
Minimum trolley speed (constr)	6 fpm			
Maximum bridge speed (constr)	51.5 fpm			
Minimum bridge speed (constr)	6 fpm			
Normal load range (constr)	0-475 tons			
Maximum monorail hoist speed		20 fpm		22 fpm
Minimum monorail hoist speed		10 fpm		7 fpm
Maximum monorail trolley speed		32 fpm		
Minimum monorail trolley speed		16 fpm		
Lifting limitation	28.5 ft (above vessel flange)	Cask bottom 3 inches above floor El. 2047'-6"	24'-3" (hook limit is 2066'-8")	
Seismic Class	(3)	(3)	(3)	(3)
Design Standards General	CMAA NO. 70 (1975)	CMAA No. 70 (1975)	CMAA No. 70 (1975)	CMAA No. 70 (1975)

TABLE 2.1 CONTINUED

Parameters	Name of Crane: Polar Crane	Cask Handling Crane	Spent Fuel Pool Bridge Crane	Refueling Machine
Structural	Covered by CMAA	Covered by CMAA	Covered by CMAA	ASME Sect. III, App. XVII, Subarticle XVII-2200
Electrical	NFPA Vol. 5 Art. 610 1974-1975	NFPA Vol. 5 Art. 610 1974-1975	NFPA Vol. 5 Art. 610 1974-1975	NFPA Vol. 5 Art. 610 1974-1975
Materials	ASTM Std's.	ASTM Std's.	ASTM Std's.	ASTM Std's.
Others	OSHA 29 CFR 1910 & 1926	OSHA 29 CFR 1910 & 1926	OSHA 29 CFR 1910 & 1926	OSHA 29 CFR 1910 & 1926

NOTES:

(1) Rated speeds given are within ±10 percent of the actual speeds.

(2) Refer to Figure 23, Reference 4. A 2-ton limit to the monorail hoist exists only over area B on Figure 23.

(3) Seismic Category I.

TABLE 2.2 OVERHEAD HANDLING DEVICES EXCLUDED FROM FURTHER CONCERN (MISCELLANEOUS HOISTS DATA) - CALLAWAY PLANT UNITS 1 AND 2

Equipment No.	Service Description	Hoist Capacity	Primary Loads Lifted
HKF03A-D	Containment Jib Crane	3 tons	Hydrogen mixing fans
HKF05	Secondary Shield Wall Area Jib Crane	3 tons	Cooling fan
HKF06	Hot Machine Shop Bridge Crane	3 tons	Chemical tanks
HKF08A & B	Diesel Generator Underhung Monorail and Bridge Crane	5 tons	Emergency fuel oil day tank and miscellaneous equipment
HKF09A & B	Fuel Pool Cooling Pump Monorail and Hoist	2 tons	Fuel pool cooling heat transfer
HKF10	Auxiliary Building Filter Room Monorail and Hoist	5 tons	Reactor coolant filters
HKF11A-C	Auxiliary Feedwater Pump Monorail and Hoist	4 tons	Auxiliary feedwater pumps
HKF12A-C	Component Cooling Water Pump Monorail and Hoist	5 tons	Component cooling water heat exchangers
HKF13	Component Cooling Water Surge Tank Area Monorail and Hoist	10 tons	Component cooling water surge tanks
HKF15A & B	Centrifugal Charging Pump Monorail and Hoist	5 tons	Centrifugal charging pumps
HKF16A & B	Safety Injection Pump Monorail and Hoist	5 tons	Safety injection pumps
HKF17A & B	RHR Pump Monorail and Hoist	5 tons	RHR pumps

TABLE 2.2 CONTINUED

Equipment No.	Service Description	Hoist Capacity	Primary Loads Lifted
HKF18A & B	Containment Spray Pump Monorail and Hoist	5 tons	Containment spray pumps
HKF19	Reciprocating Charging Pump Monorail and Hoist	5 tons	Positive displacement charging pumps
HKF23	Auxiliary Building HVAC Monorail and Hoist	10 tons	Miscellaneous fans and equipment
HKF24	Moderation Heat Exchanger Monorail and Hoist	2 tons	Miscellaneous heat exchangers
HKF29A-D	Main Steam Relief Isolation Valve Monorail and Hoist	10 tons	Main steam relief isolation valve and feedwater piping
HKF30	Resin Charging Tank Area Monorail and Hoist	1 ton	Boron resin thermal regenerative filter
HKF32	Communication Corridor Hot Water Packaging Area Monorail, Hoist and Switch	5 tons	Miscellaneous equipment
HKF33	Boric Acid Batch Tank Monorail and Hoist	1 ton	Boric acid tanks
HKF41	ESW Pump House Hoist	10 tons	ESW pumps

for safe shutdown or decay heat removal. Therefore, the overhead handling devices in these buildings were excluded from further concern. EG&G agrees with the Licensee's evaluation of these devices and concludes that the Licensee has met the requirements of NUREG-0612 concerning exclusion of overhead handling systems and justification for their exclusion.

2.2.1.3 Summary on Heavy Load Overhead Handling Systems

Callaway Plant Units 1 and 2 complies with the criteria of NUREG-0612 on heavy load overhead handling systems.

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.

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 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.

2.3.1.1 Summary of Licensee's Evaluation of Safe Load Paths

The Licensee presented a discussion on the cranes of Table 2.1 which demonstrated the adequacy of the design and administrative measures to ensure that load-handling operations remain within safe load paths. Figures 20 through 25 of Reference 4 show equipment configurations and the areas for movement of the cranes.

2.3.1.2 EG&G Evaluations, Conclusions and Recommendations on Safe Load Paths

EG&G has reviewed the Licensee's response to the criteria of Guideline 1, Safe Load Paths, and

concludes that Reference 4 did not address safe load paths, their inclusion into procedures, their path on equipment layout drawings and markings in areas where loads are to be handled. Approvals to deviations from written procedures by Plant Safety Review Committee was not addressed. EG&G recommends the Licensee should address the clearly defined criteria of Guideline 1 in order to satisfy NUREG-0612.

2.3.1.3 Summary on Safe Load Paths

In order to comply with the criteria of Guideline 1, "Safe Load Paths," the Licensee should perform the following prior to fuel load:

(a) Define safe load paths for the movement of heavy loads to minimize potential for heavy load drops that might impact irradiated fuel in the reactor vessel and in the spent fuel pool or to impact safe shutdown equipment. Structural members should be utilized to the maximum extent practical such that load drop effects would be minimized.

(b) Define load paths in procedures.

(c) Show load paths on equipment layout drawings.

(d) Mark physical area by some means to clearly outline safe load paths while handling heavy loads.

(e) Incorporate approval by Plant Safety Review Committee to deviations from defined load paths using alternative procedures.

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. As 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 load path, and other special precautions.

2.3.2.1 Summary of Licensee's Evaluation on Load Handling Procedures

The Licensee responded to this guideline by describing the cranes of Table 2.1 and defining various devices that are used to ensure safe handling of fuel assemblies.

2.3.2.2 EG&G Evaluations, Conclusions and Recommendations on Load Handling Procedures

EG&G has reviewed the Licensee's response and although informative, does not address the development of procedures to cover load handling operations that are or could be handled over or in proximity to irradiated fuel or safe shutdown equipment. The Licensee should prepare the necessary procedures and include the criteria delineated in Guideline 2 of NUREG-0612.

2.3.2.3 Summary on Load Handling Procedures

In order to comply with the criteria of Guideline 2, "Load Handling Procedures," the Licensee should perform the following prior to fuel load:

(a) Develop and prepare operating procedures for devices handling heavy loads.

(b) The procedures should include:

(1) Identification of required equipment

(2) Inspections and acceptance criteria required before movement of load

(3) The steps and proper sequence to be followed in handling the load

(4) Defining the safe load path

(5) Other special precautions.

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."[5]

2.3.3.1 Summary of Licensee's Evaluation of Crane Operator Training

The Licensee stated in their response that specific plant procedures will be developed that address crane

operator training, qualification and conduct for those cranes identified in Table 2.1. These procedures will incorporate the guidance provided by ANSI B30.2-1976, Chapter 2.3.

2.3.3.2 EG&G Evaluation, Conclusions and Recommendations on Crane Operator Training

With the Licensee developing procedures that will comply with the criteria of Guideline 3 of NUREG-0612, EG&G considers this guideline will be completed.

2.3.3.3 Summary on Crane Operator Training

The Licensee will comply with the criteria of Guideline 3 when crane operators are trained and qualified in accordance with Chapter 2-3 of ANSI B30.2-1976, "Overhead and Gantry Cranes." In addition, the Licensee should have their training program available for possible NRC review. The Licensee should complete this action prior to fuel load.

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."[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.

2.3.4.1 Summary of Licensee's Evaluation on Special Lifting Devices

The Licensee has not selected special lifting devices for the SNUPPS units. Compliance with ANSI N14.6-1978 for the lifting device will be a consideration in the selection and compliance or equivalency will be provided.

2.3.4.2 EG&G Evaluation, Conclusion and Recommendations on Special Lifting Devices

If the Licensee intends to comply with Guideline 4 and ANSI N14.6-1978, then the criteria will be satisfied for Callaway Plant Units 1 and 2. In addition, if the special lifting devices have not been selected, then compliance to ANSI N14.6-1978 is a requirement and equivalency is not an option.

2.3.4.3 Summary on Special Lifting Devices

In order to comply with the criteria of Guideline 4, the Licensee should address all aspects of ANSI N14.6-1978 in their report. Special lifting devices that have not been selected should be in accordance with ANSI N14.6-1978. This action should be completed prior to fuel load.

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."[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.

2.3.5.1 Summary of Licensee's Evaluation on Lifting Devices (Not Specially Designed)

The Licensee has stated that lifting devices for the miscellaneous hoists and cranes will be in accordance with the guidance provided by ANSI B30.9-1971, as clarified in NUREG-0612, Section 5.1.1(5).

2.3.5.2 EG&G Evaluation, Conclusions and Recommendations on Lifting Devices (Not Specially Designed)

EG&G considers the criteria of this guideline will be satisfied at the Callaway Plant Units 1 and 2 when the slings are installed in accordance with the guidelines of ANSI B30.9-1971, "Slings."

2.3.5.3 Summary on Lifting Devices (Not Specially Designed)

When the slings are installed at the plant in accordance with the guidelines of ANSI B30.9-1971, "Slings," then the criteria of this guideline will be satisfied.

The Licensee should have all necessary documentation on file for possible NRC review. This action should be accomplished prior to fuel load.

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.

2.3.6.1 Summary of Licensee's Evaluation on Cranes (Inspection, Testing and Maintenance)

The Licensee response states that plant procedures will be developed for inspection, testing and maintenance of those cranes identified in Table 2.1. These procedures will include the guidance provided by Chapter 2-2 of ANSI B30.2-1976 as clarified in NUREG-0612, paragraph 5.1.1(6), with regard to frequency of inspections, tests and maintenance.

2.3.6.2 EG&G Evaluation, Conclusions and Recommendations on Cranes (Inspection, Testing and Maintenance)

When the Licensee completes the development of procedures, then EG&G will consider the criteria of Guideline 6 to be satisfied for Callaway Plant Units 1 and 2.

2.3.6.3 Summary on Cranes (Inspection, Testing and Maintenance)

In order to comply with the criteria of Guideline 6 of NUREG-0612, the Licensee should complete development of the inspection, testing and maintenance program prior to fuel load and have it available for possible NRC review.

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."[8] 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.

2.3.7.1 Summary of Licensee's Evaluation of Crane Design

The Licensee has stated that the cranes of Table 2.1 are designed to the standards of CMAA-70 (1975). The SNUPPS cranes were ordered in 1974 and their purchase specifications included reference to ANSI B30.2-1967, which was the applicable edition for design requirements.

2.3.7.2 EG&G Evaluation, Conclusions and Recommendations on Crane Design

It appears the Licensee's cranes (Table 2.1) were designed to meet the applicable criteria and guidelines of CMAA-70 (1975) and ANSI B30.2-1967. EG&G concludes that the Licensee has met Guideline 7 of NUREG-0612.

2.3.7.3 Summary on Crane Design

Callaway Plant complies with Guideline 7 of NUREG-0612. The Licensee should have all pertinent information to substantiate the design of its cranes for possible NRC audit.

3. CONCLUDING SUMMARY

3.1 Applicable Load Handling Systems

The list of cranes and hoists supplied by the Licensee as being subject to the provisions of NUREG-0612 is complete (see Section 2.2).

3.2 Guideline Recommendations

Compliance with five of the NRC guidelines for heavy load handling (Section 2.3) are satisfied at the Callaway Plant Units 1 and 2; i.e., Crane Operator Training, Special Lifting Devices, Slings, Cranes (Inspection, Testing and Maintenance), and Crane Design. The conclusions are presented in tabular form on Table 3.1. Specific recommendations to aid in compliance with the intent of the safe load paths and load handling procedures guidelines are presented in Table 3.2.

3.3 Interim Protection

Compliance with the seven guidelines of NUREG-0612, Section 5.1, must be accomplished prior to fuel load. Interim protection measures are not applicable to the Callaway Plant Units 1 and 2.

TABLE 3.1 CALLAWAY PLANT UNITS 1 AND 2 COMPLIANCE MATRIX

Equipment Designation	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
Polar Crane	C	260/25	NC	NC	C	C	C	C	C
Cask Handling Crane	C	150/5	NC	NC	C	C	C	C	C
Spent Fuel Pool Bridge Crane	C	2	NC	NC	C	C	C	C	C
Refueling Machine	C	2.4	NC	NC	C	C	C	C	C

C = Licensee action complies with NUREG-0612 Guidelines.

NC = Licensee action does not comply with NUREG-0612 Guidelines.

TABLE 3.2 SUMMARY OF RECOMMENDATIONS FOR CALLAWAY PLANT UNITS 1 AND 2

Guideline	Recommendation
1. Section 2.3.1 - Safe Load Paths	Comply with the criteria described in Guideline 1 of NUREG-0612 prior to fuel load.
2. Section 2.3.2 - Load Handling Procedures	Develop and prepare operating procedures for devices handling heavy loads incorporating recommendations of Guideline 2 of NUREG-0612 prior to fuel load.
3. Section 2.3.3 - Crane Operator Training	Complete development of crane operator training program prior to fuel load and have information demonstrating compliance to ANSI B30.2-1976 available for possible NRC review.
4. Section 2.3.4 - Special Lifting Devices	Licensee should complete compliance to ANSI N14.6-1978 for special lifting devices prior to fuel load.
5. Section 2.3.5 - Slings	Complete compliance to ANSI B30.9-1971 for slings prior to fuel load and have documentation available for possible NRC audit.
6. Section 2.3.6 - Crane (Inspection, Testing and Maintenance)	Complete development of inspection, testing and maintenance program for cranes prior to fuel load and have available for possible NRC review.
7. Section 2.3.7 - Crane Design	Documentation verifying compliance to Guideline 7 should be available for possible NRC audit.

4. REFERENCES

1. U.S. Nuclear Regulatory Commission, Regulatory Guide, NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

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

3. U.S. Nuclear Regulatory Commission, Letter to Union Electric Company, Subject: NRC Request for Additional Information on Control of Heavy Loads Near Spent Fuel, dated December 22, 1980.

4. N. A. Petrick, Standardized Nuclear Unit Power Plant System, Letter to H. R. Denton (NRC), Subject: Response to Staff Position, Interim Actions for Control of Heavy Loads, dated June 22, 1981.

5. American National Standards Institute, ANSI B30.2-1976, "Overhead and Gantry Cranes."

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

7. American National Standards Institute, ANSI B30.9-1971, "Slings."

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