ENCLOSURE 1

CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS
COMANCHE PEAK STEAM ELECTRIC STATION, UNITS 1 AND 2
(PHASE I - DRAFT)

Docket Nos. 50-445, 50-446

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Published
March 1984

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Prepared for the
U.S. Nuclear Regulatory Commission
Under DOE Contract No. DE-AC07-76IDO 1570

FIN No. A6457

8405230577 XA

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 Comanche Peak Steam Electric Station Units 1 and 2.

EXECUTIVE SUMMARY

Comanche Peak Units 1 and 2 do not totally comply with the guidelines of NUREG-0612. In general, compliance is insufficient in the following areas:

- o Development of load paths is not yet complete and there is no plan to mark the load paths on the floor.
- o The proposed method for estimating the dynamic load may be subject to misinterpretation. Two cranes are rated as having the capacities equal to the weights of loads to be carried, but it is not indicated if the dynamic effect has been taken into consideration.
- o Cranes are not indicated as designed per all of the indicated regulatory requirements.

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
COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2
(PHASE I - DRAFT)

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 Comanche Peak 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 applicant 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:

- Provide sufficient operator training, handling system design, load-handling instructions, and equipment inspection to assure 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 Texas Utilities Generating Company (TUGC), the applicant for Comanche Peak requesting that the applicant review provisions for handling and control of heavy loads at Comanche Peak Units 1 and 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 7, 1981, TUGC provided the initial response [4] to this request. Additional information was provided on October 8, 1981 [5]. After EG&G's preliminary evaluation [12], TUGC submitted two revisions of the initial response on March 1, 1982 and June 8, 1983 [10,11].

2. EVALUATION AND RECOMMENDATIONS

2.1 Overview

The following sections summarize Texas Utilities Generating Company's (TUGC) review of heavy load handling at Comanche Creek Units 1 and 2 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. TUGC'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 2150 lbs.

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.

TABLE 2.1. NONEXEMPT HEAVY LOAD HANDLING SYSTEMS--COMANCHE CREEK UNITS 1 AND 2

Crane/Hoist Name	Crane/Hoist I.D. Number	Capacity (Tons)	Location	Elevation
1. Fuel Building overhead crane	CPX-MESCFC-01	130-17-5	Fuel Building	Above 860 ft
2. Containment auxiliary upper cranes	CP1-MESCCA-01 CP2-MESCCA-01	5	Containment Building	905 ft-6 in.
3. Containment polar cranes	CP1-MESCPP-01 CP2-MESCPP-01	175-20	Containment Building	950 ft-7 in.
4. Moderating HX and letdown chiller HX hoist	CP1-MEMHCH-16 CP2-MEMHCH-16	2	Safeguards Building	831 ft-6 in.
5. Component cooling water pump hoist	CPX-MEMHCH-01	4	Auxiliary Building	810 ft-6 in.
6. Safety related chiller hoist (Single-failure-Proof)	CP1-MEMHCH-04A CP2-MEMHCH-04A	3	Auxiliary Building	778 ft
7. Centrifugal charging pumps hoist	CP1-MEMHCH-01, 02 CP2-MEMHCH-01, 02	4	Auxiliary Building	810 ft-6 in.
8. Containment fuel handling bridge crane	CP1-MESCCF-01 CP2-MESCCF-01	1	Containment Building	Above 860 ft
9. Auxiliary feedwater pump hoist (electric motor driven pump)	CP1-MEMHCH-13, 14 CP2-MEMHCH-13, 14	4	Safeguards Building	790 ft-6 in.
10. Auxiliary feedwater pump hoist (turbine driven pump)	CP1-MEMHCH-12 CP2-MEMHCH-12	3	Safeguards Building	790 ft-6 in.
11. Auxiliary filter hoist	CPX-MEMHWR-04	8	Auxiliary Building	852 ft-6 in.
12. Reactor coolant pumps hoist	CP1-MEMHCH-42 CP2-MEMHCH-42	45	Containment Building	905 ft-9 in.
13. Diesel generator (piston) hoist	CP1-MEMHCH-37, 38 CP2-MEMHCH-37, 38	1	Safeguards Building	810 ft-6 in.
14. Spent fuel pool HX hoist	CPX-MEMHCH-43, 44	8	Fuel Building	838 ft-9 in.
15. Service water traveling screen hoist and jib crane	CPX-MEMHCH-12 CPX-SWEHSG-01	20 3	Outside of service water intake structure	838 ft

TABLE 2.1. (continued)

	Crane/Hoist Name	Crane/Hoist I.D. Number	Capacity (Tons)	Location	Elevation
16.	Residual heat removal HX and Containment Spray System hoist	CP1-MEMHCH-47, 59	10	Safeguards Building	831 ft-6 in.
17.	Main steam safety valves hoist	CP1-MEMHCH-48, 49, 50, 51 CP2-MEMHCH-48, 49, 50, 51	1	Safeguards Building	880 ft-6 in.
18.	Service water intake structure crane	CPX-MESCSW-01	7 1/2	Service water intake structure	Above 796 ft
19.	Containment dome access rotating platform hoist	CP1-MESCRP-01 CP2-MESCRP-01	1	Containment Building	1000 ft
20.	Fuel handling bridge crane (Fuel Building)	TBX-FHSCFB-01	2	Fuel Building	Above 860 ft
21.	Refueling machine (Containment Building)	TBX-FHSCMC-01 TCX-FHSCMC-01	2	Containment Building	Above 860 ft
22.	Service water intake stop gate hoist	CPX-MEMHCH-61	8	Service water intake structure	789 ft-9 in.
23.	Auxiliary filter hoist (Single-Failure-Proof)	CPX-MEMH[illegible]-04A	8	Auxiliary Building	852 ft-6 in.
24.	Miscellaneous hoist	CPX-MEMHCH-72	2	Fuel Building	838 ft-9 in.
25.	Residual heat removal pump hoist	CP1-MEMHCH-08 CP2-MEMHCH-09	3	Safeguards Building	773 ft

/

The applicant has also identified numerous other cranes that have been excluded from satisfying the criteria of the general guidelines of NUREG-0612.

B. EG&G Evaluation

The safety injection pump hoist is omitted while the auxiliary building filter hoist is restored in the revised list of nonexempt cranes [11] without explanation.

C. EG&G Conclusions and Recommendations

The applicant should indicate if the safety injection pump hoist handles heavy loads in the vicinity of the irradiated fuel or safety shutdown equipment. If it does, it should be listed in Table 2.1 and the hazard of a load drop from this hoist should be evaluated.

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."

A. Summary of Applicant's Statements

" 'Safe load areas' (areas serviced by a particular crane in which a load drop will not result in damage to shutdown or decay heat removal equipment or spent fuel) have been identified where applicable for the cranes listed in [Table 2.1]. Equipment handled by these cranes will be transported whenever possible within the identified safe load areas."

"Safe load areas" for 9 of the 25 listed in Table 2.1 are marked on submitted drawings. For the remaining hoists, the establishment of safe load areas is not applicable, since the hoists generally travel along a single monorail which allows the hoist to follow only one possible path.

"All 'safe load areas' and 'safe load paths' will be identified by drawing."

" 'Safe load paths' will also be identified and established for loads handled outside safe load areas prior to initial fuel load to ensure the safe operation of the crane during maintenance and normal operation of the plant."

" 'Safe load paths' will be defined in the CPSES maintenance procedure as attachments to load handling procedures. Procedures will be approved and handled in accordance with CPSES station procedures, as directed by the Station Operation Review Committee. Deviation from this maintenance procedure or load path will be handled in accordance with procedures governing deviation or revisions of safety related procedures, as directed by the Station Operation Review Committee."

B. EG&G Evaluation

As pointed out in [12], the idea of "safe load areas" is not completely sound. A safe load path should be established for each heavy load to be moved. If several loads are moved through the same area, this area constitutes a composite load path which could be defined as a "safe load area." Otherwise, this guideline does not call for identifying the "safe load areas." There is no need for the applicant to establish the safe load path and the safe load area separately.

For defining the safe load path, the applicant has neglected to indicate if the path will be painted on the floor in the area of load movement.

C. EG&G Conclusions and Recommendations

The applicant's action is not fully consistent with the intent of NUREG-0612, Article 5.1.1(1). For establishing the safe load paths, the applicant should consider:

(1) Defining a definite path, not a general area, for transporting each heavy load.

(2) Marking the load path on the floor for easy identification by the crane operator.

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

"For some heavy loads, it may be necessary to operate outside the safe load area and transport the load over or near plant shutdown or decay heat removal equipment or spent fuel. For these loads and all oversize loads, special precautions or procedures will be utilized with the purpose of minimizing the risk of a heavy load drop in these areas. The procedure will consist of load drop prevention measures, such as a list of required equipment, inspection, acceptance criteria for the movement of the load, sequence of steps, etc. These procedures will be available for NRC review."

B. EG&G Evaluation

The applicant's statements imply that the development of the load handling procedures is covered by the designation of the "safe load areas."

TUGC has committed to providing procedures in accordance with Guideline 2.

C. EG&G Conclusions and Recommendations

Based upon the information supplied, EG&G considers that Comanche Peak units 1 and 2 are consistent with the intent of Guideline 2.

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

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

Procedures governing crane operator training qualifications and conduct will be available for NRC review prior to fuel load."

B. EG&G Evaluation

The applicant has committed to compliance with guideline 3.

C. EG&G Conclusions and Recommendations

Based upon the information provided, EG&G considers Comanche Peak units 1 and 2 to be consistent with guideline 3.

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. <u>Summary of Applicant's Statements</u>

"Although a special lifting device for a spent fuel shipping container weighing 10,000 lbs or more has not yet been procured, ANSI N14.6-1978 and NUREG-0612 Guidelines for special lifting devices will be invoked when this device is obtained. Although it is anticipated at this time that the standards for the lifting devices will be met, it may later be determined that alternatives to the standard are required. In that event, written notification will be made to the Nuclear Regulatory Commission describing the alternatives and their equivalency in terms of load handling reliability."

"Reactor vessel head and reactor internals lifting rigs meet the intent of ANSI N14.6-1978 and NUREG-0612 for design, fabrication, assembly and operation. The analysis for these devices is provided in [the Westinghouse report WCAP-10156]" "These rigs meet the intent of mentioned NUREG and ANSI standard for design, fabrication, assembly and operation, but do not meet all the specific load verification testing. The proposed alternate testing was included in Section 6 of WCAP-10156."

"The failed fuel assembly lifting tool has been deleted from Table 4 of [Report WCAP.9198] because our review indicated that this tool is not required."

In Table A-4 [11], the applicant indicates that special lifting devices will be used only on:

(1) Spent fuel cask

(2) Reactor vessel head

(3) Reactor internals

B. EG&G Evaluation

The information related to the proposed alternate load verification testing of the reactor vessel head and reactor internals lifting rigs has not been provided for review. The applicant was reminded that dynamic loads must be considered for calculating the stress design factors [12], but this requirement is left unaddressed in the applicant's latest submittal [11].

C. EG&G Conclusions and Recommendations

The applicant's information indicates a partial consistency with the intent of this guideline. Additional actions are recommended:

(1) Provide information on the proposed load verification testing for reactor vessel head and reactor internals lifting devices, and demonstrate that the alternate testing methods are consistent with the intent of the ANSI N14.6 testing procedures.

(2) For the design of the special lifting devices, calculate the ANSI N14.6 specified design safety factors with the combined maximum static and dynamic loads.

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

"Lifting devices that are not specially designed for use with heavy loads, as defined by NUREG-0612, will comply with the guidelines of ANSI B30.9-1971."

"Sling ratings will be identified on the sling in terms of the static load, which produces the maximum static and dynamic load; (i.e., load x 0.005 x hoist speed + maximum static load). Where this restricts slings to use on only certain cranes, the slings will be clearly marked as to the cranes with which they may be used."

B. EG&G Evaluation

For calculating the dynamic load, the applicant has failed to specify the unit for hoist speed.

C. EG&G Conclusions and Recommendations

The applicant's proposed action is not completely consistent with the intent of this guideline. The unit of the hoist speed used for calculating the dynamic load should be clearly stated, e.g. feet/minute.

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

"ANSI B30.2-1976, Chapter 2-2, will be invoked with respect to crane inspections, test and maintenance.

With respect to Section 2-2.1.1.1 of ANSI B30.2, cranes located within containment will be inspected every scheduled refueling outage in accordance with the requirements of ANSI B30.2. This is necessary because periodic inspections during power operations are impractical due to high radiation levels in containment.

These measures will be implemented prior to fuel handling. Procedures and inspection records will be retained and available for NRC review."

B. EG&G Evaluation

As stated, the applicant has committed to implement the measures consistent with the intent of this guideline prior to fuel handling, and to retain the procedures and the inspection records for review.

C. EG&G Conclusions and Recommendations

Based on the information provided, EG&G considers that Comanche Peak units 1 and 2 are consistent with the intent of guideline 6.

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

"Table A-3 lists the load handling systems identified in Table A-1 and the applicable codes and standards as specified in the CPSES Equipment Purchase Specifications. In all cases, the crane design complies with the guidelines of CMAA Specification 70 and Chapter 2-1 of ANSI B30.2-1967 and all hoists are designed in accordance with the requirements of ANSI B30.16-1973."

Table A-3 [11] is a revised version of Table 3 in the applicant's early response [10]. In Table 3, the applicant indicated that all nonexempt cranes were designed per ANSI B30.2-1976, Chapter 2-1 or to the criteria of both CMAA-70 and ANSI B30.2, Chapter 2-1. In response to EG&G's comments [12] on the specified weight of a heavy load and rated capacities of some cranes, the applicant states:

"The term 'heavy load' is defined in NUREG-0612 as a load whose weight is greater than the combined weight of a single spent fuel assembly and its handling tool. For CPSES, this weight is approximately 2,150 lbs."

"Table 4 of Reference [10] has been corrected to eliminate the discrepancies concerning rated capacity of cranes [in question] and their maximum loads. (See Attachment A, Table A-4 [11])."

B. EG&G Evaluation

As shown in Table A-3 [11], the applicant has apparently classified the overhead load handling systems into two categories: cranes and hoists. Even though a hoist may run on a monorail, it is not considered as a crane. All the overhead load handling systems designated as hoists are specified to meet the criteria of ANSI B30.16-1973: "overhead hoist (underhung)", not the criteria of CMAA-70 and ANSI B30.2-1976 specified by this guideline. Cranes are designed according to the criteria of ANSI B30.2-1967 instead of ANSI B30.2-1976. In the opinion of EG&G, the use of ANSI B30.16-1973 in lieu of CMAA-70 and Chapter 2-1 of ANSI B30.2-1976 is not entirely appropriate. Some areas of crane design discussed in CMAA-70 and Chapter 2-1 of ANSI B30.2-1976 are not covered in ANSI B30.16-1973. For example, Chapter 2-1 of ANSI B30.2-1976 includes guidelines for construction of runways and supporting structure, whereas ANSI B30.16-1973 does not. Since the design of the runways and supporting structure usually is based on time-tested engineering practice, the applicant only needs to state the codes and standards stipulated in the design specifications. As an alternative, the applicant may review ANSI B30.11-1980 for applicability to applicant's crane design. Inasmuch as there exist only some minor differences between the 1967 edition and the 1976 edition of ANSI B30.2, the use of the 1967 version in lieu of the 1976 edition for crane design is acceptable.

As pointed out in EG&G previous evaluation [12], some cranes should belong to the exempt category.

In the applicant's latest submittal [11], the following six cranes are still listed as nonexempt cranes, even though the maximum weights (Table A-4 [11]) carried by these cranes are all less than 2150 lbs:

(1) Containment fuel handling bridge crane

(2) Main steam safety valve hoist

(3) Containment dome access rotating platform hoist

(4) Safety related chiller hoist

(5) Refueling machine (containment building)

(6) Diesel generator (piston) hoist.

Pending further review by the applicant, these cranes are included in Table 2.1.

Based on the information provided in [11], the load carrying capacities of

(1) Residual heat removal pump hoist

(2) Diesel generator (piston) hoist

are rated as equal to the loads to be handled. The applicant has not indicated if the specified loads are static loads or combined static and dynamic loads. If they are static loads, these two cranes are still underrated.

C. EG&G Conclusions and Recommendations

At present, the crane design at Comanche Peak Steam Electric Station is not in complete conformance to the intent of NUREG-0612, Article 5.1.1(7). For the applicant's further effort, EG&G recommends the following:

(1) If the criteria other than those specified by this guideline were used for crane design, provide information to demonstrate that the intent of this guideline is satisfied in every respect.

(2) Re-examine the maximum loads and rated capacities to determine if sufficient safety margin for some cranes to carry the combined static and dynamic loads has been provided and if some cranes should be categorized as exempt cranes.

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

The interim protection measure has not been addressed.

B. EG&G Evaluation

No evaluation is possible.

C. EG&G Conclusions and Recommendations

This measure should be addressed before plant operation, if the implementation of the guidelines of Section 5.1, NUREG-0612, is not completed at that time.

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

The applicant's statements concerning this interim protection measure appear in an early response [4]. No additional information is provided in the later submittals [10,11].

B. EG&G Evaluation

The applicant has indicated that this interim protection measure will be implemented before fuel is handled over the core at the facility.

C. EG&G Conclusions

As stated in [12], the applicant's planned action satisfies the intent of Interim Protection Measure 6.

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 is incomplete (see Section 2.2.1 C).

3.2 Guideline Recommendations

Compliance with the seven NRC guidelines for heavy load handling (Section 2.3) are partially satisfied at Comanche Peak Units 1 and 2. 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:

Guideline		Recommendation
1. Section 2.3.1	a.	Complete the development of safe load paths for all heavy loads and mark the paths on the floor in the areas where loads are to be handled.
2. Section 2.3.2	a.	Consistent with guideline 2.
3. Section 2.3.3	a.	Consistent with guideline 3.
4. Section 2.3.4	a.	Provide verification that special lifting devices used on heavy load lifts meet the intent of ANSI N14.6-1978 as appended by NUREG-0612 Section 5.1.1(4) concerning dynamic effects.
5. Section 2.3.5	a.	Redefine the method for computing the dynamic loads.
6. Section 2.3.6	a.	Consistent with guideline 6.
7. Section 2.3.7	a.	Provide information to supplement ANSI B30.16-1973 and ANSI B30.2-1967 to demonstrate that the requirements of this guideline are met in every respect.

TABLE 3.1. COMANCHE PEAK UNITS 1 AND 2 NUREG-0612 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 Design
1. Fuel building overhead crane	New and spent fuel casks, handling tools and transfer canal gate. 1 to 110 tons	130-17-5	I	C	C	I	I	C	I
2. Containment auxiliary upper crane	Reactor vessel studs, stud tensioner, stud baskets, control rod drive vent ducts 0.3 to 3.1 tons	5	I	C	C	--	I	C	I
3. Containment polar crane	RV head, reactor internals, reactor coolant pump and fuel storage area stop gate. Weights given for 16 components: 1.5 to 168.1 tons	175-20	I	C	C	I	I	C	I
4. Moderating HX and letdown chiller HX	Moderating HX and letdown chiller HX components. 0.2 to 1.3 tons	2	I	C	C	--	I	C	I
5. Component cooling water pump hoist	CCW pump components, 24 in. valve and fan/coil motor. 0.1 to 3.3 tons	4	I	C	C	--	I	C	I
6. Safety related chiller hoist	All weights given less than "heavy weight."	3	I	C	C	--	I	C	I
7. Centrifugal charging pump hoist	CCP components, lube oil cooler and fan/coil motor. 0.1 to 3.8 tons	4	I	C	C	--	I	C	--
8. Containment fuel handling bridge	Fuel assembly and lifting tool. 1.04 tons (less than "heavy load").	1	I	C	C	--	I	C	I

TABLE 3.1. (continued)

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 Design
9. Auxiliary feedwater pump hoist (motor driven)	AF pump components. 0.6 to 3.6 tons	4	I	C	C	--	I	C	I
10. Auxiliary feedwater pump hoist (turbine driven)	AF pump and turbine components. 0.6 to 2 tons	3	I	C	C	--	I	C	I
11. Auxiliary filter hoist	Filter, spent filter cask and concrete floor plug. 0.01 to 6.4 tons	8	I	C	C	--	I	C	I
12. Reactor coolant pump hoist	RC pump and motor components. 3.5 to 42.4 tons	45	I	C	C	--	I	C	I
13. Diesel generator (piston) hoist	Piping and structure components. 1 ton	1	I	C	C	--	I	C	I
14. Spent fuel pool HX-hoist	SFC pump, motor, HX shell, HX tubes and concrete floor plugs. 1.1 to 4.5 tons	8	I	C	C	--	I	C	I
15. Service water traveling screen hoist and jibe crane	Traveling screen, miscellaneous parts and stop gates. 2.3 to 10.9 tons	20-3	I	C	C	--	I	C	I
16. Residual heat removal HX and containment spray system HX hoist	RHR HX and CSS HX components and valves. 0.1 to 8.5 tons	10	I	C	C	--	I	C	I
17. Main steam safety valves hoist	Main steam safety valves. 0.8 ton (less than "heavy load")	1	I	C	C	--	I	C	I
18. Service water intake structure crane	Service water pump motor and fire pump components. 0.09 to 4.9 tons	7.5	I	C	C	--	I	C	I

Table 3.1. (continued)

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 Design
19. Containment dome access rotating platform hoist	Miscellaneous tools and welding equipment. 0.2 ton (less than "heavy weight")	1	I	C	C	--	I	C	I
20. Fuel handling bridge crane (Fuel bldg)	Fuel assembly plus tool and lighting fixture. 0.15 to 1.04 tons	2	I	C	C	--	--	C	I
21. Refueling machine (containment bldg)	Fuel assembly, rod control cluster plus gripper and CRD shaft plus handling fixture. 0.2 to 0.9 ton	2	I	C	C	--	--	C	I
22. Service water intake stop gate hoist	SW pump compartment stop gates. 6.2 tons	8	I	C	C	--	I	C	I
23. Auxiliary filter hoist	Filter, spent filter cask and concrete floor plug. 0.01 to 6.4 tons	8	I	C	C	--	I	C	I
24. Miscellaneous hoist	Spent fuel pool cooling pump inlet isolation valve. 1.3 tons	2	I	C	C	--	I	C	I
25. Residual heat removal pump hoist	RHR pump. 3 tons	3	I	C	C	--	I	C	I

C = Applicant action consistent with NUREG-0612 guideline.

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

-- = Guideline is not applicable to this handling system.

I = Insufficient information was provided to determine consistency.

Guideline	Recommendation
	b. Re-examine the information in [11] to determine if some cranes mentioned in Section 2.3.7 should be given the exempt status and if the capacities of two other cranes are underrated.

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 Comanche Peak Units 1 and 2 are met:

Interim Measure	Recommendation
1. Section 2.4.1	Implement this interim measure before any spent fuel is stored in the spent fuel pool if actions for complying with the guidelines of Section 5.1 of NUREG-0612 are not completed at that time.
2. Section 2.4.3	None.

3.4 Summary

The overhead head heavy load handling systems at Comanche Peak Units 1 and 2 partially meet the requirements of NUREG-0612, Section 5.1. The facilities fully meet the intent of Guideline 6. For all other guidelines, additional information is needed to cover the areas that are inadequately addressed or unaddressed.

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, 17 May 1978.

3. USNRC, Letter to Texas Utilities Generating Company. Subject: NRC Request for Additional Information on Control of Heavy Loads Near Spent Fuel, 22 December 1980.

4. H. C. Schmidt Texas Utilities Services Inc. (TUSI), Letter to S. Burwell (NRC). Subject: Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612, August 7, 1981.

5. H. C. Schmidt (TUSI), Letter to S. Burwell (NRC). Subject: Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612, October 8, 1981.

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.

10. H. C. Schmidt (TUSI), Letter to S. Burwell (NRC). Subject: Comanche Peak Steam Electric Station Control of Heavy Loads: NUREG-0612, March 1, 1982.

11. H. C. Schmidt (TUSI), Letter to B. J. Youngblood (NRC). Subject: Comanche Creek Steam Electric Station, Docket Nos. 50-445 and 50-446, Final Response to NUREG-0612, June 8, 1983.

12. B. W. Dixon (EG&G), Phase I Interim Report. Subject: Control of Heavy Loads at Nuclear Plants-Comanche Peak Steam Electric Station Units 1 and 2, March 1982.

ENCLOSURE 2

SYNOPSIS OF ISSUES ASSOCIATED WITH NUREG 0612

The following information is provided to identify exceptions or interpretations related to verbatim compliance with NUREG 0612 Guidelines that have occurred during the course of this review. For each of the major Guidelines specific exceptions are identified, a discussion concerning the underlying objective of that Guideline is provided, and approaches felt to be consistent and inconsistent with that guideline are identified. While each such exception has been handled on a case by case basis, and has been considered in light of overall compliance with NUREG 0612 at a particular plant, the topics are of a nature general enough to be of interest to other plants.

GUIDELINE 1 SAFE LOAD PATHS

Exception 1

In the opinion of the licensee, development of individual load paths is impractical since there are a significant number of loads for which the pickup and laydown areas vary from outage to outage. Further, in some cases the location of safety related equipment combined with the design of the floor over which heavy loads are carried indicates that for a number of lifts there is no preferred load path.

Discussion

The purpose of this portion of Guideline 1 is to ensure that the paths over which heavy loads are carried have been developed and approved in advance of the lift and are based on considerations of safety. In particular it is provided to avoid the ad hoc selection of load paths by maintenance personnel since such a situation could result in the use of a load path which has been established by a process wherein considerations other than safety have taken precedence.

It is recognized that there are a class of loads which, although in excess of the weight specified for classification as a heavy load, are actually miscellaneous or maintenance related loads for which it is impractical to identify a specific laydown area which can be fixed from outage to outage. Conversely there are a number of loads for which specific laydown areas have been allocated in the original plant design and which should reasonably be expected to be carried over the same load paths during every outage. A tabulation of loads in this latter category, generally applicable to PWR's and BWR's, was provided in NUREG 0612 as Table 3-1.

A fundamental principal of NUREG 0612 is protection through defense in depth. Specifically, the first line of protection from an accident which could result in damage to spent fuel or equipment required for safe shutdown or decay heat removal is to avoid or minimize the exposure of such equipment to crane borne loads overhead. Where such exposure is minimized, rather than avoided, a second line of defense can then be provided by intervening barriers such as floors or the provision of additional lifting device redundancy or safety factors. Considering the foregoing, the use of exclusion areas, rather than safe load paths, is consistent with this guideline only under circumstances where there is no safety related equipment located beneath the area accessible to the crane hook but outside of the exclusion area. This situation has been found in buildings such as the turbine hall or screen house where safety related equipment is concentrated in a specific area within the crane path. It is unlikely to occur within containment due to the numerous safety related piping and electrical systems provided to support decay heat removal.

Approaches Consistent With This Guideline

Specific safe load paths are prepared and approved for major components for which hazardous areas are well established. For miscellaneous lifts load corridors are established such that any movement within that corridor cannot result in carrying a heavy load over spent fuel or systems required for safe shutdown or decay heat removal (regardless of intervening floors). Movement within these corridors is at the discretion of the load handling party.

Specific safe load paths are prepared and approved for major components for which hazardous areas are well established. For miscellaneous lifts detailed directions are prepared and approved for developing safe load paths which include floor plans showing the location of safety related equipment and instructions to avoid such equipment. Specific safe load paths are then prepared each time a miscellaneous lift qualifying as a heavy load is made. These individual load paths are temporary and may change from outage to outage.

Approaches Inconsistent With this Guideline.

Use of limited exclusion areas in containment which merely prohibited the carrying of heavy loads directly over the core or specific components and allow full load handling party discretion in other areas.

Exception 2

In the opinion of the licensee marking of load paths on the floor is impractical. This may be caused by the general use of temporary floor coverings which would cover the load path markings, or, due to the number of loads involved, a requirement for multiple markings which could confuse the crane operator.

Discussion

The purpose of this feature of Guideline 1 is to provide visual aids to assist the operator and supervisor in ensuring that designated safe load paths are actually followed. In the case of the operator it has the additional function of avoiding undesirable distractions while handling suspended loads (e.g., trying to read procedural steps or drawings while controlling the crane). This feature should also be seen as a provision necessary to complete a plan for the implementation of safe load paths. Specifically it provides some additional assurance that, having spent the time and effort to develop safe load paths, those paths will be followed.

Approaches Consistent With this Guideline

Rather than mark load paths a second member of the load handling party (that is, other than the crane operator) is made responsible for assuring that the designated safe load path is followed. This second person, a signalman is typically used on cab operated cranes, checks out the safe load path prior to the lift to ensure that it is clear, refers to the safe load path guidance during the lift and provides direction to the operator and that the load path is followed. To support this approach the duties and responsibilities of each member of the load handling party should be clearly defined.

Prior to a lift the appropriate load path is temporarily marked (rope, pylons, etc.) to provide a visual reference for the crane operator. In cases where the load path cannot be marked (e.g., transfer of the upper internals in a PWR) temporary or permanent match marks can be employed to assist in positioning the bridge and/or trolley during the lift.

In either case reasonable engineering judgement would indicate that in certain specific lifts marking of safe load paths is unnecessary due to physical constraints on the load handling operation (e.g., simple hoists, monorails, or very short lifts where movement is limited to one coordinate axis in addition to the vertical).

Approaches Inconsistent With this Guideline

Positions which in effect do not recognize the need for realistically providing visual aids to the crane operator and imply that, for all lifts, the operator will remember the load path from review of procedures or by reference to a drawing.

Exception 3

Obtaining written alternative procedures approved by the plant safety review committee for any deviations from a safe load path is considered too cumbersome to accommodate the handling of maintenance loads where laydown areas may have to change or load paths altered as a result of unanticipated maintenance requirements.

Discussion

The purpose of this portion of this guideline is to ensure that deviations from established safe load paths receive a level of review appropriate to their safety significance. In general it is highly desirable that once safe load paths are established they are retained and kept clear of interference rather than routinely deviated from. It is recognized, however, that issues associated with plant safety are the responsibility of an individual licensee plant safety review committee (or equivalent) and the details of their excercizing this responsibility should be within their jurisdiction.

Approach Consistent With this Guideline

A plant safety review committee (or equivalent) delegates the responsibility for approving temporary changes to safe load paths to a person, who may or may not be a member of that committee, with appropriate training and education in the area of plant safety. Such changes are reviewed by the safety review committee in the normal course of events. Any permanent alteration to a safe load path is approved by the plant safety review committee.

Approach Inconsistent With this Guideline

Activities which in effect allow decisions as to deviations from safe load paths to be made by persons not specifically designated by the plant safety review committee.

GUIDELINE 2 LOAD HANDLING PROCEDURES

No significant exceptions to this guideline have been encountered. Occasionally a question arises concerning the need for individual procedures for each lift. In general, it was not the purpose of this guideline to require separate procedures for each lift. A reasonable approach is to provide separate procedures for each major lift (e.g., RV head, core internals, fuel cask) and use a general procedure for handling other heavy loads as long as load specific details (e.g., load paths, equipment requirements) are provided in an attachments or enclosures.

GUIDELINE 3 CRANE OPERATOR TRAINING

Exception

The only exception occassionally encountered with respect to this Guideline other than fairly minor, site unique, exceptions has been a desire to deviate from the requirement of ANSI B30.2-3.1.7.o for testing of all controls before beginning a new shift. In some cases a licensee has qualified a commitment in this area by noting that only crane controls "necessary for crane operation" will be tested at the start of a shift.

Discussion

This requirement (ie. not a recommendation) of ANSI B30.2 is important since crane control system failures are relatively significant contributors to load handling incidents. The only reason that can be seen for an exception in this area is a general aversion to the word "all". Specifically, it appears that some licensees fear that a commitment to this requirement will force them to test all control type devices (eg. motor overloads, load cells, emergency brakes) rather than just those features generally known as controls (ie. hoist, bridge, and trolley motion controllers).

Approaches Consistent With this Guideline

Exceptions that clearly indicate that all normal controls (hoist, bridge, and trolley motion controllers) will be tested at the start of each shift and that the purpose of not committing to "all" controls is to avoid a misunderstanding concerning other control devices.

Approaches Inconsistent With This Guideline

A response that implies that a decision to test or not test a normal control will be made by the crane operator on the basis of what type of lift or direction of motion he expects for the forthcoming shift.

GUIDELINE 4 SPECIAL LIFTING DEVICES

Exception 1

Some licensees have indicated that their special lifting devices were designed and procured prior to the publication of ANSI N14.6 and therefore are not designed in accordance with that standard. This fact is sometimes combined with a reference to the title of that standard to reach a conclusion that the standard is not applicable.

Discussion

The purpose of this section is to ensure that special lifting devices were designed and constructed under controlled conditions and that sufficient documentation is available to establish existing design stress margins and support future maintenance and repair requirements. ANSI N14.6 is an existing standard that provides requirements supporting this goal for lifting device applications where the consequence of a failure could be similar to that which could be expected in the event of the failure of a special lifting device carrying a load within the jurisdiction of NUREG 0612. Consequently it seems appropriate that for special lifting devices subject to NUREG 0612 it should be able to be demonstrated that, from a design standpoint, they are as reliable as a device for which ANSI N14.6 was developed.

Approaches Consistent With This Guideline

Although not originally specified to be designed in accordance with ANSI N14.6 the special lifting device in question was provided by a reactor vendor, in accordance with appropriate quality assurance and quality control procedures, for a specific application associated with power plant components provided by that vendor. Based on either the review of the original stress report or, if such a stress report is unavailable, the preparation of a new stress report, the licensee has determined that margins to material yield and ultimate strength are comparable to those specified in ANSI N14.6. Although not required of the lifting device vendor, the licensee has reviewed the design of the lifting device and prepared a list of critical components whose repair or replacement should be performed under controlled conditions.

Approaches Inconsistent With This Guideline

No information is available concerning the original design but it is probably allright because the device has been used for ten years and never failed.

The device was built before the publication of ANSI N14.6, does not carry shipping containers of nuclear material weighing more than 10,000 pounds, and thus need not comply with ANSI N14.6.

Exception 2

No 150% overload test has been performed and, in the opinion of the licensee, such a test is impractical.

Discussion

The performance of a load test in excess of the load subject to NUREG 0612 is an important contributor to the ability to assess the overall reliability of a device. Such a test supplements design reliability by demonstrating that the device was properly fabricated or assembled and that a portion of the design safety margin has been demonstrated. Such proof of workmanship is particularly important for a fairly complicated device. It is recognized, however, that the specification of a 150% overload test is somewhat arbitrary and that, in some cases, the nature of the device is such that the liklihood of workmanship shortcomings is remote.

Approaches Consistent With This Guideline

The licensee has evaluated the lifting device in question and has determined that design stress margins are substantial. Further it has been established that the device itself is uncomplicated and principally put together with mechanical joints such that an assembly error is highly unlikely. The use of welded joints is severly limited and where employed were performed in accordance with substantial quality controls (eg AWS D1.1) including NDE. The device has been tested to 100% of rated load.

Although a 150% overload test has not been performed the lifting device has been subjected to a manufacturer recommended overload to demonstrate proof of workmanship (typically 120-125%).

Approaches Inconsistent With This Guideline

See this topic for Exception 1 above.

Exception 3

The requirement of ANSI N14.6 for an annual 150% load test or full NDE is excessive. Both the load test (due to the inability to make the test lift within containment) and the NDE (due to the need to remove protective coatings) are impractical and not justified by the infrequent use of these devices.

Discussion

A continuing inspection program to assure the continued maintenance of safety margins incorporated in the original design of the device is important to demonstrate the reliability of special lifting devices. It is recognized, however, that some devices employed in a nuclear power plant, particularly those associated with refueling, are used under conditions of control and at frequencies of use that are substantially less severe than that possible for the type of lifting device for which ANSI N14.6 was originally prepared. Consequently a reasonable relaxation of the inspection interval seems appropriate.

Approaches Consistent With This Guideline

Overload tests will be conducted but at a longer interval, 5 years, between tests to be consistent with the number of operational lifts required.

NDE of load bearing welds will be conducted at 5 year intervals or, alternatively, load bearing welds will be examined through a program that ensures that all welds will be examined over a normal inservice inspection interval of 10 years in a manner similar to that specified in the B&PV Code for Class 2 Component Supports.

Approach Inconsistent With This Guideline

Continuing inspection will be limited to an annual visual examination of the device.

GUIDELINE 5 LIFTING DEVICES NOT SPECIALLY DESIGNED

Exception

Licensees have taken exception to the requirement to select slings in accordance with the maximum working load tables of ANSI B30.9 considering the sum of static and dynamic loads. Most commonly it is the licensees position that the approximate factor of safety of five on rope breaking strength inherent in these tables adequately accomodates dynamic loading.

Discussion

The intent of this portion of this Guideline, which also applies to special lifting devices under Guideline 4, is to reserve the ANSI B30.9 safety factors for accomodating sling wear and unanticipated overloads and avoid a reduction of this safety factor as a result of the routine dynamic loads inherent in hook/load acceleration and deceleration. While it is acknowledged that, for operating characteristics typical of cranes employed at nuclear power plants, these dynamic loads are unlikely to be substantial, such a determination cannot be made generically. Typically the actual dynamic load due to hook/load acceleration or deceleration is a function of design hook speeds and the type of hoist control system employed. It should also be recalled that ANSI B30.9 is a general industrial standard which applies to all load handling devices and does not in itself provide for any additional conservatism in consideration of the potential consequences of a load handling accident at a nuclear power plant. Based on this, it is considered reasonable that individual licensees evaluate the potential contribution of dynamic loading in their operations and if such dynamic loading is indeed significant accomodate it in their procedures for sling selection.

Approach Consistent With This Guideline

The licensee has evaluated the potential routine dynamic loading for lifting devices not specially designed and found them to be a relatively small fraction (typically 5-15%) of static load. This estimate has been made on the basis of either calculated acceleration and deceleration rates or through use of the industrial standard for impact loading of cranes specified in CMAA-70. In either case having verified that routine dynamic loading of a specific hoist is indeed small the licensee has drawn the conclusion that revised selection criteria to accomodate such minor additional loads will not have a substantial effect on overall load handling reliability.

Approach Inconsistent With This Guideline

- Statement to the effect that dynamic loads are accomodated in the tables of ANSI B30.9 with no indication that the licensee has assessed the actual dynamic loading imposed on cranes subject to NUREG 0612.

GUIDELINE 6 CRANE INSPECTION TESTING AND MAINTENANCE.

Exception

The only exception occasionally encountered with respect to this Guideline other than fairly minor and site-unique exceptions has been a desire to deviate from the requirement of ANSI B30.2-1.1.2.a.2 and 3.2.4 for testing of hoist limit devices before beginning a new shift. In some cases a licensee has qualified a commitment in this area by noting that this limit switch will be tested only if operations in the vicinity of the limit switch are anticipated.

Discussion

While this issue is treated somewhat ambigously in ANSI B30.2 (it is a recommendation in article 1.1.2 and a requirement in article 3.2.4) it is important since two-blocking incidents are relatively significant contributors to load handling incidents. Further it should be noted that this test has been incorporated as a requirement of OSHA in 29 CFR 1910.179.(n).(4).(i). It is recognized, however, that there may be circumstances where such a test is not prudent. First, such a test clearly should not be made with the hook under load. Consequently if a shift change is made with the hook loaded (this, by the way, is not a desireable practice and could be precluded through strict compliance with ANSI B30.2-3.2.3.j) a hoist limit switch test should not be performed. Second, there may be circumstances where the nature of forthcoming load handling operations indicates that the time (and minor risk) associated with this test is not justified. In particular if it is known that a hoist will not be used or used only in an area substantially removed from the upper travel limit, it would seem reasonable to defer the limit switch test until the start of the next shift. If such an approach is taken, however, it should be approached with care. Requirements for deferring an upper limit switch test should accomodate the uncertainty associated with maintenance plans and establish unambiguous criteria concerning what operations can be determined to be remote from upper travel limits. Such criteria should recognize that the need for upper travel limit switch protection may be preceeded by a control system failure and consequently should conservatively allow for operater response time and potential delays associated with emergency shutdown of the crane.

Approach Consistent With This Guideline

General compliance with this requirement. Certain specific provisions made for deferring upper limit switch testing under conditions that are not subject to operater interpretation.

Approaches Inconsistent With This Guideline

An approach that implies that a decision to test or not is left to the discretion of the operator or implies that such a test will be required only if operations are planned in close proximity to the hook upper travel limit.

GUIDELINE 7 . CRANE DESIGN

Exception

Occasionally a licensee has indicated that the overhead electric travelling cranes employed at a site were purchased prior to the publication of CMAA-70 or ANSI B30.2-1976 and thus these standards should not be applied.

Discussion

The purpose of this Guideline is to ensure that all cranes carrying heavy loads in nuclear power plants meet certain minimum criteria in their design and, consequently, can be assumed to provide an acceptable standard of mechanical, electrical, and structural reliability. It is also recognized, however, that cranes in operating plants may have been designed and procured prior to the publication of current standards and, thus, not strictly comply with some details of these standards. In general, though, current standards have evolved from predecesor standards in existence at the time of crane procurement (EOCI 61, ANSI B30.2-1967) and, since the later standards are not revolutionary, it is likely that cranes at nuclear power plants will provide a degree of reliability equivalent to that provided by the current standards. Such a general determination canot be made, however, by the staff since nuclear power plant cranes are usually unique and provided with site specific design features. It is up to the licensee then to make a systematic comparison of their crane design with the requirements of current standards and determine if additional design features are appropriate.

Approach Consistent With This Guideline

The licensee has compared original crane procurement specifications or existing crane designs with the requirements of the referenced standards in areas effecting load handling reliability. In instances where the current standard provides additional protection against the consequences of operater error or component failure the licensee has proposed modifications which will result in a degree of load handling reliability similar to that provided in the current standard.

Approach Inconsistent With This Guideline

Positions to the effect that the cranes satisfied standards in existence at the time of procurement and what was good enough then is good enough now.