2.C.2.1
JHG-81-179

MAINE YANKEE ATOMIC POWER COMPANY •

EDISON DRIVE
AUGUSTA, MAINE 04336
(207) 623-3521

September 18, 1981
FMY-81-141

RECEIVED
SEP 22 1981
U.S. NUCLEAR REGULATORY COMMISSION

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Office of Nuclear Reactor Regulations
Mr. D. G. Eisenhut, Director
Division of Licensing

References:
(a) License No. DPR-28 (Docket No. 50-271)
(b) USNRC letter, D. G. Eisenhut to all Licensees of Operating Plants and Applicants for Operating Licensees and Holders of Construction Permits, dated December 22, 1980
(c) USNRC letter, D. G. Eisenhut to all Licensees and Holders of Construction Permits, dated February 3, 1981
(d) USNRC letter to MYAPC, dated March 13, 1981
(e) MYAPC letter (FMY 81-91) from R. H. Groce, dated June 15, 1981; Subject: Control of Heavy Loads

Enclosure: (a) Control of Heavy Loads, Section 2.1 submittal

SUBJECT: Control of Heavy Loads

Dear Sir:

References (b), (c), and (d) required evaluation of heavy load handling equipment at Maine Yankee and requested a report of the results of this evaluation. Reference (e) provided Maine Yankee's intended schedule for submittal of this information.

The information requested in Section 2.1 of reference (d) is presented in enclosure (a) numbered to correspond to the information request.

This submittal is a summary of the detailed engineering analysis performed by Maine Yankee. The analysis and inspections were conducted in accordance with the objectives and bases of the defense in-depth approach outlined in Section 5.1 of NUREG 0612.

A033
s
1/1

Section 2.2 of reference (d) requests information on specific requirements for overhead handling systems operating in the vicinity of fuel storage pools. In 1975, the Commission reviewed Maine Yankee's analysis of a postulated spent fuel cask drop accident in the spent fuel pool and concurred with our evaluation that no safety related equipment was beneath the path for cask travel.

Additionally, the yard crane (CR-3) was modified to improve reliability, including addition of limit switches and a new main hoist equalizer sheave assembly to provide overload sensing of main hoist hook loads. Limit switches were installed which prevent movement of any load over spent fuel in the pool. The Commission concurred with the Maine Yankee review and stated that provisions to prevent a postulated spent fuel shipping cask accident are acceptable. Maine Yankee contends that this last review is still valid and that submission of additional information per reference (d), section 2.2 is unnecessary.

Maine Yankee is currently analyzing section 2.3 of reference (d) on specific requirements of overhead handling systems operating in the containment. Upon identifying the scope and necessary time required to complete this review, we will forward the commission a proposed submittal date that will allow for completion of a comprehensive and quality submittal.

Section 2.4 requests information on specific requirements for overhead handling systems operating inplant areas containing equipment required for reactor shutdown, core decay heat removal, or spent fuel pool cooling. Maine Yankee's response to section 2.1 (Enclosure A) justified the exclusion of all overhead handling systems at the plant. Our detailed engineering inspection of plant arrangements has shown that sufficient redundancy exists such that a load drop would not result in the loss of critical safety related functions. No further response to section 2.4 is considered necessary.

We trust that this informatin will be satisfactory, however, should you require additional information, please contact us.

Sincerely,

MAINE YANKEE ATOMIC POWER COMPANY

John H Garrity

John H. Garrity, Director
Nuclear Engineering and Licensing

JHG/plb

ENCLOSURE A

CONTROL OF HEAVY LOADS AT NUCLEAR POWER PLANTS - NUREG 0612

2.1.1 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).

Safe shutdown equipment includes safety related equipment and associated subsystems that would be required to bring the plant to hot shutdown conditions or provide continued decay heat removal following the dropping of a heavy load. Safety functions that should be preserved are: to maintain reactor coolant pressure boundary; capability to reach and maintain subcriticality; and removal of decay heat.

The following Maine Yankee systems are required to accomplish these safety functions:

Function	Equipment Required
A. Maintain Reactor Coolant Pressure Boundary	Reactor Coolant System, and portions of Safety Injection, Charging, Pressurizer surge and spray piping and Residual Heat Removal (RHR) piping.
B. Capability to Reach and Maintain Subcriticality	Control Rods, Chemical and Volume Control System for Boration.
C. Decay Heat Removal	1. Steam Generator a) Steam to Atmosphere Safety and Steam Dump valves. b) One auxiliary feed pump; (3 pumps available). 2. RHR (below 400 psig) (1 of 3 pumps req'd) plus PCCW (1 of 2 pumps req'd) or SCCW (1 of 2 pumps req'd) plus service water (1 of 4 pumps required). 3. Fuel Pool Cooling Pumps (1 of 2 pumps req'd) plus PCCW (1 of 2 pumps req'd) plus service water (1 of 4 pumps required).

For each of the systems or components identified above, all piping and power cables necessary to carry out the function must be intact for the system to carry out its function unless a non-associated redundant train is available.

For each of the functions critical volumes exist in the areas immediately adjacent to each system and rising vertically to the top of the structure. If a crane or hoist hook is capable of penetrating these critical volumes, then the potential for a load drop to damage critical equipment exists.

The following critical volumes exist at Maine Yankee:

Safe Shutdown System	Critical Volume
A. Reactor Coolant Systems and associated portions of safety injection, charging, pzr. surge and spray piping and RHR piping.	Containment Bldg.
B. Control Rods	Containment Bldg. Containment Penetration Area, Protected Cable Vault, Protected Cable Tray Room, Control Room Cable Chase.
C. Chemical and Volume Control System	Components & Piping: Containment Bldg. and PAB Electrical Cables: PAB, Protected Cable Vault, Control Room Cable Chase, Protected Cable Tray Room.
D. Steam Generators and Steam to Atmosphere Safety and Steam Dump Valves	Containment Bldg., Steam and Feed Valve House.
E. Auxiliary Feed Pumps	Components and Piping: Containment Auxiliary Feed Pump Room, Steam and Feed Valve House. Electrical Cables: Protected Cable Tray Room, Control Room Cable Chase, Protected Cable Vault.
F. Residual Heat Removal	Components and Piping: Containment, Spray Pump Bldg. Electrical Cables: Protected Cable Tray Room, Control Room Cable Chase, Protected Cable Vault, Steam and Feedwater Valve House, Containment Spray Pump Building.

G.	Primary Component Cooling/ Secondary Component Cooling	Components and Piping: Northwest corner of Turbine Bldg., Containment Spray Pump Bldg. Electric Cables: Protected Cable Tray Room, Control Room Cable Chase. Protected Cable Vault, Turbine Building.
H.	Service Water Pumps	Components and Piping: Circulating Water Pump House, Turbine Building. Electric Cables: Protected Cable Tray Room, Control Room Cable Chase, Turbine Building, Circulating Water Pump House.

Overhead weight handling systems capable of operating within these critical volumes consist of:

A.	Reactor Containment Polar Crane	(CR-1)
B.	Turbine Hall Crane	(CR-2)
C.	Fuel Bldg. Yard Crane	(CR-3)
D.	PAB Hoist for Lower Floors	(CR-5, MR-5)
E.	Auxiliary Feed Pump Room Monorails	
F.	PAB Hoist for Upper Floors	(CR-12, MR-12)
G.	Trolley for Circulating Water Pump House	
H.	Monorails and Hoists for Steam and Feed Valve House	
I.	Fuel Building Crane	(CR-5)
J.	Containment Annulus Manual Hoist and Monorail	(CR-19)

The following areas may be excluded from further consideration since no installed weight handling systems exist in these areas:

1. Control Room Cable Chase
2. Protected Cable Vault
3. Protected Cable Tray Room
4. Containment Spray Pump Building
5. Containment Penetration Area

2.1.2 JUSTIFY THE EXCLUSION OF ANY OVERHEAD HANDLING SYSTEM FROM THE ABOVE CATEGORY, 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.

A. Turbine Hall Crane

The critical volume areas in the Turbine Hall are limited to the entire north wall and an area in the northwest corner of the building above the Primary Component Cooling (PCC) and Secondary Component Cooling (SCC) systems. The critical volume along the north wall contains the power cabling for the PCC and SCC systems and the service water pumps. These cable trays run near the wall at about the 39' elevation well below the turbine operating floor which is at the 61' elevation. This critical volume is not capable of being penetrated by either the main or auxiliary hooks since the hook travel limit is approximately 17' from the wall. The primary and secondary component cooling pumps are also outside of the hook travel limit and situated at the 21' elevation well separated from the crane hooks. Portions of the piping and the heat exchangers for these two systems are within a critical volume which can be penetrated by the crane hook. The hook however is not capable of being lowered through the turbine operating floor to the 29' level where the heat exchangers are located or the 35' level where portions of the system piping are located due to the absence of removable concrete slabs. Loads are never handled directly over the components of concern. The only concern would come from a heavy load which might drop with sufficient kinetic energy to penetrate the concrete slab and steel girders supporting the operating floor at the 61' elevation.

While the plant is operating, heavy loads are rarely handled within this critical volume. During outage situations, heavy loads are moved through the critical volume and stored on the 61' level inside the volume. The largest load which could be potentially stored in this area is the main generator rotor which weighs approximately 144 tons. This load is handled about every two or three outages and is controlled such that it is never raised 6-8" above the floor in order to limit the potential energy of the load. The normal laydown location is alongside the generator casing in which case it would not be within the critical volume. Because of the infrequency of handling this load and the protection provided the systems of concern by the building structure and due to administrative procedures used in moving the load, it is not considered credible that a load drop could penetrate the 61' elevation and impact safe shutdown equipment.

If however, something did happen resulting in damage to these components, redundant trains are available to fulfill the decay heat removal function of the Primary and Secondary Component Cooling systems. Cooldown to cold shutdown could be accomplished using water from the fire pond for cooling.

The Residual Heat Removal System heat exchangers, one Residual Heat Removal System pump, and the diesel driven fire pump could be used since they would remain undamaged if a load drop occurred within the Turbine Hall. Hose connections are available on the shell side of both heat exchangers which permit fire pond water to be used to remove heat. Less than 400 gpm per heat exchanger would be required. This flow rate can be continued for at least 2 months using the minimum amount of available water from the fire pond and the Montsweag Brook Reservoir. This cooldown path assures the ability to cool to a cold shutdown condition with reactor coolant system temperature well below the Technical Specifications requirement of 210°F. Repair measures to restore a damaged PCC and SCC system could be completed in this time frame. Following the necessary damage control measures, the Service Water/Primary Component Cooling Water/Residual Heat Removal system's heat removal path would be restored.

Service water piping to the primary and secondary component heat exchangers also is located within the Turbine Hall critical volume. The piping run travels to the heat exchangers beneath the ground floor 21' elevation and is thus provided additional protection. In addition, the design of the Service Water System insures operability following a single piping failure due to a heavy load drop. The system is normally lined-up with the pump discharge cross-connect isolation valve closed and the heat exchanger supply cross-connect isolation valve open so that a rupture in either the north or south supply header will not seriously affect plant operation. Check valves in the supply headers prevent backflow through the ruptured header, and the unaffected header has sufficient capacity to meet system requirements. Header ruptures downstream of the check valves can be isolated by closing manually operated isolation valves. If a load drop did result in loss of the service water then the residual heat removal heat exchangers, one Residual Heat Removal System pump and the diesel driven fire pump could be used as previously described as they would be unaffected by a load drop that impacted service water piping within the Turbine Hall.

The Turbine Hall Crane, CR-2 receives a detailed inspection prior to any heavy load lift and prior to a refueling outage. This detailed inspection is performed by an authorized Whiting Crane representative, the vendor for the Turbine Hall Crane. This inspection includes examination of all components of the rope reeving system with close attention given to the hoisting ropes, limit switches and brakes. All deficient components are replaced or repaired prior to any lift.

Detailed engineering inspection of the critical volume associated with the safe shutdown systems within the Turbine Hall along with the administrative controls applied to the Turbine Hall Crane provides adequate safety for the associated safe shutdown systems. No further analysis of this crane is considered necessary.

B. Fuel Building Yard Crane (CR-3)

In 1975 the Commission reviewed Maine Yankee's analysis of a postulated spent fuel cask drop accident in the spent fuel pool and concurred with the plant evaluation that no safety related equipment was beneath the path for cask travel. The crane was modified to improve its reliability including addition of limit switches and a new main hoist equalizer sheave assembly to provide overload sensing of main hoist hook loads. Limit switches were installed which prevent movement of any load over spent fuel in the pool. The Commission concurred with the Maine Yankee review and stated that provisions to prevent a postulated spent fuel shipping cask accident are acceptable. Specific questions 5.17 and 9.14 in Volume III of the FSAR also address the yard crane. Analysis has shown that even if a cask drop resulted leakage from the pool would be minimal and well within the capacity of either of the two primary water transfer pumps. No further analysis of this crane is considered necessary at this time.

C. PAB Hoist for Lower Floors (CR-5, MR-5)

Boration is normally accomplished with the use of any one of three charging pumps located in the Primary Auxiliary Building. These pumps are not required to achieve a hot shutdown condition. However, to achieve a cold shutdown condition, boration would be required. The critical volume associated with the 21' level of the Primary Auxiliary Building surrounds the three charging pumps, their power cables, charging pump lube oil power cables, and the Chemical and Volume Control System piping associated with boration to support the capability to reach and maintain subcriticality. The power cable to the charging pumps runs through a 4" steel conduit imbedded mid-way through the 18" thick floor slab at the 21' elevation. The monorail runs parallel to the power cables but is horizontally separated by about 2' such that a load drop could not impact directly on the concrete above the conduit. The power cabling for the charging pump lube oil pumps is routed through a cable tray running parallel to the monorail. This tray is level with the monorail and thus not susceptible to damage from a load drop. The cables leave the tray and are routed above the monorail to each of the charging pump cubicles, therefore no electric cabling for the charging pumps is subject to load drop damage.

Branches of the monorail are located above the centerline of each of the pumps to facilitate their installation and removal. Each pump is enclosed in its own cubicle with concrete partitions separating the pumps. Access to the charging pump cubicle is administratively controlled by a locked barrier. The only loads that would ever be hoisted by the monorail are the charging pumps themselves. Chemical and Volume Control System piping associated with boration does not pass directly beneath the monorail at any point.

If a charging pump was being removed for maintenance and did drop it is not considered likely that it could fall such that it would penetrate the concrete wall damaging another charging pump. In any case, there would still be an additional charging pump available. Another alternative would be to use the auxiliary charging pump which has sufficient vertical and horizontal separation so that neither the pump itself or the power cables would be subject to damage involving the main charging pumps.

In the extremely unlikely event that a load drop in the Primary Auxiliary Building did somehow destroy the power cables to the auxiliary charging pump and the main charging pumps, conservative estimates show that power cables to the auxiliary charging pump (480 V) or to a main charging pump (4160 V) could be re-run in 8 hours, after which cooldown could begin. It is important to note that the plant can be maintained in a safe hot shutdown condition until such rerouting is accomplished.

Detailed engineering inspection of this critical volume indicates that sufficient protection is provided such that alternative safe shutdown equipment is always available. No further analysis of monorail MR-5 and hoist CR-5 is considered necessary.

D. Auxiliary Feed Pump Room Monorails

The auxiliary feed pumps are required to support decay heat removal. Decay heat removal is accomplished by venting steam to the atmosphere through the steam generator safety valves and the atmospheric steam dump valve. Feedwater inventory is normally maintained in the steam generators with the use of either one (1) of two (2) electric driven auxiliary feed pumps, P-25A or P-25C. Both of these pumps are located in a tornado protected room adjacent to the containment.

The monorails in this room are directly above each pump. They are used only for installing/removing the associated pump. Piping and cabling to the pumps are located such that a load drop would not impact directly on the piping or cabling. If the pump was being rigged out for repair it would already be out of commission and not be relied upon to maintain feedwater inventory. Either the other electric pump or the steam driven auxiliary feed pump located in the steam a[illegible]d valve house, could provide the necessary makeup water. Coold[illegible]ld be accomplished by venting steam to atmosphere through the steam generator safety valves and the atmospheric steam dump valve.

The plant can be cooled to approximately 212 to 250°F by the above method and is considered safely shutdown by Maine Yankee. However, to reduce the reactor coolant temperature to cold shutdown as defined in the plant Technical Specifications, an additional heat removal method is required. This is provided by the Residual Heat Removal System, Primary or Secondary Component Cooling Water Systems, and Service Water System.

Since these monorails are special purpose and only used on a rare basis, it is not considered credible that a load drop in the auxliary feedwater pump room could prevent a safe shutdown. No further analysis of these monorails is considered necessary.

E. PAB Hoist for Upper Floors (CR-12, MR-12)

The critical volume associated with this hoist is very small and located in the southeast corner of the building. It occurs in an area above the charging pump power cables and the charging pump lube oil pump power cables approximately 8'8" from the east wall of the building. The monorail intersects the routing of the cables at a 90^{0} angle. The charging pump power cables are routed through steel conduit embedded in 9" of concrete, as previously stated. They are also afforded the additional protection provided by the concrete slab forming the floor at the 36' elevation. Since loads would only be traveling through the critical volume for a short period of time and due to the protection provided it is not considered credible that a load drop from this hoist could result in loss of the ability to borate the reactor plant. The charging pump lube oil pump power cables are routed in cable trays beneath the 36' elevation and thus could conceivably be incapacitated by a load drop.

The pump manufacturer, however, has verified that the main charging pumps can be operated without their lube oil pumps. Ring oiling of the bearings is provided, which will adequately lubricate the bearings without the lube oil pumps. This reinforces the assertion that a load drop from this overhead handling system cannot destroy the ability to borate.

The west end of this monorail in the Fuel Building penetrates a critical volume associated with the spent fuel pool cooling pump power cables. This is discussed in conjunction with the Fuel Building Crane in sub-paragraph G. No further analysis of the PAB hoist for upper floors is considered necessary.

F. Trolley for Circulating Water Pump House (MR-6)

The critical volume in the Circulating Water Pump House is associated with the service water pumps, including piping and power cables. The service water pumps are spaced 17' apart. Their power cables are routed through conduit along the east wall of the service water pump bay. Sufficient horizontal separation exists such that no load drop can impact on the power cables. The trolley for the Circulating Water Pump House runs parallel to the discharge header piping between the service water pumps and their discharge valve. A load drop could conceivably impact on one of the service water pumps or its associated discharge valve and piping. The design of the service water system insures operability following a single piping failure. Normally, the system is operated with the pump discharge cross-connect closed and the heat exchanger supply cross-connect open so that a rupture in either the north or south header will not seriously affect plant operation. One header is sufficient to meet system requirements and check valves in the supply headers prevent backflow through the ruptured header.

Alternative methods exist to fulfill the decay heat removal function of the Service Water System to permit cooldown to cold shutdown. As discussed previously, the Residual Heat Removal System heat exchangers, one Residual Heat Removal System pump, and the diesel driven fire pump could be used since they would remain undamaged if a load drop occurred within the Circulating Water PUmp House. Hose connections are available on the shell side of both heat exchangers which permit fire pond water to be used to remove heat. Less than 400 gpm per heat exchanger would be required. This flow rate can be continued for at least 2 months using the minimum amount of available water from the fire pond and the Montsweag Brook Reservoir. This cooldown path assures the ability to cool to a cold shutdown condition with Reactor Coolant System temperature well below the Technical Specifications requirement of 210°F. Repair measures to restore a damaged Service Water System could be completed in this time frame. Following the necessary repair measures, the Service Water, Primary/Secondary Component Cooling Water/Residual Heat Removal heat removal path would be restored.

Since this monorail is used for a specific purpose and then only rarely and considering the redundant trains available to achieve safe shutdown, it is not considered credible that a load drop from this monorail could prevent a safe shutdown. No further analysis in this area is considered necessary.

G. Monorails for Steam and Feed Valve House

These monorails are located on top of the Steam and Feed Valve House. The critical volume associated with these monorails is that area above the main steam piping up to the non-return valves including the steam line to the decay heat release valve and the turbine driven auxiliary feed pump. These monorails are special purpose in that they are only used to perform maintenance on the non-return valves.

This portion of the Main Steam System is necessary for decay heat removal which would be accomplished by venting steam to the atmosphere through the steam generator safety valves and the atmospheric steam dump valve. If this evolution were in progress, no overhead handling systems capable of operating in the critical volume would be in use. Conversely, portable hoists would only be utilized after the Primary System had been cooled down with the Residual Heat Removal System removing decay heat.

Inspection of this critical volume also identified several other beams inside the Steam and Feed Valve House to which hoists could be attached for performing maintenance on other large steam valves within the enclosure.

Maine Yankee can foresee no circumstances when overhead weight handling systems within the critical volume would be in use such that a load drop could prevent safe shutdown or the ability to remove decay heat. No further analysis of this area is considered necessary.

H. Fuel Building Crane (CR-6)

The critical volume associated with the Fuel Bruilding Crane contains an area of the spent fuel pool and the Spent Fuel Pool Cooling System. The systems in the decay heat removal chain for the spent fuel pool include the Spent Fuel Pool Cooling System, Primary Component Cooling System, and the Service Water System. The Primary Component Cooling System and the Service Water Systems were discussed previously. The power cables for the spent fuel pool cooling pumps and the purification pump are routed through the cable tray room, the cable vault, through a duct into the PAB 11' level, up a riser along the east wall, then along the north wall into the Fuel Building. The cables to the cooling pumps are routed through conduit 13'6" from the east wall of the Fuel Building to the cooling pumps. The purification pump is powered from switchboard MCC-11B in the southwest corner of the truck unloading area of the Fuel Building. Cables are routed through a tray in the RCA storage area and then via conduit to the pump. Critical volumes exist over each of the cable runs. The critical volume for this system in the Primary Auxiliary Building is not penetrated at any point by the monorail in this area.

Normally one of two pumps is run to remove decay heat from the pool. The purification pump is capable of fulfilling the cooling function for the pool provided the heat load is low, and is available as a backup to the two cooling pumps. Within the Fuel Building, the power cables are routed with sufficient separation such that a load drop could not damage the power cables to all three pumps.

The pumps themselves, along with the heat exchanger and most of the piping, are located at the 21' level in the Fuel Building. They are enclosed in a small area of the building north of the spent fuel pool. There are no overhead weight handling systems directly over the pumps or heat exchanger. The Fuel Building Crane is capable of traveling over this area, however, sufficient physical separation exists such that major system components are not susceptible to damage from a load drop. The enclosure is bounded by 24" and 18" concrete sidewalls supporting a 15" concrete floor at the 31' 1-1/2" level. Additionally a 12" concrete floor around the new fuel storage area exists at the 44'6" level. This concrete floor supports the new fuel storage rack matrix which is partially over the fuel pool cooling components.

Normally this crane is used for unloading new fuel storage containers and transporting the new fuel assemblies to the new fuel storage area and also to the spent fuel pool. Unloading new fuel shipping containers is performed under strict administrative controls and the procedure specifies all storage areas, none of which requires movement over the fuel pool cooling components. Other types of loads are generally not handled over this area and consist mainly of testing equipment used during refueling operations (ie, CEA profilometry). Generally these loads are of insufficient mass to present any danger to other components in this area.

The power cables for the cooling pumps run from north to south along the underside of a steel girder supporting the mezzanine level approximately 13'6" from the east wall of the Fuel Building. Both MR-12 the 7 1/2 ton upper level Primary Auxiliary Building overhead handling system and the 5 ton Fuel Building Crane are capable of operating within the critical volume above these power cables.

Monorail MR-12 extends into the Fuel Building ending above the mezzanine level directly over the power cables to the fuel pool cooling pumps. The current arrangement prevents lowering a load down to the lower level onto a vehicle for transport. All loads removed from the PAB for transport are handled at the other end of the monorail. No loads are currently moved from the Primary Auxiliary Building to the Fuel Building with this monorail. This monorail presents no danger to the power cables of interest. No further analysis of this monorail in the Fuel Building is considered necessary.

The Fuel Building Crane could conceivably drop a load within the critical volume in this area. The power cabling for the purification pump runs along the north and west walls of the building. With the exception of a few feet from the west wall to MCC-11B, the cabling is outside of the hook travel limits for this crane. Maine Yankee does not foresee any instance where the handling of a load in this area with the Fuel Building Crane could increase the chances for damage to critical components required for decay heat removal.

Although highly unlikely, if a load drop did result in damage to the cables for the cooling pumps, the purification pump whose cables would not be affected would provide cooling flow until the new power cables could be run to the cooling pumps. Conservative estimates show that these cables could be run in about 8 hours. An alternative means also exists to provide emergency cooling to the heat exchanger through flanged connections on the cooling water supply and return lines from the Fire Protection System in the event component cooling water flow was lost.

Detailed engineering inspection of the critical volumes associated with the Fuel Building Crane have indicated that it is not credible that a load drop could damage the Fuel Pool Cooling System such that Maine Yankee would be incapable of removing decay heat. No further analysis of this crane is considered necessary.

I. <u>Containment Annulus Manual Hoist (CR-19)</u>

This overhead handling system is located at the 57'10" level in the containment annulus 4'6" from the polar crane wall. It provides 180° coverage of the annulus from a point even with the pressurizer along the south side of the containment to a point even with steam generator E-1-3.

All piping systems entering the containment are routed through the annulus below the 20' elevation. All piping enters the loop areas at levels ranging from elevation 6' to elevation 16'. The systems required for safe shutdown or decay heat removal in this area are: Chemical and Volume Control, Safety Injection, Residual Heat Removal. The specific lines of concern are the two (2) - 3" charging lines to loops two and three for boration, the 14" residual heat removal suction line from loop 2 hot leg; and the three (3) - 10" HPSI lines into each of the three loops used for residual heat removal return for core cooling.

The three (3) - 10" safety injection header lines enter the containment from the Spray Pump Building through different horizontally separated penetrations. They are routed next to the outer perimeter of the polar crane wall to each of the three loops. The critical volumes associated with this piping is directly above the area where they travel from the containment outer wall to the polar crane wall. The 3" charging inlet line enters the containment between the loop two safety injection tank and the pressurizer. The critical volume exists where it crosses the outer annulus. After going through the regenerative heat exchanger the charging line splits into two headers and travels back through the polar crane wall and runs alongside the polar crane wall to loops two and three. The 14" residual heat removal line comes off loop 2 and is routed through the annulus and into the Spray Pump Building. The only areas of concern would be associated with where the piping runs from the Spray Pump Building to the polar crane wall. There are five horizontally separated points where the above mentioned piping intersects with the overhead weight handling system (MR-19). A critical volume exists above each of these points. The piping runs alongside the polar crane wall are outside of the critical volume.

Even though theoretical critical vlumes exist, this monorail is incapable of operating within the spaces just above the critical components. The crane is located at the 57'10" level. Two floors provide physical separation and protection for the systems required for safe shutdown or decay heat removal. The floor at the 45' level is comprised of steel grating supported by steel girders. The floor at the 20' level is reinforced concrete 24" thick. The largest load identified for this monorail is a reactor head stud detensioner which weighs slightly over one ton. The monorail is mainly used for moving the CEDM air ventilation ducting to a storage location in the outer annulus and for moving various tools and components used during refueling. This monorail is not used during power operation.

Detailed engineering inspection indicates that because of the infrequent use of this overhead handling system and the relatively small loads, the floor at the 46' and 20' levels provides sufficient protection for the critical components. It is not considered credible that a load drop from MR-19 could damage a critical system such that safe shutdown or decay heat removal could not be completed. No further analysis of this monorail is considered necessary.

2.1.3 WITH RESPECT TO THE DESIGN AND OPERATION OF HEAVY-LOAD HANDLING SYSTEMS IN THE CONTAINMENT AND THE SPENT FUEL POOL AREA AND THOSE LOAD HANDLING SYSTEMS IDENTIFIED IN 2.1-1, ABOVE, PROVIDE YOUR EVALUATION CONCERNING COMPLIANCE WITH THE GUIDELINES OF NUREG 0612, SECTION 5.1.1.

This section will evaluate the Reactor Containment Polar Crane (CR-1) at Maine Yankee. The cranes associated with the Spent Fuel Pool area and all other load handling systems identified in 2.1-1, above, were evaluated in Section 2.1-2 and will not be addressed in the response to this section.

A. DRAWINGS OR SKETCHES SUFFICIENT TO CLEARLY IDENTIFY THE LOCATION OF SAFE LOAD PATHS, SPENT FUEL, AND SAFETY-RELATED EQUIPMENT.

Critical volumes within the containment exist over each of the loop areas and the area over the reactor vessel itself. The Polar Crane is generally required to operate within these critical volumes. Safe load paths to approved storage areas are administratively controlled and depicted in Maine Yankee Maintenance Procedures. Maine Yankee does not have drawings identifying safe load paths other than those utilized as part of specific procedures. Procedures are available for review at the plant site.

B. A DISCUSSION OF MEASURES TAKEN TO ENSURE THAT LOAD-HANDLING OPERATIONS REMAIN WITHIN SAFE LOAD PATHS, INCLUDING PROCEDURES, IF ANY, FOR DEVIATION FROM THESE PATHS.

Maine Yankee defines safe load travel paths through procedures and operator training so that, to the extent practical heavy loads avoid being carried over or near irradiated fuel. The reactor vessel head storage stand is located outside the refueling cavity between loops two and three. No safety related equipment is located beneath the travel path. Other large core components are strictly controlled in that their travel paths are specified by a polar crane coordinate system. For those heavy loads handled on a frequent basis (every outage) procedures exist to adequately control movement of heavy loads. Maine Yankee relies heavily on specific procedures and operator training and safety awareness to ensure that all loads are handled in as safe a manner as is feasible. Deviations from normal load handling would be accomplished using special procedures approved by the Plant Operations Review Committee.

C. A TABULATION OF HEAVY LOADS TO BE HANDLED BY EACH CRANE WHICH INCLUDES THE LOAD IDENTIFICATION, LOAD WEIGHT, ITS DESIGNATED LIFTING DEVICE, AND VERIFICATION THAT THE HANDLING OF SUCH LOAD IS GOVERNED BY A WRITTEN PROCEDURE CONTAINING AS A MINIMUM, THE INFORMATION IDENTIFIED IN NUREG 0612, SECTION 5.1.1.(2).

The heavy loads (including weights and lifting fixtures) handled routinely by the Polar Crane during outage conditions are as follows:

	COMPONENT	APPROXIMATE WEIGHT	DESIGNATED LIFTING FIXTURE
a.	Reactor Vessel Closure Head	/250,000 lbs/	Head lifting fixture.
b.	Upper Guide Structure	/ 94,500 lbs/	Reactor internals lifting fixture.
c.	CEDM Missile Shield	/ 88,000 lbs/	Appropriately sized 6 x 19 Preformed, Improved Plow Steel IWRC bridle sling.
d.	Reactor Water Cavity Seal Ring	/ 18,000 lbs/	Appropriately sized 6 x 19 preformed, Improved Plow Steel IWRC cable slings.
e.	Stud Tensioners	/ 2,250 lbs/	Appropriately sized 6 x 19 Preformed, Improved Plow Steel IWRC cable sling.

Maine Yankee uses detailed procedures which substantively meet the requirements identified in NUREG 0612, Section 5.1.1(2). These procedures identify required equipment; inspections and acceptance criteria required before movement of load; detailed steps and proper sequence to be followed in handling the load and the safe load path. A separate procedure is not considered necessary for the stud tensioners. Their movement is covered in procedures for removing reactor vessel head closure studs.

Maine Yankee also has procedures to handle the following loads not routinely lifted during every outage:

	COMPONENT	APPROXIMATE WEIGHT	DESIGNATED LIFTING FIXTURE
a.	Core Support Barrel Assembly	/269,000 lbs/	Reactor internals lifting fixture.
b.	Core Support Barrel Radiation Shield	/ 80,000 lbs/	Appropriately sized 6 x 19 Preformed, Improved Plow Steel IWRC cable slings.

	COMPONENT	APPROXIMATE WEIGHT	DESIGNATED LIFTING FIXTURE
c.	Reactor Coolant Pump Motor	/123,000 lbs/	Appropriately sized 6 x 19 Preformed, Improved Plow Steel cable slings.
d.	Reactor Coolant Pump Driver Mount and Rotating Assembly	/ 36,000 lbs/	Appropriately sized 6 x 19 Preformed, Improved Plow Steel cable slings.

The closure head stud storage rack and studs (approximately 11 tons) has been identified as a heavy load which is not directly covered in current Maine Yankee procedures. Adequate controls to cover the movement of this load will be incorporated into existing procedures prior to 1982 refueling outage.

D. VERIFICATION THAT LIFTING DEVICES IDENTIFIED IN 2.1.3-c, ABOVE, COMPLY WITH THE REQUIREMENTS OF ANSI N14.6-1978, OR ANSI B30.9-1971 AS APPROPRIATE. FOR LIFTING DEVICES WHERE THESE STANDARDS, AS SUPPLEMENTED BY NUREG 0612, SECTION 5.1.1(4) or 5.1.1(5), ARE NOT MET, DESCRIBE ANY PROPOSED ALTERNATIVES AND DEMONSTRATE THEIR EQUIVALENCY IN TERMS OF LOAD-HANDLING RELIABILITY.

Two special lifting devices were identified in 2.1.3-c above: reactor vessel closure head lifting fixture and the reactor internals lifting fixture. NUREG 0612 states that 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". Maine Yankee does not consider that this standard is applicable for special lifting devices for the closure head and upper guide structure. Shipping containers are handled frequently whereas the closure head and upper guide structure are handled only twice every outage. With outages occurring at 12-14 month intervals, these lifting devices may see a total of from 70-80 lifts assuming a forty year plant life. All lifts are strictly controlled through procedures and conducted by trained operators.

These two special lifting devices were provided by Maine Yankee's NSSS supplier - Combustion Engineering (C-E). The closure head lifting rig was provided in a package with the closure head and vessel. We are in the process of obtaining the specific design and testing data from C-E for Maine Yankee analysis and review.

The reactor internals lifting rig is designed to lift the core support barrel assembly consisting of the core barrel, thermal shield, core shrouds and instrumentation support structure. The operating load of this assembly is 269,000 lbs. The lifting rig has been tested to 125% of the operating load. The actual proof load lift was approximately 351,000 lbs. Normally, this lifting fixture is used twice every outage to lift the upper guide structure which weighs approximately 94,500 lbs. The core support barrel assembly is handled only for 10 year reactor vessel inservice inspections. For this lift, the fuel assemblies will have been removed and transferred to the spent fuel pool thus removing the danger of a radioactive release which could potentially produce doses exceeding 10 CFR Part 100 limits.

These two lifting devices were designed prior to ANSI N14.6-1978 and are not required to comply with the specifics of this standard. Maine Yankee is reviewing the documentation for each of these lifting devices to determine what actions, if any, are required to improve load-handling reliability. This review will be completed prior to the 1982 refueling outage

Maine Yankee utilizes a specific maintenance procedure which governs and documents the sling inspection program. Each sling has a specific identification tag and is required to be inspected on a yearly basis. This inspection program meets the requirements of ANSI B30.9-1971. Each individual procedure for lifting heavy loads is being checked for compliance with this ANSI standard.

E. VERIFICATION THAT ANSI B30.2-1976, CHAPTER 2-2, HAS BEEN INVOKED WITH RESPECT TO CRANE INSPECTION, TESTING AND MAINTENANCE. WHERE ANY EXCEPTION IS TAKEN TO THIS STANDARD, SUFFICIENT INFORMATION SHOULD BE PROVIDED TO DEMONSTRATE THE EQUIVALENCY OF PROPOSED ALTERNATIVES.

Maine Yankee has specific maintenance procedures governing periodic inspection and maintenance of all major cranes at the site. The reactor containment polar crane receives an intensive inspection by a Whiting Crane representative prior to each outage. Deficiencies identified are corrected prior to crane use and documented in the material history folder. Specific inspections required on a daily basis are covered in specific procedures or through operator training and are generally performed each shift. Maine Yankee considers that this program meets the intent of ANSI B30.2 - 1976, although this standard does not apply to Maine Yankee's cranes as discussed in the response to F below.

F. VERIFICATION THAT CRANE DESIGN COMPLIES WITH THE GUIDELINES OF CMAA SPECIFICATION 70 AND CHAPTER 2-1 OF ANSI B30.2-1976, INCLUDING THE DEMONSTRATION OF EQUIVALENCY OF ACTUAL DESIGN REQUIREMENTS FOR INSTANCES WHERE SPECIFIC COMPLIANCE WITH THESE STANDARDS IS NOT PROVIDED.

The Maine Yankee polar crane was procured prior to publication of CMAA #70 and ANSI B30.2-1976 and is designed in accordance with the Electric Overhead Crane Institute (EOCI) specification #61. The polar crane generally meets the design requirements as set forth in ANSI B30.2-1976 and CMAA #70 although some design terminology of EOCI #61 differs from that of CMAA #70. For example, the allowable design stresses for the bridge girder are slightly lower for EOCI #61 than they are for CMAA #70. However, due to the plant location the Maine Yankee polar crane was designed so that routine lifts could be safely handled with temperatures of crane parts as low as -20°F with icing conditions prevailing prior to containment completion. All heavy and overload lifts have been made after containment enclosure with temperatures not less than 30°F.

Maine Yankee believes that it would be inappropriate to require that cranes installed over ten years ago comply with new standards. The older cranes were designed in accordance with the standards available at that time and are adequately engineered and tested to handle the required loads.

G. EXCEPTIONS, IF ANY, TAKEN TO ANSI B30.2-1976 WITH RESPECT TO OPERATOR TRAINING, QUALIFICATION, AND CONDUCT.

Currently, Maine Yankee procedures and the crane operator training program reference USAS B30.2-1967 as the applicable standard. There is virtually no difference between the requirements of the USAS standard and the ANSI standard. Management actions are currently being undertaken to revise our procedures and training program utilizing ANSI B30.2-1976.

All personnel who operate the polar crane have been trained and tested in accordance with the Maine Yankee training program which satisfies the intent of ANSI B30.2-1976. Training records documenting this training are stored at the plant site.