Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

November 7, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Zion Station Units 1 and 2
Control of Heavy Loads Near Spent Fuel
NRC Docket Nos. 50-295 and 50-304

Reference (a): July 31, 1980, letter from D. G. Eisenhut to D. Louis Peoples

Dear Mr. Denton:

Reference (a) requested two reports documenting the results of our review of controls for the handling of heavy loads near spent fuel. Attachment A to this letter contains the first of the requested reports. The second report is not due for another three months. Attachment A also indicates the manner in which the interim actions described in Enclosure 2 to Reference (a) have been implemented.

One original and thirty-nine (39) copies of this letter are included for your use. Seven (7) copies of drawings referenced in Attachment A are also included.

Please address questions regarding this report to this office.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Administrator
Pressurized Water Reactors

cc: Zion Resident Inspector (w/att.)
S. P. Carfagno, Franklin Research Center (w/att.)

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NRC Docket Nos. 50-295
50-304

ATTACHMENT A

Partial Response to Request for Additional Information on Control of Heavy Loads

2.1 General Requirements for Overhead Handling Systems

Request 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).

Response 1:

The cranes and trolleys identified throughout the plant that handle loads in areas where equipment for shutdown or decay heat removal is located are listed below by building.

Containment

Polar crane
Underhung hand geared bridge crane (1 ton capacity)
Manipulator crane

Fuel Handling Building

Fuel building crane
Fuel handling bridge

Auxiliary Building

2-ton trolley attached to rail at 666' 0" elevation at top of auxiliary building.

Diesel Generator Room

2-ton trolley attached to two 10-ton monorails running the full length of each side of each diesel generator.

Crib House

10-ton hoist attached to 16-ton monorail I-beam at 646' 11 3/4" elevation on roof of crib house.

Request 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 or component required for plant shutdown or core decay heat removal.

Response 2:

The turbine building crane and MSR removal trolleys were excluded from item 1 above since no system or component required for plant shutdown or core decay heat removal is located in this building.

The radwaste crane and maintenance shop crane also are not listed since they are completely removed from the area of safe shutdown or decay heat removal equipment by concrete walls.

The two 4-ton monorails between the fuel building and the auxiliary building (one on Unit 1 side, one on Unit 2 side) do not have hoists physically attached to them, are separated from safety-related equipment by concrete walls, and physically far enough away from the spent fuel pool (approximately 40') to preclude consideration of dropping a load into the pool or damaging spent fuel.

The two 25-ton monorails at the 592' 0" elevation of the auxiliary building in front of the elevator (running in the east-west direction) do not have hoists physically attached and are so low (approx 7' off the floor) that a physical inspection of the area confirms that no safe shutdown or decay heat removal component could be damaged by a load drop.

Request 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. The following specific information should be included in your reply:

Request 3a:

a. Drawings or sketches sufficient to clearly identify the location of safe load paths, spent fuel, and safety-related equipment.

Response 3a:

Attached are one print each of the following sketches:

MS-16	Hoist load path - Crib House
MS-681	Hoist load path - Plan Main Floor el. 642' 0"
MS-682	Polar Crane load paths - Plan Mezz. Floor el. 617' 0"
MS-683	Diesel Gen. Room Hoist load path - Plan ground Floor el. 592' 0".

These drawings have load paths clearly marked and the nearby equipment is also identified.

Heavy loads drop analysis and safe load path information concerning the fuel handling building have been previously submitted to the NRC in the 4-8-76 letter from R. L. Bolger to A. Schwencer, 9-14-76 letter from R. L. Bolger to A. Schwencer, and the 8-9-77 letter from D. E. O'Brien to A. Schwencer.

Request 3b:

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.

Response 3b:

Loads moved in the areas defined in Section 5.1.1 (1) are listed in attached Table 3-1. The procedures governing the assembly/disassembly and movements of these loads are also listed.

Loads number 1 through 9 are covered by maintenance department procedures. These procedures allow the movement of the loads from only one point to another. While the paths for these movements are not explicitly stated in the procedures, the movements follow the safest and shortest routes. These routes are shown in the attached sketches listed in the response to Request 3a above.

This practice is consistent with the company's general safety rules and practices. These safety rules are an integral part of Zion Station's Maintenance Department Administrative Instructions (MDAI's), under which all maintenance work is performed. Also, this work is performed by maintenance nuclear mechanics and "A" men who are supervised by maintenance foremen. These personnel have achieved these positions by demonstrating their craft knowledge and ability in performing the required work.

Since the safety rules are already established and being followed and the work is being performed by experienced personnel, the intent of this request is now being met.

Request 3c:

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).

Response 3c:

The attached Table 3-2 lists the cranes and the loads normally handled by each.

Table 3-1 indicates the written procedures that govern the handling of each load. These procedures generally include sections such as Equipment Description, Purpose, References, Initial Plant and/or component Conditions, Precautions/Limitations in addition to the step by step instructions. The procedures being used meet the intent of Section 5.1.1 (2) of NUREG-0612.

Restrictions on loads in the vicinity of the spent fuel pit are also stated in the Composite Licenses for the Zion Units.

For applicable loads that will be moved in the future for which no procedure is now in effect (i.e., reactor vessel lower internals), a procedure will be developed prior to the movement of such a load.

Request 3d:

Verification that lifting devices identified in 2.1.3-c, above, comply with the requirements of ANSI 14.6-1978, 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.

Response 3d:

The RCP motor lifting tripod and the RV head lifting device, and the 17-ton shield blocks slings used at the station comply completely with ANSI B30.9-1971. This includes, use, maintenance, and storage.

Request 3e:

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.

Response 3e:

The crane inspection, maintenance, and operating procedures are all based upon ANSI B30.2-1976, Section 179.

Request 3f:

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.

Response 3f:

The cranes used at Zion Station were purchased to the Sargent & Lundy Specification for Electric Overhead Traveling Bridge Cranes which is based on the American Institute of Steel Construction Specifications and the Electric Overhead Crane Institute, Inc. Specifications. A review of this document shows that it is in basic compliance with CMAA70 - 1975 except for the following:

1) Impact Force: The Electrical Overhead Crane Institute's (ECOI) specification which was referenced in Form 280B requires a design force equal to 15% of the rated capacity of the crane. The CMAA #70-1975 specifies that the impact load be 1/2% load X Hoist Speed in feet per minute and that the impact should not be less than 15% or greater than 50% of the rated capacity. Therefore, the Zion cranes have been procured to a criteria which conforms to the requirements of CMAA specification for low hoist speed.

2) Compressive Stress: Although the allowable compressive stress specified for the Zion cranes is identical to those specified by CMAA 70-1975, in Zion this allowable stress is $B/C \leq 41$, whereas CMAA 70-1975 provides a limitation of $B/C \leq 38$, where B is the distance between web plates in inches and C is the thickness of top cover plate in inches. Therefore, only if the B/C value falls between 38 and 41, the Zion specification requirements may be slightly less conservative than CMAA 70-1975.

In summary, although the Zion procurement specification differs from CMAA 70-1975, in a few isolated areas as outlined above and on the attached Table 3-3, in general they were procured with structural design requirements that are identical or exceed those required by CMAA 70-1974.

Request 3g:

Exceptions, if any, taken to ANSI B30.2-1976 with respect to operator training, qualification, and conduct.

Response 3g:

The crane operators for the Maintenance are all 'B' category union personnel.

The polar crane can only be operated by 'A' union personnel who have demonstrated their capability through on-the-job performance.

The fuel handling crane operators receive a refresher course in crane operations prior to every refueling outage. This is seminar type training administrated by the senior fuel handling foremen.

While ANSI B30.2-1976 may be used as a guideline for crane operator training as formal program exists that uses this standard as a basis. Procedures will be written to incorporate ANSI B30.2-1976 into the Zion operator training program.

Table 3-1

LOADS	PROCEDURE
1) Reactor Vessel Head and Lifting Rig	1) RC001-1 "Reactor Vessel Head Installation" RC001-4 "Reactor Vessel Head Removal"
2) Reactor Upper Internals and Lifting Rig	2) RC001-5 "Removal of Reactor Vessel Upper Internals" RC001-6 "Installation of Reactor Vessel Upper Internals"
3) Reactor Lower Internals and Lifting Rig	3) No procedure now. Will be developed when needed.
4) Reactor Coolant Pump Motor	4) P/RC110/410-6N "Inspect/Adjust Reactor Coolant Pump Motor"
5) Reactor Coolant Pump	5) P/RC110/410-1N "Reactor Coolant Pump Seal Inspection/Replacement"
6) Shield Blocks	6) RC001-1 and RC001-4
7) Reactor Vessel Head Studs and Stud Hydraulic Tensors	7) RC001-1 and RC001-4
8) Service Water Pump and Motor	8) SW001-1 "Disassembly/Assembly of Layne Bowler Service Water Pump"
9) Equipment Hatch and Missile Shields	9) P/PP000-2N "Removal and Installation of Equipment Hatch"
10) Spent Fuel	10) FHI-23
11) New Fuel	11) FHI-02 FHI-14 FHI-33
12) Fuel Handling Equipment	12)
A) Spent Fuel Assembly Handling Tool	A) FHI-19
B) Thimble Plug Assembly Handling Tool	B) FHI-20
C) Rod Control Cluster Change Fixture	C) FHI-21
D) Full Length Control Rod Drive Shaft Unlatching Tool	D) FHI-26

Table 3-1 (Cont'd)

LOADS	PROCEDURE
E) Irradiation Sample Handling Tool	E) FHI-30
F) Burnable Poison Rod Assembly Handling Tool	F) FHI-31
G) Guide Tube Cover Handling Tool	G) FHI-32
H) New Fuel Assemoly Handling Tool	H) FHI-33
I) Rod Control Cluster Changing Tool	I) FHI-37
J) Manipulator Crane	J) FHI-13
K) Fuel Transfer System Operation	K) FHI-12
13) Spent Fuel Handling and Shipment	13) FHI-23
14) Site Removal of New Assemblies from Shipping Containers and Handling of Shipping Containers	14) FHI-02

ZION STATION - UNITS 1&2
CRANES AND HOISTS

Crane/Hoist Identification	Location	Loads Carried	Load Weight	Load Path
Polar Crane 225T Main Hook 35T Aux. Hook	Each Containment. Rail Elevation 617'-0"	RPV Head RPV Upper Internals RPV Lower Internals RC Pump Motor RC Pump Concrete Slabs	73.5T 60T 170T 36T 51T 17T	See MS-682
Underhung Hand Geared Bridge Crane - 1 ton	Each Containment on permanent rails over the reactor cavity. (In place only during refueling).	RX vessel head studs. 2 work baskets. Thimble plugs	.5T .125T .05T	Same as RPV head. Along cavity walls when head is on. In RX cavity.
Maintenance Bridge 1 ton	Each Containment over reactor cavity.	Spent fuel assy's. New fuel assy's. Fuel handling tools.	.8T .8T .2T	Reactor cavity Reactor cavity Reactor cavity
Fuel Handling Building Crane 125T Main Hook 15T Aux. Hook	Fuel Handling Building. Rail Elevation 643'-0". Col. Rows R-W/17-23	Spent Fuel Cask New Fuel Containers.	100T 3T	See Fig. 1 in 7/14/76 letter.
Spent Fuel Bridge 1 ton	Spent fuel building over spent fuel pool.	Spent fuel assy's. New fuel assy's. Fuel tools	.8T .8T .2T	In spent fuel pool. In RX cavity.

Crane/Hoist Identification	Location	Loads Carried	Load Weight	Load Path
2T Trooley	Auxiliary Building in each Diesel Generator Room. Approx. Rail Elevation 615'-0".	Diesel Generator. Parts	2T	See MS-683
2T Trolley	Auxiliary Building. Approx. Rail Elevation 666'-0". Col. Row N/18-20	Equipment Removal	2T	See MS-681
10T Trolley	Crib House. Rail Elevation 646'-11 3/4". Row CC-BB/101-113	Removal Slab SW Pump SW Pump Motor	6T 5T 7.5T	See MS-16

Table 3-3

OVERHEAD AND GANTRY CRANES

COMPARISON OF STRUCTURAL DESIGN CRITERIA

ZION 1 & 2

uctural Requirements / ecifications	Design Forces		Structural Steel Material	Allowable Stresses (ksi)				Hoisting Rope Rated Cap	(3) Non-Struct. Load Bearin. Capacity
	Impact = I	Lateral		Tension	Compresion (2)	Shear	Bearing		
A Spec #70 yright 1975 ss A1 (Standby vice)	1. ½% Load X (Hoist Speed in Feet/Min) 2. 15% ≤ I ≤ 50% of rated capacity.	2½% of (Live Load + Bridge)	ASTM-A36	17.6	17.6 for b/c 38	13.2	26.4	20% Breaking Strength	20% Fultimate
n Crane (1) ocurement ecification	I=15% of the Rated Capacity	5% of (Live Load + Bridge)	ASTM-A36	17.6	17.6 for b/c 41	13.2	21.6, AISC Fitted Stiff-eners	20% Breaking Strength	20% Fultimate

tes

1) Based on 0.9 times the allowables of EOCI #61, Class A Service or 0.8 Times the allowables of AISC 6th Edition) and use of A36 Steel.

2) b = Distance between web plates (inches)
c = Thickness of top cover plate (inches)

3) Fult = Published average ultimate stress of material

10/14/80