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December 22, 1982

ØCAN128213

Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Units 1 & 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Final Response on NUREG-0612, Control of Heavy Loads at Nuclear Power Plants

Gentlemen:

The purpose of this letter is to provide you with AP&L's final response on NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." In our November 12, 1982, letter (ØCAN118204), we provided NRC with a response plan which indicated that our resolution to the following items would be sent to you by December 22, 1982. Attachments 1 through 5 address the topics below:

1. Section 2.2 Response on overhead handling systems operating in the vicinity of fuel storage pools.

2. Section 2.3 Response on overhead handling systems operating in containment.

3. Section 2.4 Response on overhead handling systems operating in plant areas containing equipment required for reactor shutdown, core decay heat removal or spent fuel pool cooling.

4. Safe load paths.

5. Sling load testing program.

This letter concludes our response commitments on NUREG-0612.

Very truly yours,

John R. Marshall

John R. Marshall
Manager, Licensing

JRM:DET:sl

Attachment

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ATTACHMENT 1 TO ØCAN128213

SECTION 2.2: SPECIFIC REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS OPERATING IN THE VICINITY OF FUEL STORAGE POOLS

Request 1:

"Identify by name, type, capacity, and equipment designator, any cranes physically capable (i.e., ignoring interlocks, moveable mechanical stops, or operating procedures) of carrying loads which could, if dropped, land or fall into the spent fuel pool."

Response 1:

The Fuel Handling Crane (Equipment Number L3) was manufactured by P&H Harnischfeger and is a 100-ton electric overhead traveling bridge crane with a 10-ton auxiliary hoist. A 2-ton auxiliary hoist is suspended monorail fashion from a 12-inch I-beam welded between the end trucks at the south end of the Fuel Handling Crane (L3) and is designated as the Unit 1 Auxiliary Fuel Handling Crane. The Unit 2 New Fuel Handling Crane (Equipment Number 2L35) was manufactured by Heco-Pacific Manufacturing Company and is a [illegible]-ton capacity Top Riding Single Girder Crane consisting of a bridge, monorail, trolley and hoist.

Request 2:

"Justify the exclusion of any cranes in this area from the above category by verifying that they are incapable of carrying heavy loads or are permanently prevented from movement of the hook centerline closer than 15 feet to the pool boundary, or by providing a suitable analysis demonstrating that for any failure mode, no heavy load can fall into the fuel-storage pool."

Response 2:

No cranes in this area may be excluded under the above stated criteria.

Request 3:

"Identify any cranes listed in 2.2-1, above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG 0612, Section 5.1.6 or partial compliance supplemented by suitable alternative or additional design features.) For each crane so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1."

Response 3:

No cranes in this area may be excluded under the above stated criteria.

Request 4:

"For cranes identified in 2.2-1, above, not categorized according to 2.2-3, demonstrate that the criteria of NUREG-0612 Section 5.1 are satisfied. Compliance with Criterion IV will be demonstrated in response to Section 2.4 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the spent fuel area and your determination of compliance. This response should include the following information for each crane:

a. Which alternatives (e.g., 2, 3, or 4) from those identified in NUREG 0612 Section 5.1.2 have been selected.

b. If Alternative 2 or 3 is selected, discuss the crane motion limitation imposed by electrical interlocks or mechanical stops and indicate the circumstances, if any, under which these protective devices may be bypassed or removed. Discuss any administrative procedures invoked to ensure proper authorization of bypass or removal, and provide any related or proposed technical specification (operational and surveillance) provided to ensure the operability of such electrical interlocks or mechanical stops.

c. Where reliance is placed on crane operational limitations with respect to the time of the storage of certain quantities of spent fuel at specific post-irradiation decay times, provide present and/or proposed technical specifications and discuss administrative or physical controls provided to ensure that these assumptions remain valid.

d. Where reliance is placed on the physical location of specific fuel modules at certain post-irradiation decay times, provide present and/or proposed technial specifications and discuss administrative or physical controls provided to ensure that these assumptions remain valid.

e. Analyses performed to demonstrate compliance with Criteria I through III should conform to the guidelines of NUREG 0612, Appendix A. Justify any exception taken to these guidelines, and provide the specific information requested in Attachment 2, 3, or 4, as appropriate, for each analysis performed."

Response 4:

Alternative 4 has been selected from those identified in NUREG-0612 Section 5.1.2.

No analysis per NUREG-0612, Appendix A, requirements has been performed. Existing technical specifications for load handling operations in the spent fuel pool prohibit the handling of any load in excess of 2000 pounds over the spent fuel pool. These technical specifications are Specification 3.8.15 (Unit 1) and 3.4.9.7 (Unit 2). In addition to these restrictions, the bases statement for Unit 1's specification 3.8.15 assumes the prohibition of the storage of irradiated fuel at locations adjoining the walls at the north and south ends of the spent fuel pool in the vicinity of the access gates to the fuel tilt pit and the cask storage pit until the cask drop accident review has been completed by NRC. Plant procedures have been revised to preclude the storage of spent fuel in the racks around the periphery of the fuel pools, and in those racks in the vicinity of the gates.

The Fuel Handling Crane and the Unit 1 Auxiliary Fuel Handling Crane were designed to withstand a design basis earthquake force of .067g vertical and .35g horizontal and a maximum credible earthquake force of .133g vertical and .60g horizontal with the capacity lifted load of 100 tons considered for both vertical earthquakes. These cranes were also designed with a factor of safety of 5 to ultimate. These cranes were designed so that the vertical and horizontal deflections incurred during the maximum credible earthquake would not jeopardize normal operation of the crane. The crane girders and their supports were designed to withstand these earthquake forces as well.

In summary, we believe that the likelihood of a load drop from the Fuel Handling Crane and the Unit 1 Auxiliary Fuel Handling Crane that would result in an unacceptable radioactivity release is extremely small for the following reasons:

1. Plant technical specifications prohibit the handling of loads in excess of 2000 lbs. over spent fuel and plant procedures have been revised to prohibit the storage of irradiated fuel in the vicinity of the fuel pool gates.

2. A safety factor of 5 to ultimate was used for the design of the 100/10 ton fuel handling crane.

3. The crane's box girders, as well as the crane girders and their support structures, were designed to resist both design basis and maximum credible earthquake forces. The crane box girders were also designed to resist vertical earthquake induced loads with the lifted load of 100 tons. The crane girders and support structures were also designed to resist tornado wind loadings.

4. The crane is inspected in accordance with ANSI B30.2-1976 prior to its use and the slings utilized in load handling operations with this crane comply with ANSI B30.9-1971 requirements.

We have analyzed the reinforced concrete slab on the bottom of the spent fuel pools in both units for a pool gate load drop in accordance with an impact load analysis methodology contained in ASCE's Report on Engineering Practice #58, "Structural Analysis & Design of Nuclear Plant Facilities," 1980.

This analysis revealed that while a fuel pool gate would slightly penetrate the bottom slab in the fuel pool, the slab would not spall nor would the slab fail in shear. We believe that this analysis is conservative and therefore an acceptable method of excluding a fuel pool gate drop from further consideration.

We believe the crane's main hoist load block can be excluded from further consideration for the following reasons:

1. The main hoist is only used to lift a spent fuel cask or a fuel handling machine (if necessary) and other miscellaneous loads that are less than 2000 pounds. Plant procedures identify load paths which do not cross over spent fuel in the pool.

2. Before use, the crane is inspected per ANSI B30.2 and all slings utilized with this crane meet ANSI B30.9 requirements

3. The only crane failure that could cause the main hoist block to fail and thus fall on spent fuel in the pool would be a "two-blocking" event, which cannot occur with the hoist not in use.

4. The main hoist load block is considered an integral part of the crane.

The Unit 2 New Fuel Handling Crane (Equipment Number 2L35) is utilized to handle new fuel, new control components and other miscellaneous loads such as steel hatch covers at el. 404 in the Auxiliary Building that crane L3 cannot reach. The only loads handled over fuel are either new fuel, new control components or loads less than 2000 pounds. However, we intend to exclude this crane from further consideration under NUREG-0612 for the following reasons: (1) The crane was designed and constructed per CMAA-70; (2) It is inspected and operated per ANSI B30.2-1976 and all slings that are used with this crane are in compliance with ANSI B30.9-1976, and (3) The load of a new fuel assembly and its handling tool for Unit 2 is approximately 1450 lbs. which is 18 percent of the crane's 4 ton rated capacity and is less than the 2000 lb. limit of loads carried over spent fuel in the pool. A new control component weighs approximately 96 pounds and a hatch cover weighs approximately 2300 pounds, but it is not handled over the fuel pool.

ATTACHMENT 2 TO ØCAN128213

SECTION 2.3: SPECIFIC REQUIREMENTS OF OVERHEAD HANDLING SYSTEMS OPERATING IN THE CONTAINMENT

Request 1:

"Identify by name, type, capacity and equipment designator any cranes physically capable (i.e., taking no credit for any interlocks or operating procedures) of carrying heavy loads over the reactor vessel."

Response 1:

The polar cranes at Arkansas Nuclear One, Units 1 & 2, are P&H Harnischfeger 150/25 ton capacity double gantry circular cranes. The equipment numbers for these cranes are L2 and 2L2 for Units 1 and 2, respectively.

The Unit 1 Control Rod Drive and General Maintenance Crane (Equipment Number L21) was manufactured by Heco-Pacific Manufacturing Company and is a two (2) ton capacity Top Riding Single Girder Crane consisting of a bridge, monorail, trolley and hoist.

Request 2:

"Justify the exclusion of any cranes in this area from the above category by verifying that they are incapable of carrying heavy loads, or are permanently prevented from the movement of any load either directly over the reactor vessel or to such a location where in the event of any load-handling-system failure, the load may land in or on the reactor vessel."

Response 2:

We believe that the Control Rod Drive (CRD) and General Maintenance Crane (L21) in the Unit 1 Reactor Building can be excluded from further consideration for the following reasons:

1. Despite the fact that the crane has a rated capacity of two (2) tons, its maximum lifted load is a control rod drive mechanism whose total assembly weight is 935 pounds. This crane also is used to move reactor vessel studs which weigh 640 pounds, reactor vessel head insulation pieces with an average weight of approximately 400 pounds, portions of reactor vessel head cooling duct work whose maximum calculated weight is approximately 800 pounds, and several other small miscellaneous loads. None of these loads is a heavy load since their weight does not exceed 2000 pounds.

2. This crane is utilized to assist in several maintenance operations prior to the removal of the reactor vessel head. However, administrative controls are being developed to ensure that prior to the removal of the reactor vessel head, the crane is locked in a position at the east end of the refueling canal so that it is incapable of carrying any load over the open reactor vessel.

Administrative controls are being developed to ensure that it is also locked in this position and seismically restrained during normal plant operations.

Also, administrative controls are being developed to ensure that the trolley and hoist are removed from the crane gantry and stored elsewhere during normal plant operations since there are no seismic restraints on the trolley.

Request 3:

"Identify any cranes listed in 2.3-1, above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1."

Response 3:

There are no cranes in this area that may be excluded under the above stated criteria.

Request 4:

"For cranes identified in 2.3-1, above, not categorized according to 2.3-3, demonstrate that the evaluation criteria of NUREG 0612, Section 5.1 are satisfied. Compliance with Criterion IV will be demonstrated in your response to Section 2.4 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the containment and your determination of compliance. This response should include the following information for each crane:

a. Where reliance is placed on the installation and use of electrical interlocks or mechanical stops, indicate the circumstances under which these protective devices can be removed or bypassed and the administrative procedures invoked to ensure proper authorization of such action. Discuss any related or proposed technical specification concerning the bypassing of such interlocks.

b. Where reliance is placed on other, site-specific considerations (e.g., refueling sequencing), provide present or proposed technical specifications and discuss administrative or physical controls provided to ensure the continued validity of such considerations.

c. Analyses performed to demonstrate compliance with Criteria I through III should conform with the guidelines of NUREG 0612, Appendix A. Justify any exception taken to these guidelines, and provide the specific information requested in Attachment 2, 3, or 4, as appropriate, for each analysis performed."

Response 4:

No analyses were performed in accordance with the guidelines of NUREG-0612, Appendix A to demonstrate compliance with Criteria I through III. However, a head drop analysis from 3'-6" above the vessel flange was performed by Babcock & Wilcox in November 1972, and it revealed that the support skirt assembly will be generally overstressed in compression and will yield moderately or buckle. A total displacement was estimated to be 7/16 inches. This anlysis is conservative since it was assumed that the head was a rigid falling weight and no attempt was made to evaluate its own elasticity which would have reduced the stresses seen.

The Unit 1 and Unit 2 Polar Crane (Equipment Numbers L2 and 2L2, respectively) are rated at 150 tons for their main hooks and 25 tons for their auxiliary hooks. Both cranes were designed to support the maximum loads caused by a 600-ton construction lift as well as designed for normal operating loads plus earthquake forces resulting from a design basis earthquake of .21g vertical and 1.04g horizontal and the maximum credible earthquake of .42g vertical and 1.46g horizontal for Unit 1. Unit 2's Polar Crane was designed for an earthquake loading of .48g vertical and 1.41g horizontal for the operating basis earthquake and for .96g vertical and 1.80g horizontal for the design basis earthquake.

In summary, we believe that the likelihood of a load drop from the polar cranes that would result in an unacceptable radioactive release is extremely small for the following reasons:

1. A safety factor of 5 to ultimate was used for the design of the 150/25 ton polar cranes.

2. The box girders as well as the crane girder and its brackets were designed for a 600-ton (605-ton on Unit 2) load, and the maximum normal load is only 25% of this on Unit 1 (24% on Unit 2).

3. The polar cranes are inspected in accordance with ANSI B30.2-1976 only during outages. All polar crane inspections (except daily inspections) are performed under Plant Surveillance Test Programs as they come due. Surveillances that come due during plant operation will be performed at the beginning of each outage prior to the use of the crane. This includes periodic, quarterly, semi-annual and annual inspections. Plant Procedures are being revised to ensure that the daily (frequent) polar crane inspections are performed prior to the use of these cranes. Exceptions to this are outages that occur that are short lived and do not require use of polar cranes. Slings utilized in lifting heavy loads will be in compliance with ANSI B30.9-1971, and crane operators are trained and qualified in accordance with ANSI B30.2-1976.

4. The cranes were designed to resist earthquake forces generated by the design basis earthquake and the maximum credible earthquakes.

The ISI tools, ARIS on Unit 1 and PAR on Unit 2, are attached to the polar crane auxiliary hook and are considered as individual loads. The ISI (ARIS) tool that is utilized for the reactor vessel inspection on Unit 1 can be utilized for the upper nozzle inspection which can be accomplished with fuel in the core and the upper plenum assembly removed. The ISI (ARIS) tool has design features which preclude the inadvertent contract of the tool's mast and remote arm with the irradiated fuel in the vessel core. This prevents an accidental criticality of the fuel which could be caused by the fuel being crushed. The PAR tool is not utilized on Unit 2 with fuel in the reactor. Based on the above considerations, we intend to exclude the main hoist load block on polar cranes L2 and 2L2 from further consideration as a heavy load.

ATTACHMENT 3 TO ØCAN128213

SECTION 2.4: SPECIFIC REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS OPERATING IN PLANT AREAS CONTAINING EQUIPMENT REQUIRED FOR REACTOR SHUTDOWN, CORE DECAY HEAT REMOVAL OR SPENT FUEL COOLING

General Request:

"NUREG-0612, Section 5.1.5, provides guidelines concerning the design and operation of load-handling systems in the vicinity of equipment or components required for safe reactor shutdown and decay heat removal. Information provided in response to this section should be sufficient to demonstrate that adequate measures have been taken to ensure that in these areas, either the likelihood of a load drop which might prevent safe reactor shutdown or prohibit continued decay heat removal is extremely small, or that damage to such equipment from load drops will be limited in order not to result in the loss of these safety-related functions. Cranes which must be evaluated in this section have been previously identified in your response to 2.1-1, and their loads in your response to 2.1-3-c."

General Response:

Two cranes identified in Section 2.1.1 will be eliminated from further discussion. The Unit 1 CRD and general maintenance crane (L21) is rated at a 2-ton capacity. We are in process of administratively reducing its capacity to restrict L21 to loads of 1 ton or less. Its normal maximum load is a control rod drive mechanism whose total weight is approximately 935 pounds. Otherwise it is utilized in the uncoupling and coupling of the control rod drive mechanisms. These loads are less than 2000 pounds which is our definition of a heavy load. Due to the size of the largest normal load and the restriction on the crane's movement during plant operation and during the times the head is removed, a load drop from this crane would not cause the loss of any safety-related functions.

The Unit 2 New Fuel Handling Crane (2L35) can be eliminated from further discussion because the floor slab of the new fuel storage area was sized for a fuel element drop.

Request 1:

"Identify any cranes listed in 2.1-1, above, which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small for all loads to be carried and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling-system (i.e., crane-load- combination) information specified in Attachment 1."

Response 1:

No cranes can be excluded based on the above stated criteria.

Request 2:

"For any cranes identified in 2.1-1 not designated as single-failure-proof in 2.4-1, a comprehensive hazard evaluation should be provided which includes the following information:

a. The presentation in a matrix format of all heavy loads and potential impact areas where damage might occur to safety-related equipment. Heavy loads identification should include designation and weight or cross-reference to information provided in 2.1-3-c. Impact areas should be identified by construction zones and elevations or by some other method such that the impact area can be located on the plant general arrangement drawings. Figure 1 provides a typical matrix."

Response 2:

Table 2.4.2 shows the matrix for heavy loads and potential impact areas.

*This designation on the table indicates that these loads move over the reactor cavity.

**Loads with this designation can only be moved around the containment at elevation 424'-6" (426'-6" on Unit 2). These loads will be moved as close to the top of the secondary shield walls as possible with adjustments to the load's elevation as required to avoid such obstructions as handrails, Unit 2 Main Steam Lines, etc. These loads may be moved to the equipment hatch elevation in accordance with the safe load paths.

Request 3:

"For each interaction identified, indicate which of the load and impact area combinations can be eliminated because of separation and redundancy of safety-related equipment, mechanical stops and/or electrical interlocks, or other site-specific considerations. Elimination on the basis of the aforementioned considerations should be supplemented by the following specific information:

(1) For load/target combinations eliminated because of separation and redundancy of safety-related equipment, discuss the basis for determining that load drops will not affect continued system operation (i.e., the ability of the system to perform its safety-related function).

(2) Where mechanical stops or electrical interlocks are to be provided, present details showing the areas where crane travel will be prohibited. Additionally, provide a discussion concerning the procedures that are to be used for authorizing the bypassing of interlocks or removable stops, for verifying that interlocks are functional prior to crane use, and for verifying that interlocks are restored to operability after operations which require bypassing have been completed.

(3) Where load/target combinations are eliminated on the basis of other, site-specific considerations (e.g., maintenance sequencing), provide present and/or proposed technical specifications and discuss administrative procedures or physical constraints invoked to ensure the continued validity of such considerations."

Response 3:

The loads lifted by the Intake Structure Gantry Crane (L7), the Fuel Handling Crane (L3), and their respective load/target combinations can be eliminated from further consideration because a load drop would not prevent safe reactor shutdown nor prohibit continued decay heat removal capability or because of physical separation of safe-shutdown equipment.

The heaviest safety-related loads lifted by the Intake Structure Gantry Crane (L7) are the Service Water Pumps, and it is not physically possible to drop one pump on top of another due to the separation of the pumps from one another. This separation consists of thick, reinforced concrete walls between each pump bay in both Units and the Unit 1 motors are approximately twenty-seven (27) feet apart with 18 inch thick reinforced concrete walls separating them. The Unit 2 motors are approximately eight (8) feet apart with 18 inch thick reinforced concrete walls separating them. In addition to this, the size of the motors allows them only to be lifted through the roof hatch directly above them.

There are presently no administrative controls to prevent the handling of other loads at the Intake Structure, such as the Circulating Water Pumps, over safety-related equipment in this area. Intake Structure crane procedures are being revised to incorporate these restrictions.

Other than the spent fuel shipping cask, whose load drop has already been analyzed, the Fuel Handling Machine is the heaviest load lifted by the Fuel Handling Crane (L3). Since this load weighs less than that of the 100-ton shipping cask, and the slab at elevation 404'-0" has been shown to survive a cask drop, the crane can be eliminated from further consideration because a load drop would not prevent safe reactor shutdown.

It should be noted that there are no safe shutdown components beneath the load paths of the remainder of the heavy loads handled by the Fuel Handling Crane. The crane load block has been previously excluded from further consideration based on a discussion in Section 2.2.

The Unit 1 and Unit 2 Polar Cranes (Equipment No. L2 and 2L2) can be eliminated from further consideration due to separation and redundancy of safety-related equipment.

In Unit 1, the heaviest load that would be lifted during any plant condition other than cold shutdown would be the reactor vessel missile shields. The missile shields are normally lifted when the plant is in cold shutdown. Lifting these missile shields during hot shutdown would be extremely unusual. The worst case load drop of a missile shield could impact a portion of decay heat removal system piping at the west end of the refueling canal at elevation 354'-0"±. This postulated case has been excluded from further consideration because the piping in question is routed against the outside face of the secondary shield wall and the load would have to slide down the shield wall in order to destroy this piping. Due to its physical orientation, we have determined this to be an incredible scenario.

When the plant is in a cold shutdown condition, or in a refueling shutdown condition, the remainder of the heavy loads listed in Table 2.4.2 may be lifted. There are only four (4) loads whose load drop could impact the ability to maintain the plant in a cold shutdown condition, i.e. maintain decay heat removal capability. These are the Reactor Vessel Head lift and the Reactor Coolant Pump Motor, Pump and Structural Support Beam lifts. The load paths of the Reactor Coolant Pumps (RCP) located in the north cavity pass over one decay heat removal line located near the reactor building sump. A load drop onto this line would not result in the loss of decay heat removal capability because we would still have one decay heat loop available. The load paths of the RCP's located in the south cavity pass over the "A" core flood line on the west side of the secondary shield wall, but a load drop on this line would not result in the loss of decay heat removal capability. Finally, the load path of the Reactor Vessel Head passes over the core flood line and the decay heat removal line for "A" loop. Even if these lines were destroyed by a head drop, we could still maintain core coverage through the redundant decay heat removal loop.

In Unit 2, the heavy loads that might be lifted by the Polar Crane in any other plant condition other than cold shutdown would be the vessel head stud stand or the refueling canal seal plate lifting rig. They are normally lifted when the plant is in cold shutdown. While these loads "pass" over safety injection piping, the possiblity of these loads penetrating several feet of reinforced concrete is extremely remote. For this reason, these loads carried under a plant condition other than cold shutdown can be eliminated from further consideration.

When the plant is in a cold shutdown or a refueling shutdown condition, the remainder of the heavy loads listed in Table 2.4.2 may be lifted. There are only nine (9) loads that may be lifted whose load drop could impact the ability to maintain the plant in a cold shutdown condition, i.e. maintain decay heat removal (shutdown cooling) capability. These are the Reactor Vessel Head lift, the Reactor Coolant Pumps and their Structural Steel support beams, the Head Maintenance Structure, the Jib Crane (2L45), the Refueling Machine and other Refueling System components, and the Refueling Cavity Seal Plate. Of these loads, the consequences of a RCP motor drop or a Reactor Vessel Head drop would envelope the other postulated load drops.

A Reactor Vessel Head Drop over the refueling cavity could result in the loss of shutdown cooling and safety injection piping from the Reactor Vessel through the "B" Hot Leg. However, this would only occur if the head penetrated a 4'-0" thick concrete slab. This would not cause loss of decay heat removal capability from the reactor vessel because this line could be isolated and we could use the other cooling loop to maintain shutdown cooling.

A Reactor Coolant Pump Motor drop of the "A" RCP motor over the Reactor Building Sump Area could result in the loss of shutdown cooling and safety injection piping into "C" cold leg as well as one (1) containment spray line. It is still possible to maintain adequate core decay heat removal after the loss of this piping by placing the shutdown cooling system in the recirculation mode utilizing the HPSI pumps and by isolating the affected safety injection line.

We feel that the very low probability of these postulated load drops justifies our exclusion of these scenarios from further consideration for the reasons stated in our response to Section 2.3.4.

The postulated load drop of the reactor vessel head as well as the upper plenum assembly or the upper internals (Unit 2) are also considered remote for the reasons stated in the response to Section 2.3.4. The postulated drop of the core barrel assembly has not been considered because there is no fuel in the reactor vessel when this load is lifted.

The load lifted by the MSIV Bridge Crane (2L10) and its respective load/target combinations can be eliminated from further consideration because a load drop would not prevent safe reactor shutdown nor prohibit continued decay heat removal. The reactor and the plant are in a cold shutdown condition before a Main Steam Isolation Valve (MSIV) would be removed so a load drop would not prevent safe reactor shutdown. The heaviest component of a MSIV lifted is a cylinder stiffner section which weighs approximately 10,000 lbs. We have postulated that this load, if dropped, would penetrate the north penetration rooms which contain piping and electrical conduit servicing the service water system, the emergency feedwater system, the fire water system to containment, the main feedwater system, the MSIV's, Penetration Room Ventilation and a containment HVAC radiation monitor. Since the loss of these systems or portions of them when the plant is in a cold shutdown condition will not prohibit continued decay heat removal, this crane can be eliminated from further consideration.

Request 4:

"For interactions not eliminated by the analysis of 2.4-2-b, above, identify any handling systems for specific loads which you have evaluated as having sufficient design features to make the likelihood of a load drop extremely small and the basis for this evaluation (i.e., complete compliance with NUREG-0612, Section 5.1.6, or partial compliance supplemented by suitable alternative or additional design features). For each crane so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1."

Response 4:

There are no handling systems for specific loads over safe shutdown systems that can be excluded under the above stated criteria.

Request 5:

"For interactions not eliminated in 2.4-2-b or 2.4-2-c, above, demonstrate using appropriate analysis that damage would not preclude operation of sufficient equipment to allow the system to perform its safety function following a load drop (NUREG-0612, Section 5.1, Criterion IV). For each analysis so conducted, the following information should be provided:

(1) An indication of whether or not, for the specific load being investigated, the overhead crane-handling system is designed and constructed such that the hoisting system will retain its load in the event of seismic accelerations equivalent to those of a safe shutdown earthquake (SSE).

(2) The basis for any exceptions taken to the analytical guidelines of NUREG-0612 Appendix A.

(3) The information requested in Attachment 4."

Response 5:

There are no loads remaining that require exclusion under the above stated criteria.

TABLE 2.4.2

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	404'-0	Spent Fuel Cask (25 Ton)	Control Room Roof	Relay Panels	E
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	404'-0	Hatch Over Crane Bay	Hatch Frame	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	368'-6	Fuel Trans. Tube Gate Valve	Fuel Tilt Pit Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	362'-0	New Fuel Elevator	Fuel Tilt Pit Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	404'-0	Fuel Hand. Machine	Control Room Roof	Relay Panels	E
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	362'-0	Upender	Fuel Tilt Pit Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	354'-0	New Fuel Ship. Cont.	R. R. Bay Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	354'-0	New Control Comp.	R. R. Bay Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel	354'-0	New Fuel Elements	R. R. Bay Floor	None	C

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
	Hand. Area)					
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	354'-0	New Control Equipment	R. R. Bay Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	362'-0	Fuel Transfer Carriage	Fuel Tilt Pit Floor	None	C
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	362'-0	Fuel Pool Divider Gates	Spent Fuel Pool Floor	Fuel Pool	E
Fuel Hand. Crane (L3)	Reactor Aux. Bldg. (Fuel Hand. Area)	404'-0	Crane Load Block	Fuel Hand. Floor; Fuel Pool Floor; R. R. Bay Floor	Spent Fuel in Fuel Pool; Relay Panels in Control Room	D
New Fuel Hand. Crane (2L35)	Reactor Aux. Bldg. Unit 2	404'-0 or 362'-0	New Fuel Assembly	Control Room Roof; Spent Fuel in Pool	Relay Panels in Control Room; Spent Fuel in Pool	E
New Fuel Hand. Crane (2L35)	Reactor Aux. Bldg. Unit 2	404'-0 or 362'-0	New Cont. Component	Control Room Roof; Spent Fuel in Pool	Relay Panels in Control Room; Spent Fuel in Pool	E
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1	366'-0 or 378'-0	Unit 1 Service Water Pump Motor	Service Water Pump Room Floor or Intake Structure Roof	Pump Room	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1	322'-6 or 378'-0	Unit 1 Service Water Pump	Intake Structure Base Mat	Pump Room	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 2	366'-0 or 378'-0	Unit 2 Service Water Pump Motor	Service Water Pump Intake Room Floor or Intake Structure Roof	Pump Room	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 2	322'-6	Unit 2 Service Water Pump	Intake Structure Base Mat	None	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1	366'-0 or 378'-0	Motor Driven Fire Pump and Motor	Pump Room Floor or Intake Structure Roof	Pump Room Floor	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1	366'-0 or 378'-0	Diesel Driven Fire Pump	Pump Room Floor or Intake Structure Roof	Pump Room Floor	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1	366'-0 or 378'-0	Jockey Pump	Pump Room Floor or Intake Structure Roof	Fire Pump	B
Intake Structure Gantry Crane (L7)	Intake Structure Unit 1&2	378'-0	Room Hatch Plugs	Intake Structure Roof	Pump Room	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	424'-6	**Missile Shield	Top of Secondary Shield Walls	Reactor Vessel Head; RCP's "A" & "C"; Pressurizer; Steam Generators; Letdown Piping; Decay Heat Removal Piping	B, C
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6	*Top Head Insul. w/Storage Racks	Refueling Cavity Floor	Reactor Vessel Head	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	362'-0	*Transfer Tube Flange	Refueling Cavity Floor	None	C
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6, 401'-6 or 357'-0	*Reactor Vessel Head	Refueling Cavity Floor; Head Stand; Equip. Hatch Area	Reactor Vessel; Decay Heat Removal Piping	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	362'-0	*Upper Plenum Assembly	Reactor Vessel; Refueling Cavity Floor	Reactor Vessel; Fuel in Vessel	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6	*Stud Storage Rack	Refueling Cavity Floor	None	C
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6	*Indexing Fixture	Refueling Cavity or Reactor Vessel Flange	Reactor Vessel	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6	*Head & Internal Handling Fixture Lift Rig w/Turn-buckles	Reactor Vessel Head, Refueling Cavity or Head Stand	Reactor Vessel Head; RCP "A"; "B" Steam Gener-ator; Core Flood Piping	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6	*Refueling Cavity Seal Plate	Refueling Cavity or Reactor Vessel	RCP's "A" or "B"; Reactor Vessel; "B" Steam Gener-ator; Decay Heat Removal & Core Flood Piping	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	357'-0, 401'-6 or 424'-6	Unassembled ISI (ARIS) Tool	Equipment Hatch Area; Operating Floor South Cavity	"A" Cold Leg, "A" RCP, "B" Hot Leg; "B" Steam Gener-ator; Core Flood Piping	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-6, 424'-6	*Assembled ISI (ARIS) Tool	Top of "D" Ring, Reactor Vessel	"B" Hot Leg and Steam Generator; Reactor Vessel	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	336'-6 or 357'-0	**RCP Motor or Pump	Bldg. Basement or or Equip. Hatch	RCP; HPI Nozzles in Cold Leg; Reactor Bldg. Spray Header; Decay Heat Removal Piping and Core Flood Piping	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	336'-6 or 357'-0	**Structural Beams Above RCP "A", "D"	Same as RCP Motor or Pump	Same as RCP Motor or Pump	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	336'-6 or 357'-0	**Structural Beams Above RCP "B", "C"	Same as RCP Motor or Pump	Same as RCP Motor or Pump	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	336'-6, 357'-0, 362'-0 376'-6 401'-6, or 424'-6	*Fuel Transfer Carriage	Bldg. Basement; Equip. Hatch; Operating Floor; Top of "D" Ring (South); Refueling Cavity Floor	HPI Nozzles "A" & "B"; Reactor Vessel; "B" Steam Generator	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	336'-6, 357'-0, 362'-0 376'-6, 401'-6, or 424'-6	*Upender	Bldg. Basement; Equip. Hatch; Operating Floor; Top of "D" Ring (South; Refueling Cavity Floor	HPI Nozzles "A" & "B"; Reactor Vessel; "B" Steam Generator	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-0, 357'-0, 424'-6	Refueling Machine	Bldg. Basement; Equip. Hatch; Operating Floor; Top of "D" Ring (South); Refueling Cavity Floor	HPI Nozzles "A" & "B"; RCP's "A" & "B"; "B" Steam Generator	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-0, 357'-0, 424'-6	Aux. Refueling Machine	Bldg. Basement; Equip. Hatch; Operating Floor; Top of "D" Ring (South); Refueling Cavity Floor	HPI Nozzles "A" & "B"; RCP's "A" & "B"; "B" Steam Generator	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	376'-0, 357'-0, 424'-6	*Refueling Canal Ladder	Bldg. Basement; Equip. Hatch; Operating Floor; Top of "D" Ring (South); Refueling Cavity Floor	HPI Nozzles "A" & "B"; RCP's "A" & "B"; "B" Steam Generator	B
Unit 1 Polar Crane (L2)	Reactor Bldg. Unit 1	Any Elev.	*Crane Load Block (Main Hoist)	Any Area	Any Safety-Related Equipment Under a Load Path	D
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	365'-0 426'-6	*Head Maint. Structure	Refueling Cavity Floor; Top of Secondary Shield Walls	Reactor Vessel Head ;Pressurizer; RCP "A"; RCP "C"; Safety Injection or Shutdown Cooling Piping	B
Unit 2 Polar Crane (2L2)	Reactor Bldg Unit 2	357'-0 376'-0 426'-6	*CEDM Ductwork	Refueling Cavity Floor; Top of Secondary Shield Wall; Equip. Hatch	All RCP's; Both Steam Generators; Safety Injection Tanks "A" & "D"	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0 426'-6	*CEDM Cooling Shroud	Refueling Cavity Floor; Top of Secondary Shield Wall	All the Above for CEDM Ductwork Plus "B Hot Leg	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	336'-6 426'-6 357'-0	**RCP Motor & Pump	Basement; Top of Secondary Shield Wall; Equip. Hatch Area	Respective RCP Pump; Pressurizer Surge Line; Safety Injection & Shutdown Cooling Piping; Cold Legs; Steam Generators	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	336'-6 426'-6 357'-0	**Structural Beams Above RCP "A" & "B"	Basement; Top of Secondary Shield Wall; Equip. Hatch Area	Respective RCP Pump; Pressurizer Surge Line; Safety Injection & Shutdown Cooling Piping; Cold Legs; Steam Generators	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	336'-6 426'-6 357'-0	**Structural Beams Above RCP "C" & "D"	Basement, Top of Secondary Shield Wall, Equip. Hatch Area	Respective RCP Pump; Pressurizer Surge Line; Safety Injection & Shutdown Cooling Piping; Cold Legs; Steam Generators	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	336'-6 357'-0 376'-0 405'-6 426'-6	*Inservice Inspection Tools	Basement; Equip. Hatch Area; Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	RCP "C"; Reactor Vessel; Safety Injection & Shutdown Cooling Piping into "C" Cold Leg	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	354'-0 362'-0 405'-6 426'-6	*Fuel Transfer Carriage	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	"A" & "B" Cold Leg; "A" Hot Leg; Safety Injection and Shutdown Cooling Piping	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	354'-0 362'-0 405'-6 426'-6	*Upender	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	"A" & "B" Cold Leg; "A" Hot Leg; Safety Injection and Shutdown Cooling Piping	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	354'-0 362'-0 405'-6 426'-6	Refueling Machine	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	"A" & "B" Cold Leg; "A" Hot Leg; Safety Injection and Shut-down Cooling Piping	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0 405'-6	*Stud Tension & Hydraulic Unit	Refueling Cavity Floor; Operating Floor	None	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	357'-0 376'-0 365'-0 405'-6	*Reactor Vessel Head	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor	Reactor Vessel Safety Injection and Shutdown Cooling Piping	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	357'-0 376'-0 365'-0 405'-6	*Reactor Vessel Head Lift Rig	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor	Reactor Vessel Safety Injection and Shutdown Cooling Piping	
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	405'-6	Reactor Vessel Head Studs	Operating Floor	None	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0	*Upper Guide Structure	Refueling Cavity Floor	Reactor Vessel Internals; Fuel in Core	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0	*Upper Guide Structure Lift Rig	Same as Upper Guide Structure	Same as Upper Guide Structure	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0	*Core Barrel	Same as Upper Guide Structure	None	C

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0	*Core Barrel Lift Rig	Same as Upper Guide Structure	None	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	336'-6 357'-0 405'-6 426'-6	Jib Crane (2L45)	Basement Floor; Head; Equip. Hatch Area; Operating Floor; Top of Secondary Shield Wall	Reactor Vessel; All RCP's; Both Steam Generators; Shutdown Cooling Piping	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0 405'-6	*Stud Stand w/Studs	Refueling Cavity Floor; Operating Floor	None	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	357'-0 376'-0 405'-6 426'-6	*CEDM Extension Shaft Uncoupling	Equip. Hatch Area; Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	Reactor Vessel Head; Pressurizer Surge Line to "A" Hot Leg; Shutdown Cooling Piping; "A" Cold Leg	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0	*Alignment Pins	Refueling Cavity Floor; Vessel Flange	None	C
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	376'-0 405'-6	*Refueling Cavity Seal Plate	Refueling Cavity Floor; Operating Floor	Reactor Vessel Head; Shutdown Cooling Pipe to "B" Hot Leg and "C" Cold Leg	B
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	365'-0 405'-6 426'-6	*Seal Plate Lift Rig	Refueling Cavity Floor; Operating Floor; Top of Secondary Shield Wall	Same as Seal Plate	B

TABLE 2.4.2 (continued)

CRANE	LOCATION	IMPACT ELEV.	LOAD	IMPACT AREA	SAFETY-RELATED EQUIPMENT	HAZARD ELIM. CATEGORY
Unit 2 Polar Crane (2L2)	Reactor Bldg. Unit 2	Any Elev.	*Main Hoist Load Block	Any Area	Any Equip. Below Crane	D
MSIV Bridge Crane (2L10)	Turbine Aux. Bldg.	404'-0 386'-0 354'-0	Main Steam Isolation Valve (10,000 #)	Piping & Electrical Penetration Room Roof	Piping & Electrical Cables in N. Penetration Rooms	B

* This designation on the table indicates that these loads move over the reactor cavity.

**Loads with this designation can only be moved around the containment at elevation 424'-6" (426'-6" on Unit 2). These loads will be moved as close to the top of the secondary shield walls as possible with adjustments to the load's elevation as required to avoid such obstructions as handrails, Unit 2 Main Steam Lines, etc.

<u>EXCEPTIONS TO NUREG-0612</u>

A. Exceptions to ANSI B30.2-1976 as it applies to the load testing of cranes at Arkansas Nuclear One.

1. For the Polar Cranes (Equipment Numbers L2 and 2L2) - AP&L will not transport the test load the full length of the bridge as required by Section 2-2.2.2b.2 of the ANSI standard because to do so would cause this load to be unnecessarily carried over safety-related equipment.

2. For the Fuel Handling Cranes (Equipment Numbers L3 and 2L35) - AP&L will not transport the test load the full length of the crane runway as required by Section 2-2.2.2b.3 because to do so would require this load to move unnecessarily over spent fuel as well as over safety-related eqiupment in the control room. Moving a load of this magnitude over spent fuel would violate our Technical Specifications. In addition to the above, AP&L will not transport the test load the full length of the crane's bridge as required by Section 2-2.2.2b.2 because of the size of the test load blocks.

3. For the Intake Structure Gantry Crane (Equipment Number L7) - AP&L will transport the test load the full length of the crane runway as required by Section 2-2.2.2b.3 with the exception of the runway that passes over safety-related equipment.

4. For the Main Steam Isolation Valve Bridge Crane (Equipment Number 2L10) - AP&L will not load test this crane in place because we cannot physically load test this crane in its location. Also, the hoist on this crane is a standard, commercial grade 10 ton hoist and as such was <u>not</u> load tested when manufactured.

EXPLANATION OF HAZARD ELIMINATION CATEGORIES FOR TABLE 2.4.2

A. Crane travel for this area/load combination prohibited by electrical interlocks or mechanical stops.

B. System redundancy and separation precludes loss of capability of system to perform its safety-related function following this load drop in this area.

C. Site-specific considerations eliminate the need to consider load/equipment combination.

D. Likelihood of handling system failure for this load is extremely small (i.e., Section 5.1.6 NUREG-0612 satisfied).

E. Analysis demonstrates that crane failure and load drop will not damage safety-related equipment.

VENDOR DRUM DESIGN CALCULATION
FOR INTAKE STRUCTURE GANTRY CRANE (L7)

```
RUN
DRUM2    01:23 PM         13-JAN-82

     DRUM WALL THICKNESS
     -------------------
ROPE DIA. & DRUM PITCH DIA.?  .625,19.75
ACTUAL PITCH & F DIM.(SEE ES-012)? .726,.0625
CENTER GROOVE DIM ON DRUM? 9
ROPE LOAD IN TONS? 3.192
GEAR PITCH DIA. (NEG IF GEAR FORCE DOESN'T OPPOSE ROPE PULL)? 23.2
RB TO DRUM CL, DRUM CL TO GEAR, & GEAR TO BEARING? 40.8125,49.125,8.1875
ULTIMATE TENSILE STRENGTH OF DRUM MATERIAL (KSI)? 48


REQ'D THICKNESS @ 2.5 X BUCKLING PRESSURE = 0.599 IN
REQ'D T TWO GROOVES IN FROM THE LEAD LINE = 0.780
REQ'D T AT THE LEAD LINE                  = 0.510


THICKNESS UNDER THE GROOVE  ? .84375


                    19.7500 IN P.D.
  +++++       +++++ 19.6250 IN O.D.
      +       +
       +     + 0.2500 IN GROOVE DEPTH
        +   +
         +++        19.1250 IN R.D.

   0.8438 IN UNDER THE GROOVE

  ++++++++++++++++++ 17.4375 IN I.D.

BUCKLING CHECK
--------------
ROPE PRESSURE ON THE DRUM :  4 X 3.19/(19.750 X0.726) = 0.890 KSI
CRITICAL PRESSURE               8240 X(0.844/ 9.141)^3 = 6.481

BUCKLING FACTOR OF SAFETY                 6.481/0.890 = 7.276


CHECK 2 GROOVES IN
------------------
                        .85 X  6.38
CIRCULAR COMPRESSION   ------------- =  8.859 KSI < 9.6 OK
                       0.844 X 0.726

DRUM BENDING : M/Z       228.4/ 212.2 =  1.076 KSI < 9.6 OK

RESULTANT SHEAR  ( 8.859 + 1.076)/2 =  4.967 KSI < 7.2 OK


CHECK @ THE LEAD LINE
---------------------
                                .50 X  6.38
CIRCULAR COMPRESSION           ------------- =  5.211 KSI < 9.6 OK
                               0.844 X 0.726
                          .96 X  6.38
LOCAL BENDING       -------------------------- =  1.779 KSI
                    0.844 X(19.750 X 0.844)^.5

DRUM BENDING : M/Z                237.9/ 212.2 =  1.121 KSI

TOTAL BENDING                  1.779 + 1.121 =  2.901 KSI < 9.6 OK

RESULTANT SHEAR             ( 5.211 + 2.901)/2 =  4.056 KSI < 7.2 OK
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ATTACHMENT 4 TO ØCAN128213

SAFE LOAD PATHS

With regard to safe load paths, AP&L proposes to modify our May 29, 1981, response (ØCANØ58117) to exclude the physical marking of safe load paths on the floor in the area where the load is to be handled. Upon further evaluation, it was determined that a more appropriate measure would be to have well defined safe load paths defined in our plant procedures for expected heavy loads. Also included in our plant procedures are provisions for handling unexpected heavy loads on a case-by-case basis.

ATTACHMENT 5 TO ØCAN128213

SLING LOAD TESTING PROGRAM

With regard to our Sling Load Testing Program for ANO-1&2, AP&L has sling load testing procedures in place which comply with ANSI B30.9-1971. In our use of slings affected by NUREG-0612, our intent is to use only those slings which are tested in compliance with ANSI B30.9-1971.