ENCLOSURE

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

Docket Nos. 50-329,330

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ABSTRACT

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

EXECUTIVE SUMMARY

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

- Safe load path marking and administrative controls are insufficient
- Sling design loads do not include dynamic effects
- Insufficient information was provided to evaluate special lifting device design, testing, and maintenance
- Insufficient design information was provided for seven cranes.

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
MIDLAND UNITS 1 AND 2

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 Midland 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 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 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 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

In December 22, 1980, the NRC issued a letter [3] to Consumers Power Company (CPC), the licensee for Midland 1 and 2 requesting that the licensee review provisions for handling and control of heavy loads at Midland 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 December 21, 1981, CPC provided the initial response [4] to this request. On February 26, 1982 CPC provided updated information [5].

2. EVALUATION AND RECOMMENDATIONS

2.1 Overview

The following sections summarize CPC's review of heavy load handling at Midland 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. CPC's review of the facilities does differentiate somewhat between the two units however it appears that both units are of basically an identical design. The licensee has indicated the weight of a heavy load for this facility (as defined in NUREG-0612, Article 1.2) as 1,700 lbs.

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 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 Licensee Statements

The licensee's review of overhead handling systems identified the cranes and hoists shown in Tables 2.1 and 2.2 as those which handle large loads in the reactor and auxiliary buildings. Some of these cranes and hoists are

exempted from the general requirements of NUREG-0612 as they either (1) only carry loads smaller than the defined "heavy load" of 1,700 lbs, or, (2) have sufficient physical separation from safe shutdown equipment and irradiated fuels. The tables indicate which cranes and hoists are exempt.

The licensee has also identified three other buildings at the site and explained the exemption status for cranes in these buildings as follows:

> "Turbine Building Cranes--There is no safe shutdown equipment located within the turbine building. Sufficient physical separation exists between the range of the turbine building cranes and any safe shutdown equipment.
>
> "Diesel Generator Building Monorails--There are four diesel generator monorails, one for each diesel (two diesels per unit). There is sufficient physical and electrical separation between diesels; each diesel provides sufficient power in the event of a loss of offsite power to safely shut down a unit. The drop of a load from one of the diesel monorails can only affect diesel already removed from service for maintenance.
>
> "There is no permanently installed lift system in the service water pumphouse. Lifts into and out of the pumphouse will be made through the roof of the building with an outside crane. Sufficient separation exists between service water pumps such that a load drop can only affect the pump being lifted."

B. EG&G Evaluation

The licensee appears to have adequately identified and described all applicable cranes and hoists.

C. EG&G Conclusions and Recommendations

Since there is no information to the contrary EG&G must conclude that the licensee has included all applicable hoists and cranes in their list of handling systems which must comply with the requirements of the general guidelines of NUREG-0612.

2.3 General Guidelines

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

The NRC has established seven general guidlines 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:

A. Guideline 1--Safe Load Paths

B. Guideline 2--Load Handling Procedures

C. Guideline 3--Crane Operator Training

D. Guideline 4--Special Lifting Devices

E. Guideline 5--Lifting Devices (not specially designed)

F. Guideline 6--Cranes (Inspection, Testing, and Maintenance)

G. 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 Licensee Statements

The licensee supplied a large number of drawings indicating the range of each of the cranes and hoists in Tables 2.1 and 2.2, safe shutdown equipment and new and irradiated fuel areas, and the safe load path for each heavy load.

A commentary was also supplied explaining the drawings and giving an overview of the load path plan. The following is an excerpt from this commentary:

"We take exception to the requirement in 5.1.1(1) of NUREG-0612 to clearly mark the floor in areas where heavy loads are to be handled. Due to the number of paths, the fact that, in some instances, there is no floor to suitably mark (i.e., some areas of

containments) or that the floor may be covered (i.e., for contamination control), we believe that marking load paths will cause confusion and reduce the degree of control necessary to ensure safe heavy load lifts. The procedure used to perform a heavy load lift will specify the safe load path and all persons involved with the lift will be thoroughly briefed beforehand."

B. EG&G Evaluation

CPC has presented a thorough load path plan which meets most of the requirements of the guideline. The plan falls short of the requirements in two areas; load path marking and procedural controls for prevention of deviations from the defined paths.

Some method of temporary or permanent marking for load paths should be employed. The simplest method involves floor paints. Where this method is inappropriate permanent trolley and girder match-marks could be used or some form of temporary marking could be employed. Acceptable methods of temporary marking involve pilons or brightly colored rope placed on the floor or temporary floor covering or draped over equipment so as to define the centerline of the path, or, for large loads, the edges of the path. When appropriate, streamers could also be utilized for defining the path edges. The placement of temporary markings supplies greater assurance that obstructions will be noted and removed from the load path prior to the initiation of the lift. Markings also supply a ready reference for spotters and the operator during the lift.

The guideline requires that any deviation from the prescribed load path for a heavy load lift be accompanied by

a written alternate path approved by the plant safety review committee. (It would be appropriate per the philosophy of NUREG-0612 to place temporary markings defining the alternate path.)

C. EG&G Conclusions and Recommendations

While the safe load path plan for Midland 1 and 2 is quite thorough, it does not meet all of the requirements of Guideline 1. The licensee should take the following actions:

(1) Develop methods for marking each safe load path

(2) Ensure that deviations from the defined paths require written alternatives approved by the appropriate personnel.

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 critria required before movement of load; the steps and proper sequence to be followed in handling the load; defining the safe path; and other special precautions."

A. Summary of Licensee Statements

"It is CP Co's intention to provide procedures for heavy load lifts but to date none have been written. These procedures as a minimum will include purpose, responsibility, precautions, special lift equipment, safe load paths, and a step-by-step sequence for performing the lift. These procedures will meet the intent of NUREG-0612, Section 5.1.1(2)."

B. EG&G Evaluation

The licensee's statement indicates that procedures yet to be written will incorporate the criteria of the guideline.

C. EG&G Conclusions and Recommendations

Midland 1 and 2 is not presently in compliance with the criteria of Guideline 2, but will be in compliance when the procedures mentioned in Section A above are written and implemented. The licensee should take the following actions:

(1) Submit to the NRC a confirmation of the implementation of these procedures

(2) Retain documentation in a readily accessible file pending possible NRC audit.

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 Licensee Statements

"When our operator training program is compared to ANSI B30.2-1976, Chapter 2-3, all the ANSI requirements are met or exceeded with the exception of Section 2-3.2.4, Hoist Limit Device. We do not emphasize the check of the hoist limit at the beginning of each shift. Operators have a variety of interpretations on what 'inching' and 'slow speed' means. The hoist limit check is included in the monthly maintenance inspection schedule and it has been

CPC's experience that this proves more reliable than having every operator tripping this safety device each time he operates the crane."

B. EG&G Evaluation

EG&G feels that the exemption on hoist limit device testing is acceptable. The licensee's statement indicates that the facility is in compliance with all other requirements of the guideline.

C. EG&G Conclusion and Recommendations

Based on the licensee's statement, the Midland facility is in compliance with the requirements of Guideline 3. The licensee should ensure that documentation of operator qualifications and training are retained in a current status pending possible NRC audit.

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) of the load and of the intervening components of the special handling device."

A. Summary of Licensee Statements

"Following is a brief description of the special lifting devices.

(1) Reactor Vessel Head and Internals Handling Fixture--Tripod configured carbon steel weldment designed for handling the reactor vessel closure head assembly and the reactor vessel internals.

(2) Internals Handling Extension--A carbon steel assembly designed to connect the head and internals handling fixture to the main hook of the polar crane.

(3) Internals Handling Adapter--An assembly designed for handling the plenum assembly, the core support assembly, or the core support assembly containing the plenum assembly. This adapter is used in conjunction with the head and internals handling fixture, the internals handling extension, and the internals indexing fixture for internals handling.

(4) Stud Tensioner Sling--A four-legged sling used for moving each stud tensioner from its storage location into the transfer canal area and for transferring the load of the tensioner from the reactor building crane to the stud tensioner hoist.

(5) Fuel Transfer Carriage Lifting Rig Assembly--used to lift the fuel transfer carriage.

(6) New and Failed Fuel Handling Tool and Sling--used to lift the New Fuel Assemblies and the Failed Fuel Container.

(7) Quad Sling--used to move the filter handling machine.

(8) Spreader Beam Type IA--used for handling decontamination area access hatch and spent resin area access hatches.

(9) Spreader Beam Type IB--used for handling filter plugs, demineralizer plug, degasifier plugs, and pipe floor chase shield plugs.

(10) Spreader Beam Type II--used for handling spent resin area access hatches.

"All of the special devices listed above were designed prior to the existence of ANSI N14.6-198 and NUREG-0612. They were designed in accordance with accepted industry standards and sound engineering practices. Devices (1) through (4) above were designed with a safety factor of three based on yield strength and considering static load. In addition, an initial acceptance test of 150% of static load has been performed. Device (5) was designed with a safety factor of one. Device (6) was designed with a safety factor of three. Device (7) was designed in accordance with ANSI B30.9-1971 with a safety factor of 1.5 and was tested to twice the actual load. Devices (8), (9), and (10) design included 25% impact load and the resulting safety factors based on the limiting component of the assembly are 1, 1.5, and 1.2 respectively. All the special lifting devices will be maintained and inspected in accordance with the requirements of ANSI N14.6-1978, Sections 5.1, 5.3, 5.4, and 5.5.

"The spent fuel cask lifting device to date has not been purchased. It is CPC's intention to have the spent fuel cask handling system meet the single-failure proof guidelines of NUREG-0612, Section 5.1.6, therefore, the handling device will also be specially designed and built to the single-failure proof criteria of NUREG-0612, Section 5.1.6."

B. EG&G Evaluation

The licensee has supplied insufficient information to determine compliance with the guideline. It has been determined that compliance with the guideline requires that the following specific sections of ANSI N14.6-1978 be addressed:

(1) Section 3.1:

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

(2) Section 3.2:

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

(3) Section 3.3:

(a) consideration of problems related to possible lameller tearing (3.3.1)
(b) design shall assure even distribution of the load (3.3.4)
(c) retainers fitted for load carrying components which may become inadvertently disengaged (3.3.5)

(d) verification that remote actuating mechanisms securely engage or disengage (3.3.6)

(4) Section 4.1:

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

(5) Section 5.1:

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

(6) Section 5.2:

(a) load test to 150% and appropriate inspections prior to initial use (5.2.1)
(b) qualification of replacement parts (5.2.2)

(7) Section 5.3:

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

In addition, Section 6 should be examined for applicability.

The following modifications should be made to the definitions of ANSI N14.6 Section 2:

- Section 2.1 of NUREG-0612 specifies the allowable offsite radioactive release applicable to heavy loads as 25% of the guideline exposure outlined in 10 CFR Part 100. For the lifts considered here the definition of "critical load" should be so amended

- Section 5.1.1(4) of NUREG-0612 states that the stress design factor used in ANSI N14.6 Section 3.2.1.1 should be based on the combined maximum static and dynamic loads. The ANSI standard does not address dynamic load effects.

C. EG&G Conclusions and Recommendations

The licensee has supplied insufficient information to determine the compliance of Midland units 1 and 2 with the requirements of Guideline 4. The following actions should be taken:

(1) The licensee should address each special lifting device per the specific sections of ANSI N14.6-1978 outlined in Section B above

(2) This examination should incorporate the amended ANSI N14.6 definitions listed in Section B so as to be consistent with the general requirements of NUREG-0612.

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 Licensee Statements

"Non-special lift devices (sling, shackles, etc) purchased are required to meet the guidelines of ANSI B30.9-1971 as specified in the purchase specification. These devices are marked with load limits and will be inspected before use for heavy load lifts."

B. EG&G Evaluation

The licensee's response indicates that the selection of slings is based on the criteria of ANSI B30.9 per plant procedures.

The licensee has only addressed ANSI B30.9 in the reply. Guideline 5 is more restrictive than ANSI B30.9 in two areas:

(1) the rated working load must be factored to account for dynamic effects

(2) the sling marking procedure is more restrictive.

C. EG&G Conclusions and Recommendations

Midland Units 1 and 2 do not fully comply with the criteria of Guideline 5. EG&G recommends that the licensee implement the following actions:

(1) for all slings used on heavy load lifts, verify compliance with ANSI B30.9 based on working loads that correspond to the sum of the static and maximum dynamic load

(2) review sling markings and verify compliance with the marking procedures of ANSI B30.9 and NUREG-0612 Section 5.1.1(5).

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 Licensee Statements

"The preventive and corrective maintenance program developed at Midland has incorporated the requirements of

ANSI B30.2-1976. The inspection requirements and frequencies will coincide with the requirements of ANSI B30.2-1976 with the possible exception of the reactor building polar cranes. If power operations preclude meeting the maintenance frequencies, the required maintenance will be performed during the next available outage and prior to use of these cranes."

B. EG&G Evaluation

The licensee's statement indicates that measures consistent with the requirements of Guideline 6 will be invoked. EG&G assumes that these measures will be implemented prior to fuel handling at the facility. Procedures, inspection records, and other documentation should be retained and available for possible NRC review.

C. EG&G Conclusions and Recommendations

Midland 1 and 2 will be in compliance with the criteria of Guideline 6 when the measures listed in Section A above are invoked. The licensee should retain documentation of these measures for audit purposes.

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 Licensee Statements

"The following cranes comply fully to the requirements of ANSI B30.2-1976 and CMAA Specification 70: Boom crane, auxiliary building crane, AFW pump hoists, makeup pump hoists, decontamination room jib crane, auxiliary building jib crane, and the auxiliary building electric monorail. The purchase order for these systems specified that they meet the requirements of ANSI B30.2-1976 and CMAA 70. The polar cranes were built to ANSI B30.2-1967 and a comparison of the 1967 and 1976 standards against the actual crane design revealed that Section 2-1.11.4 of ANSI B30.2-1976 was not met for the main hook. This section specifies that hooks shall be equipped with latches unless the application makes the use of the latch impractical."

B. EG&G Evaluation

According to the licensee's statement all the cranes and hoists listed in Section A above meet the requirements of this guideline. EG&G feels that ANSI B30.2-1967 is equivalent to and may be accepted in lieu of ANSI B30.2-1976.

The licensee has not addressed the five rigging beams, the portable crane, or the filter plug hoist (items 4, 5, 6, 7, 17, 18, and 19 of Tables 2.1 and 2.2). These six hoists' designs should be addressed and compared to applicable criteria with the same scope of intent as ANSI B30.2 and CMMA-70.

C. EG&G Conclusion and Recommendation

The Midland facility is in partial compliance with the criteria of this guideline. All the cranes addressed meet

the criteria; however, seven non-exempt cranes were not addressed.

The licensee should submit for review the results of an examination of the designs of cranes 4, 5, 6, 7, 17, 18, and 19 of Tables 2.1 and 2.2 per applicable criteria meeting the requirements of this guideline.

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.

Due to the construction status of the Midland facility, compliance with Section 5.3 is not required. However, if the licensee finds that total compliance with Section 5.1 is not possible before operations commence at the facility then Section 5.3 must be addressed.

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 apparently complete (see Section 2.2.1).

3.2 Guideline Recommendations

Compliance with the seven NRC guidelines for heavy load handling (Section 2.3) are partially satisfied at Midland 1 and 2. This conclusion is represented in tabular form as Table 3.1. Specific recommedations to aid in compliance with the intent of these guidelines are provided as follows:

Guideline	Recommendation
1. Section 2.3.1	a. Provide for review a system of temporary or permanent markings for all safe load paths.
	b. Verify that administrative procedures require written alternatives for load path deviations specifically approved by the plant safety review committee.
2. Section 2.3.2	a. Inform the NRC as to the date of implementation of load handling procedures at the plant. Procedures should be implemented prior to any fuel handling operations at the facility.
	b. Retain documentation pending possible NRC audit.

Guideline	Recommendation
3. Section 2.3.3	a. Retain documentation of operator qualifications, conduct, and training in a current status pending possible NRC audit.
4. Section 2.3.4	a. Provide for review an examination of each special lifting device used in conjunction with heavy loads carried in proximity to irradiated fuel or safe shutdown equipment addressing the sections of ANSI N14-6-1978 listed in Section 2.3.4B of this report.
	b. For this examination amend the definitions of "critical load" and "stress design factor" in ANSI N14.6 per the requirements of NUREG-0612 Sections 2.1 and 5.1.1(4).
5. Section 2.3.5	a. Provide verification for NRC review that all slings used on applicable heavy load lifts comply with the amended requirements to ANSI B30.9 found in NUREG-0612 Section 5.1.1(5).
	b. Retain documentation detailing compliance with the amended ANSI B30.9 such that said documentation is readily accessible in the event of an NRC audit.
6. Section 2.3.6	a. Provide verification for NRC review of the institution of the crane inspection, testing, and maintenance program outlined in Section 2.3.6A of this report.

Guideline	Recommendation
	b. Retain documentation pertinent to this program in a readily accessible format pending possible NRC review. Said documentation should be updated as required to maintain the file in a current status.
7. Section 2.3.7	a. Provide for review the results of an examination of the designs of cranes 4, 5, 6, 7, 17, 18, and 19 of Tables 2.1 and 2.2 per applicable criteria meeting the requirements of NUREG-0612 Section 5.1.1(7).
	b. Retain sufficient design documents for all cranes listed in Tables 2.1 and 2.2 to enable verification of compliance with the requirements of NUREG-0612 Section 5.1.1(7) in an NRC audit.

3.3 Interim Protection

EG&G's evaluation of information provided by the licensee indicates interim protection measures are not presently necessary at Midland 1 and 2. These measures will only be required if plant operation commences prior to total compliance with the seven guidelines of NUREG-0612 Section 5.1.

3.4 Summary

Consumers Power Company has provided a well defined package outlining their response to the seven general guidelines of NUREG-0612 Section 5.1 for the Midland nuclear facility Units 1 and 2. A review

of the package has indicated that the Midland facility is presently in compliance with the requirements of the guidelines governing crane operator training and crane inspection, testing, and maintenance. Twelve cranes also met the requirements for crane design while the remaining seven cranes of interest were not sufficiently documented to determine compliance. Proposed actions by the licensee, when instituted, will meet the requirements for load handling procedures. The facility does not presently comply with the requirements governing safe load paths and slings. Insufficient information was provided to evaluated special lifting device qualifications.

4. REFERENCES

1. NUREG-0612
   Control of Heavy Loads at Nuclear Power Plants
   NRC

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

3. USNRC
   Letter to Consumers Power Company (CPC). Subject: NRC Request for Additional Information on Control of Heavy Loads Near Spent Fuel
   NRC, 22 December 1980

4. J. W. Cook (CPC)
   Letter to NRC. Subject: Part I Response to NUREG-0612 Control of Heavy Loads at Nuclear Power Plants.
   CPC, 21 December 1981.

5. J. W. Cook (CPC)
   Letter to NRC. Subject: Part II Response to NUREG-0612 Control of Heavy Loads at Nuclear Power Plants.
   CPC, 26 February 1982.

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"

TABLE 2.1 OVERHEAD HANDLING SYSTEMS--REACTOR BUILDING

	Handling System	Equipment Number	Load Capacity (tons)
1.	Reactor Building Crane (Polar	1H-51 (Unit 1) 2H-51 (Unit 2)	
	Main Hoist		190
	Auxiliary Hoist		25
2.	Reactor Building Fuel Handling Bridge[a]	1H-54 (Unit 1) 2H-54 (Unit 2	1.5 1.5
3.	Boom Crane[a] (Alternate Location)[c]	OH-20	2
4.	Rigging Beam - Reactor Vessel Head Studs	(Unit 1) (Unit 2)	1 1
5.	Rigging Beam - Snubbers	(Unit 1 - 2 places) (Unit 2 - 2 places)	7.5 7.5
6.	Rigging Beam - Miscellaneous Equipment	(Unit 2 only)	2
7.	Rigging Beam - Letdown Coolers	(Unit 1) (Unit 2)	3.5 3.5
8.	Stud Tensioner Hoist[b]	(2 Hoists)	2

a. Exempt--Does not handle "heavy loads" (>1,700 lbs).

b. Exempt-- Load drop will not affect safe shutdown equipment or irradiated fuel.

c. Also utilized in auxiliary building.

TABLE 2.2 OVERHEAD HANDLING SYSTEMS--AUXILIARY BUILDING

	Handling System	Equipment Number	Load Capacity (tons)
9.	Auxiliary Building Crane (Rectilinear)	OH-52	
	Main Hoist		125
	Auxiliary Hoist		15
10.	Auxiliary Building Fuel Handling Bridge[a]	OH-53	1.5
11.	Auxiliary Building Fuel Handling Bridge Monorail[a]		2
12.	Auxiliary Feedwater Pump Hoists	1H-11A, 11B	3
		2H-11A, 11B	3
13.	Makeup Pump Hoists	1H-12A, 12B, 12C, 2H-12A, 12B, 12C	4
			4
14.	Decontamination Room Jib Crane	OH-13	4
15.	Auxiliary Building Jib Crane[b]	OH-19	2
3.	Boom Crane[a,c]	OH-20	2
16.	Auxiliary Building Electric Monorail	OH-17A	7.5
		OH-17B	7.5
17.	Filter Plug Hoist	OH-40	1
18.	Rigging Beam - Shield Plugs		2.5
19.	Portable Crane		

a. Exempt--Does not handle "heavy loads" (> 1,700 lbs).

b. Exempt--Load drop will not affect safe shutdown equipment or irradiated fuel.

c. Also utilized in reactor building.

TABLE 3.1. MIDLAND 1 AND 2/NUREG-0612 COMPLIANCE MATRIX

	Heavy Loads	Weight or Capacity (tons)	Guideline 1 Safe Load Paths	Guideline 2 Procedures	Guideline 3 Crane Operator Training	Guideline 4 Special Lifting Devices	Guideline 5 Slings	Guideline 6 Crane-Test and Inspection	Guideline 7 Design
1.	Reactor Building Crane (Polar)	190/25	--	--	C	--	--	C	C
	Reactor Vessel Head	165	NC	P	--	I	NC	--	--
	Upper Internals (Plenum Assy.)	55	NC	P	--	I	--	--	--
	Inservice Inspection Tool	4.5	NC	P	--	--	NC	--	--
	Reactor Coolant Pump Motor	50	NC	P	--	--	NC	--	--
	Stud Tensioners	1	NC	P	--	I	--	--	--
	Crane Load Block (Main Hoist)	3.4	I	P	--	--	NC	--	--
	Snubbers	1-6	NC	P	--	--	NC	--	--
	Boom Crane	3-6	NC	P	--	--	NC	--	--
	Letdown Cooler	3	NC	P	--	--	NC	--	--
	Seal Plate	6	NC	P	--	--	NC	--	--
	Missile Shields	52.5	NC	P	--	--	NC	--	--
	Equipment Carriage	1	NC	P	--	--	NC	--	--
	Plenum Assembly and Core Support Assembly	180	NC	P	--	I	--	--	--
	Reactor Vessel Top Head Insulation Rack Assembly	3.8	NC	P	--	--	NC	--	--

TABLE 3.1. (continued)

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
Intervals Indexing Fixture	6.5	NC,I	P	--	--	NC	--	--
2. Reactor Building Fuel Handling Bridge	1.5	--	--	E	--	--	E	E
3. Boom Crane	2	--	--	E	--	--	E	E
4. Rigging Beam	1	--	--	C	--	--	C	I
Reactor Vessel Head Studs	1	NC	P	--	I	I,NC	--	--
5. Rigging Beam	7.5	--	--	C	--	--	C	I
Snubbers	1-6	NC	P	--	--	NC	--	--
6. Rigging Beam	2	--	--	C	--	--	C	I
Miscellaneous Equipment	1	NC	P	--	I	I,NC	--	--
7. Rigging Beam	3.5	--	--	C	--	--	C	I
Letdown Cooler	3	NC	P	--	--	NC	--	--
8. Stud Tensioner	2	--	--	E	--	--	E	E

TABLE 3.1. (continued)

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 Building Crane (Rectilinear)	125/15	--	--	C	--	--	C	C
Inservice Inspection Tool	4.5	NC	P	--	--	NC	--	--
Reactor Coolant Pump Motor	50	NC	P	--	--	NC	--	--
Snubbers	1-6	NC	P	--	--	NC	--	--
Boom Crane	3.6	NC	P	--	--	NC	--	--
Letdown Cooler	3	NC	P	--	--	NC	--	--
Equipment Carriage	I	NC	P	--	--	NC	--	--
Spent Fuel Shipping Cask	15-110	NC	P	--	I	--	--	--
Neutron Source Shipping Cask	12	NC	P	--	--	NC	--	--
Irradiated Specimen Shipping Cask	3.5-12	NC	P	--	--	NC	--	--
New Fuel Shipping Containers	3-4	NC	P	--	--	NC	--	--
Foiled Fuel Container	1	NC,I	P	--	I	NC	--	--
Fuel Transfer Carriage	2.5	NC	P	--	I	--	--	--
Crane Load Block (Main)	5.8	I	P	--	--	NC	--	--
Makeup Pump	3	NC	P	--	--	NC	--	--

TABLE 3.1. (continued)

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
Auxiliary Feedwater Pump	2.8	NC	P	--	--	NC	--	--
Main Steam Isolation Valve Operator	7.5	NC	P	--	--	NC	--	--
Process Steam Transfer Valve Operators	7	NC	P	--	--	NC	--	--
Filter Handling Machine	5.5	NC	P	--	I	--	--	--
Filter Transfer Cask	2.6	NC	P	--	--	NC	--	--
Equipment Access Hatches	1.25	NC	P	--	--	NC	--	--
Decontamination Area Access Hatch Plug No. 1	6.9	NC	P	--	I	--	--	--
Filter Plug No. 2	6.8	NC	P	--	I	--	--	--
Spent Resin Access Hatch								
Plug No. 3	24	NC	P	--	I	--	--	--
Plug No. 4	20	NC	P	--	I	--	--	--
Demineralizer Plug No. 5	11.5	NC	P	--	I	--	--	--
Degasifier Plug No. 6	11.7	NC	P	--	I	--	--	--
10. Auxiliary Building Fuel Handling Bridge	1.5	--	--	E	--	--	E	E

TABLE 3.1. (continued)

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
11. Auxiliary Building Fuel Handling Bridge Monorail	2	--	--	E	--	--	E	E
12. Auxiliary Feedwater Pump Hoists	3	--	--	C	--	--	C	C
Auxiliary Feedwater Pump	2.8	NC	P	--	--	NC	--	--
13. Makeup Pump Hoists	4	--	--	C	--	--	C	C
Makeup Pump	3	NC	P	--	--	NC	--	--
14. Decontamination Room Jib Crane	4	--	--	C	--	--	C	C
Filter Transfer Cask	2.6	NC	P	--	--	NC	--	--
15. Auxiliary Building Jib Crane	2	--	--	E	--	--	E	E
16. Auxiliary Building Electric Monorail	7.5	--	--	C	--	--	C	C
Main Steam Isolation Valve Operator	7.5	NC	P	--	--	NC	--	--

TABLE 3.1. (continued)

	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
	Process Steam Transfer Valve Operators	7	NC	P	--	--	NC	--	--
17.	Filter Plug Hoist	1	--	--	C	--	--	C	I
	Unknown	I	NC,I	P	--	I	I,NC	--	--
18.	Rigging Beam-Shield Plugs	2.5	--	--	C	--	--	C	I
	Pipe Chase Access Plugs								
	Plug No. 7	2.2	NC	P	--	--	NC	--	--
	Plug No. 8	1.9	NC	P	--	--	NC	--	--
19.	Portable Crane	I	--	--	C	--	--	C	I
	Pipe Floor Chase Shield Plug No. 9	3.9	NC	P	--	I	--	--	--
	Valve Pit--Steel Decks	1.1,1.3	NC	P	--	--	NC	--	--
	Transfer Tube Access Shield Plates	1.05	NC	P	--	--	NC	--	--

E = Exempt status for this guideline.
C = Licensee action complies with NUREG-0612 Guideline.
NC = Licensee action does not comply with NUREG-0612 Guideline.
P = Proposed licensee action complies with NUREG-0612 Guideline.
I = Insufficient information provided by the Licensee.