Omaha Public Power District

1623 HARNEY * OMAHA, NEBRASKA 68102 * TELEPHONE 536-4000 AREA CODE 402

June 22, 1981

Mr. Robert A. Clark, Chief
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Operating Reactors Branch No. 3
Washington, D.C. 20555

Reference: Docket No. 50-285

Dear Mr. Clark:

The Commission's letter dated December 22, 1980, requested all licensees to evaluate their procedures and systems for control of heavy loads over irradiated fuel and systems required for safety. The results of Omaha Public Power District's evaluation of compliance of the Fort Calhoun Station with Item 2.1 of Enclosure 3 to that letter is attached.

Sincerely,

W. C. Jones
Division Manager
Production Operations

WCJ/KJM/TLP:jmm

Attachment

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

A033
S1/1

RESPONSE TO SECTION 2.1 REQUEST FOR ADDITIONAL
INFORMATION ON CONTROL OF HEAVY LOADS

2.1 General Requirements for Overhead Handling Systems

2.1 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.

CONTAINMENT

Polar Crane

AUXILIARY BUILDING

Auxiliary Building Crane

ITEM 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 or component required for plant shutdown or decay heat removal.

RESPONSE 2:

The following cranes and hoists have been excluded from Item 1.

a) The turbine building crane was excluded from Item 1 above since no system or component required for plant shutdown or core decay heat removal is located in this building.

b) The drumming area and the maintenance shop cranes also are not listed since there is no safe shutdown or decay heat removal equipment in these areas.

c) The two 24-ton monorails in the Diesel Generator Station Area do not have a hoist physically attached to them. The hoist is stored elsewhere, and only used for maintenace on one or the other Diesel Generator, only one generator can be serviced at any given time by this hoist. Thus this crane has been excluded from Item 1.

d) The Filter Area Crane has also been excluded from Item 1 above since no system or component required for plant shutdown or decay heat removal is located in this area.

e) The two concrete slab removal cranes, the waste evaporator equipment handling crane and the deborating demineralizer area crane are excluded since a heavy load dropped from these cranes cannot prevent the plant from achieving hot shutdown. The system that these cranes operate over (the Safety Injection pump room) is not required to achieve hot shutdown. These cranes are physically separated by two floors from the Safety Injection pump room. The ability of these floors to withstand a heavy load drop will be verified by analysis.

f) There are also miscellaneous plant hoists located in the turbine building. These hoists are completely separated from any safe shutdown or decay heat removal equipment.

g) The Intake Structure crane has been excluded since a heavy load dropped from this crane cannot prevent the plant from achieving hot shutdown. The system that this crane operates over (the raw water system) is not required to achieve hot shutdown. The crane is separated from the raw water system by an intervening floor. The ability of this floor to withstand a load drop will be verified by analysis.

h) There is also a jib crane being installed in Containment. This crane will only be used when the plant is shutdown. It will be installed on el. 1045'0" near the Reactor Vessel Closure Head laydown area. This crane has a capacity of 1T. and will be used to work on CEDM's. Since this is not a permanently installed crane, and will only be used during plant shutdown, the District believes it should be excluded from item 1 above.

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

ITEM 2.1-3a

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

RESPONSE 3a:

The prints listed below are attached:

GHDR Drawings:

11405-A-5	el. 989'0" - Primary Plant Basement Level
11405-A-6	1007'0" - Primary Plant Ground Level
11405-A-7	1025'0" - Primary Plant Intermediate Level
11405-A-8	1036'0" - Polar Crane Restricted Areas
11405-A-8	1036'0" - Auxiliary Building Crane Restricted Areas

These drawings have load paths for the polar crane and auxiliary building crane clearly marked, and the nearby equipment is also identified.

Safe load path information concerning containment and the auxiliary building was also previously submitted to NRC in the District's letter from T. E. Short to Robert W. Reid dated August 9, 1978.

ITEM 2.1 - 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) (Containment and Auxiliary Building Crane) are listed in attached Table 3-1. The procedures governing these loads are also listed.

Load numbers 1 through 4 listed in Table 3-1 are covered by maintenance procedures. The paths for the movement of these loads are not explicitly stated in the procedures, but the load paths are restricted by operating instructions OI-HE-1 for the polar crane, and OI-HE-5 for the Auxiliary Building Crane.

These restrictions are as follows:

OI-HE-1

1. The polar crane will not be used to carry loads over the reactor coolant system when the reactor coolant system temperature exceeds 225°F (Technical Specification 2.11(1).

2. The polar crane will not be used to transport any load over the core when the reactor vessel head is removed without Plant Review Committee (PRC) approved procedure.

3. The polar crane will not be used to transport any load over the area bounded by containment columns 10 and 11 and the RC-2B biological shield without a PRC approved procedure pending the results of a load drop analysis.

4. Loads should not be lifted higher than necessary to safely clear obstacles along the load path.

The operating instruction for the Auxiliary Building Crane (OI-HE-5) will provide the following restriction:

1. The Auxiliary Building Crane will not be operated over the spent fuel pool without a qualified crane supervisor present and a PRC approved procedure.

DISCUSSION 3b:

The District is of the opinion that the restrictions on the Polar Crane operation given above provide for a safe load path by exclusion. The potential to impact irradiated fuel is minimized by allowing only necessary loads to be transported over the core and by using a PRC approved procedure as indicated in Table 3-1.

Heavy loads are moved with the polar crane only during refueling. These loads are the reactor vessel head, the upper guide structure and the four missile shields.

Technical Specification 2.8.5 requires one shutdown coolant pump and one heat exchanger to be in operation during refueling. The pumps used for shutdown cooling are low pressure safety injection pumps. These pumps are located in the auxiliary building rather than in containment as are both shutdown heat exchangers. Associated piping and cabling is located below the level that could be reached by a dropped component.

The conclusion is that no heavy load drop can be postulated which would interfere with the safe shutdown of the plant since heavy loads are not handled while the plant is operating. While the plant is shutdown there are no loads which would affect the equipment required to be operating, because the required equipment is located away from the area the loads are being handled.

If a heavy load drop were to occur over the core, the release of offsite doses can be reduced by rapid containment isolation on a high radiation signal. Also, decay heat removal capability is assured by prohibiting transport of a heavy load over locations where a single load drop could remove both HPSI and LPSI as decay heat removal paths unless an alternative decay heat removal path is available. Safe shutdown and decay heat removal capability is therefore, assured. Movement of the trolley over the core with no loads on the hooks is allowed since only a spontaneous failure of the cable or sheeves could cause a load drop in this mode. The possibility of this type of failure is minimized by the preoperational inspections performed per Item 3e.

Load numbers 5 and 6 are governed by maintenance and special procedures. Although the paths for these movements are not stated they are restricted by OI-HE-5. We feel this restriction on the Auxiliary Building Crane provides a safe load path by exclusion. The potential to impact irradiated fuel is minimized by not allowing loads to be carried over irradiated fuel (Technical Specification 2.11(2)). The potential for a load drop in this area, is also minimized by the fact that we are currently installing a new retrofitted "single-failure-proof" crane in the auxiliary building.

If the analysis requested by the NRC indicates that other controls are appropriate they will be addressed in the report covering Section 2.2 - 2.4.

ITEM 2.1 - 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 include identification of required equipment, inspections, and acceptance criteria required before movement of the load, and steps and proper sequence to be followed in handling the load. These procedures meet the intent of Section 5.1.1(2) of NUREG 0612.

Restrictions on loads in the vicinity of spent fuel pool and reactor core are stated in OI-HE-5 and OI-HE-1 respectively. These were addressed in Item 2.1 - 3b.

Procedures are also available for spent resin and filter disposal. These procedures do not address load handling since these loads are not carried over or in proximity to irradiated fuel or safe shutdown equipment.

Procedures for handling other heavy loads identified in Table 3.1-1 of NUREG 0612 will be written and/or reviewed prior to handling of those heavy loads.

Specific load handling devices are identified below:

Reactor Vessel Closure Head Lifting Rig
Upper Guide Structure Lift Rig

ITEM 2.1 - 3d

Verification that lifting devices identified in 2.1.3c, 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.

RESPONSE 3d:

We are currently evaluating the design of our lifting rigs to show compliance with the requirements of ANSI N14.6-1978 or ANSI B30.9-1971. As of this date the District has not fully developed a response to Item 2.1-3d, due to lack of information. This information is being obtained from Combustion Engineering (CE). C.E. wrote the specifications for our lifting rigs. We will advise the Commission of our compliance as soon as possible, and send a response.

ITEM 2.1 - 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 Auxiliary Building Crane and the Containment Polar Crane will be inspected and maintained in accordance with ANSI B30.2-1976. The Auxiliary Building Crane will be inspected daily or prior to each use (whichever is less frequent) according to OI-HE-5. The daily inspection will include checking operation of the hoist uplimit switches and normal operating controls and a visual inspection of the hook, hook latch and hoist rope of the hooks to be used. A monthly inspection will include checking operation of the spent fuel pool boundary limit switches, and the bridge and trolley travel limit switches and inspection of the hoist rope and end clamps.

The Containment Polar Crane will be inspected daily and during use, according to OI-HE-1 (Refueling Outages). The daily inspection will include checking operation of the hoist uplimit switches and normal operating controls and a visual inspection of the hook latch and hoist rope of the hooks to be used. A monthly inspection (MP-HE-1A), performed during refueling, will include checking operation of the trolley travel limit switches and inspection of the hoist rope and end clamps. Additional maintenance and inspections are performed as part of the preventive maintenance program and as prerequisites to specific critical lifts.

ITEM 2.1 - 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:

1. The Containment Polar Crane used at Fort Calhoun was purchased to Gibbs, Hill, Durham and Richardsons' specifications for Hoisting Equipment. This specification was based on the Electric Overhead Crane Institute, Inc. Specifications and USAS Safety Code B30.2-1967. A comparison of the requirements of G.H.D.&R specs to the CMAA-70-1975 specification is shown in Table 3-3. Tables 3-3, 3-4, 3-5 and the following discussion shows that the Fort Calhoun polar crane procurement specification meets the intent of CMAA-70.

2. The Auxiliary Building Crane is currently being retrofitted. This crane will be classified as a "single-failure-proof" retofitted trolley system. This crane has been designed to meet ANSI B30.2-1976 standards and CMAA Spec. No. 70.

DISCUSSION 3f:

. Impact Force: The Electric Overhead Crane Institute's (EOCI) Specification was referenced in the design for the Polar Crane. This specification 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 Polar Crane has been procured to a criteria which conforms to the requirements of CMAA specification for hoist speed less than 30 ft/min. The Polar Crane has a hoist speed of 6ft/min or less. Therefore, this crane satisfies CMAA-70-75.

2. Compressive Stress: As shown in Table 3-3, the allowable compressive stress specified in the Polar Crane design specifications is identical to those specified by CMAA-70-1975 for members with non-slender compressive flange. A comparison of the allowable compressive stress criteria given in the design specifications and CMAA-1975 is shown in Figure 3-1. The box girders for the Polar Crane in Fort Calhoun has a b/c ratio of 24. For this b/c ratio, this structural element meets the requirements of CMAA 70-1975.

ITEM 2.. - 3g:

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

RESPONSE 3g:

It has been determined that our standing order M-8 "Control of Crane Operations" does comply with ANSI B30.2-1976. This order requires operators, signalmen and supervisors of the Containment Polar Crane and the Auxiliary Building Crane to be trained and qualified, in accordance with ANSI B30.2-1976. Quality Control administers qualification exercises and retains certifications. Currently, qualified crane operators, signalmen and supervisors will be advised of new requirements resulting from NUREG 0612.

TABLE 3-1

	Load	Procedure
1.	Reactor Vessel Closure Head and Lifting Rig	MP-RC-6-1 "Removal of Reactor Vessel Closure Head" MP-RC-6-2 "Inspection and Replacement of Reactor Vessel Closure Head"
2.	Reactor Upper Internals and Lifting Rig	SP-RC-6-2 "Upper Guide Structure Lift Rig and ICI Plate Removal and Installation" MP-RC-7-2-A "Upper Guide Structure and ICI Plate Removal" MP-RC-7-2-B "Upper Guide Structure and ICI Plate Installation"
3.	Missile Shields	MP-AE-4-1 "Missile Shield Removal" MP-AE-4-2 "Missile Shield Replacement"
4.	Spent Fueld Pool Gates	MP-FH-16-1 "Removal of Spent Fuel Pool Gates" MP-FH-16-2 "Installation of Spent Fuel Pool Gates"
5.	New Fuel	SP-NFR-2 "Fuel Receipt Procedures"
6.	Spent Fuel Shipping Cask	No procedure now. Will be developed when needed.

TABLE 3-2

Crane/Hoist	Location	Load	Weight	Load Path
Polar Crane 130T Main Hook 10T Aux. Hook	Containment elev. 1095'-1/2"	Missile Shields	10T each	See Figure 1A Diagrams A-1, A-2 A-3, in 8-9-78 letter
		Reactor Vessel Closure Head	120T (including studs)	
		Upper Guide Structure	40T (including lifting rig)	Also refer to OI-HE-1
Auxiliary Bldg. Crane 75T Main Hook 10T Aux. Hook	Auxiliary Bldg. Crane elev. 1065'-0"	Spent Fuel Pool Gates	1T.	OI-HE-5
		New Fuel Receipt	1.5T.	SP-NFR-2
		Spent Fuel Shipping Cask	30T	No procedure now. Will be developed when needed.

TABLE 3-3
OVERHEAD AND GANTRY CRANES
COMPARISON OF STRUCTURAL DESIGN CRITERIA
FORT CALHOUN STATION UNIT 1

Structural Requirements Specification	Design Forces		Structural Steel Material	Allowable Stresses (ksi) (1)				Hoisting Rope Related Cap	(2) Non-Structural Load Bearing Capacity
	Impact=I	Lateral		Tension	Compression	Shear	Bearing		
CMAA Spec. #70 Copyright 1975 Class A1 (Standby Service)	1. 1/2% Load x (Hoist Speed in ft/min 2. 15% ≤I ≤50% of rated capacity	2-1/2% of (live Load + Bridge)	ASTM-A36	17.6	17.6 for b/c ≤ 38	13.2	26.4	20% Breaking Strength	20% Fultimate
Fort Calhoun Polar Crane EOCI Spec. #61	I=15% of the rated capacity	5% of (Live Load + Bridge)	(3) ASTM-A36	16.0	16.0 for b/c ≤ 41	12.0	21.6	20% Breaking Strength	20% Fultimate

NOTES:

1. b= distance between web plates (inches).
   c= thickness of top cover plate (inches).

2. Fult = published average utlimate stress of material.

3. We specified ASTM-A36 steel, instead of ASTM-A7 as published in EOCI #61

TABLE 3-4

COMPARISON OF EOCI AND CMAA DESIGN STRESS CRITERIA

	EOCI #61	CMAA #70
Design stress of load carrying parts except structural members, gearing and hoisting ropes	Shall not exceed 20% of the assumed average ultimate strength of the material	Shall not exceed 20% of the published average ultimate strength of the material
Hoisting rope selection	The rated capacity load divided by the number of parts of rope shall not exceed 20% of the published breaking strength of the rope	The rated load capacity plus the bottom block divided by the number of parts of rope shall not exceed 20% of the published breaking strength of the rope
Structural Materials Selection	ASTM-A7 or Suitable alternate	ASTM-A36 or Suitable alternate
Basic allowable stresses for Bridge Girder	Tension=16,000 psi Compression=16,000 psi Shear=12,000 psi	Tension=17,600 psi Compression=17,600 psi Shear=13,200 psi
Basic allowable stresses for End trucks	Shall not exceed 20% of the assumed average ultimate strength of the material	Tension=14,400 psi Compression=14,400 psi Shear=10,800 psi
Basic allowable stresses for Trolley Frames	Shall not exceed 20% of the assumed average ultimate strength of the material	Tension=14,400 psi Compression=14,400 psi Shear=10,800 psi
Gear strength	Shall be such that the stress in the material does not exceed 20% of the assumed average ultimate strength of the material	Shall be per the American Gear Mfrs. Assoc. (AGMA) Standard

TABLE 3-5

COMPARISON OF USAS B30.2.0 and ANSI B30.2.0

	USAS B30.2.0 - 1967	ANSI B30.2.0 - 1976
Clearances from Obstructions	Specified as 3" overhead 2" laterally	Does not specify specific clearance dimensions
Welding	Per AWS D 2.0-66	Per AWS D14.1
Girders	Required to be of adequate design	To be designed to either CMAA, AISC or AISE
Cab clearances	Specified as 3" from all fixed structures	Does not specify a specific clearance dimensions
Toeboards & Handrails	Per USAS A 12-1932	Per latest issue of ANSI A 12.1
Ladders	Per USAS A 14.3-1956	Per latest addition of ANSI 14.3, which requires cages on ladders greater than 20 ft.
Egress from Operator's Cab	No mention of egress	Recommends a means of egress for emergencies.
Bridge & Trolley Bumper	Recommends the use of Bumper	Recommends the use of Bumper, or other automatic means providing equivalent effect
Bridge & Trolley Brakes	Specifies a size requirements for deceleration	Specifies a deceleration requirement for the brakes in addition to size requirements
Electrical Equipment	Per Article 610 of USAS CI-1965	Per latest issue of NFPA 70, Article 610, which requires a 30" walkway width in front of electrical enclosures

TABLE 3-5 (Cont'd)

	USAS B30.20.0 - 1967	ANSI B30.3.0 - 1976
Hoisting Ropes	Requires selection considering the rated load only	Requires selection considering the rated load plus the load block
Hooks	Does not address safety latches	Requires safety latches unle the application makes the use of the latch impractical
Rated Load Test	Does not specify the extent of traversing for the bridge and trolley	Requires traversing the bridg the full length of the runway and the trolley the full leng of the bridge

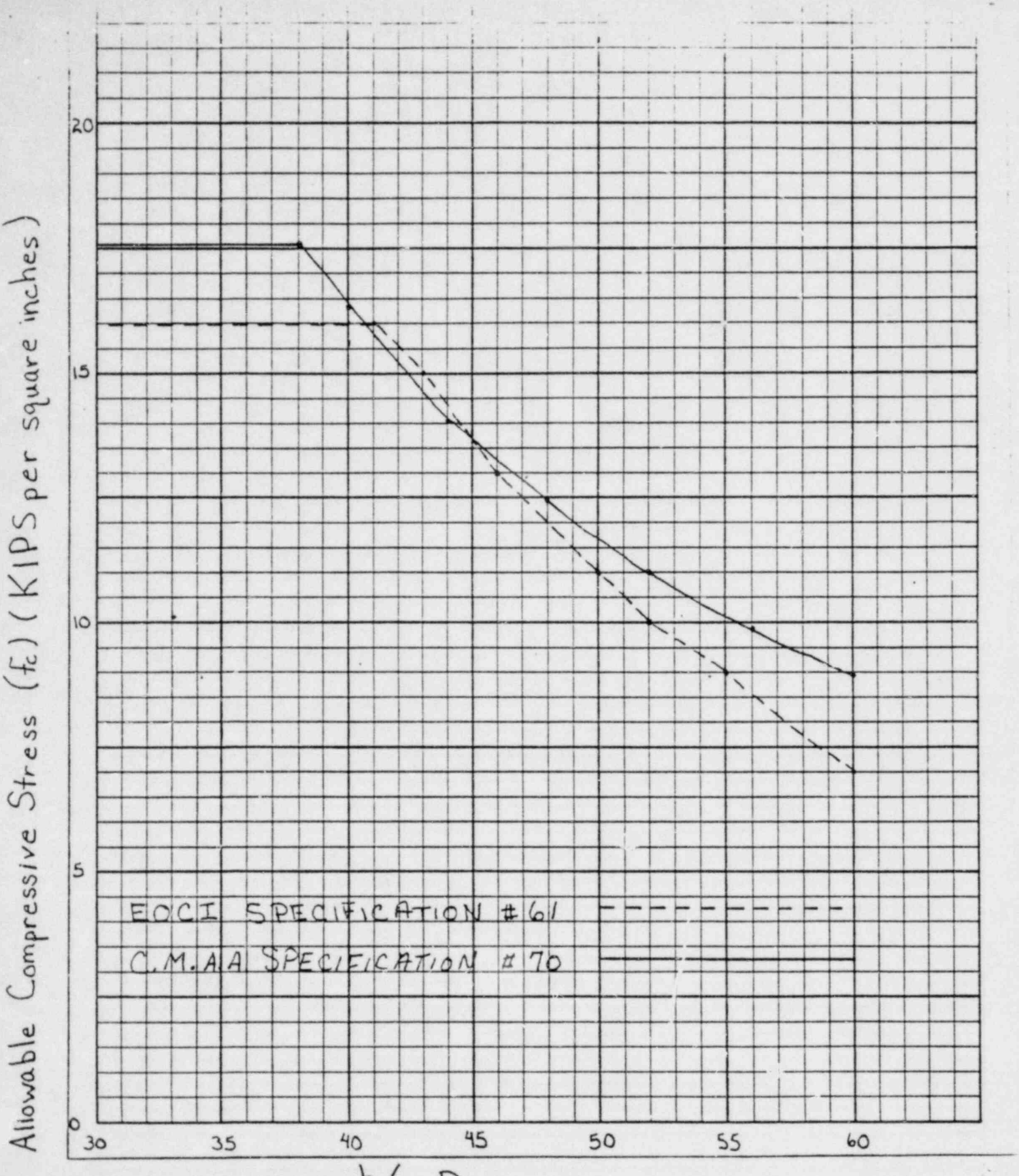


FIGURE 3-1

Modifications Required to
Meet the Guidelines of NUREG 0612

A review of Section 5.1.1 of NUREG 0612 has shown that Fort Calhoun Station is substantially in compliance. Only four (4) points of deviation are discernable and these are itemized below.

1) In item 1) of paragraph 5.1.1 of NUREG 0612, Safe Load Paths, a requirement is made for clearly marking load paths on the floor in the area where the load is to be handled.

2) Also, deviation from defined load paths should require alternative procedures approved by the plant safety review committee.

DISCUSSION:

Loads are moved by the safest and shortest paths. Load paths had been previously submitted in T.E. Short's letter to Robert W. Reid, 8-9-78. The drawings showing paths are 1A, Diagram A-1, A-2, A-3.

The District is of the opinion that it is not apparent that marking load paths on the floor is feasible or would contribute to reactor safety.

As to alternative procedures for deviation from defined load paths, we feel that the restrictions placed on the Polar Crane operation provide for a safe load path by exclusion as discussed in response to 2.1-3b. Thus no alternative procedures will be required. We feel that this is sufficient justification for not making any required changes.

3) In item 3) of paragraph 5.1.1 of NUREG 0612, Crane Operators, a requirement is made for training and qualifying crane operators in accordance with Chapters 2-3 of ANSI B30.2-1976.

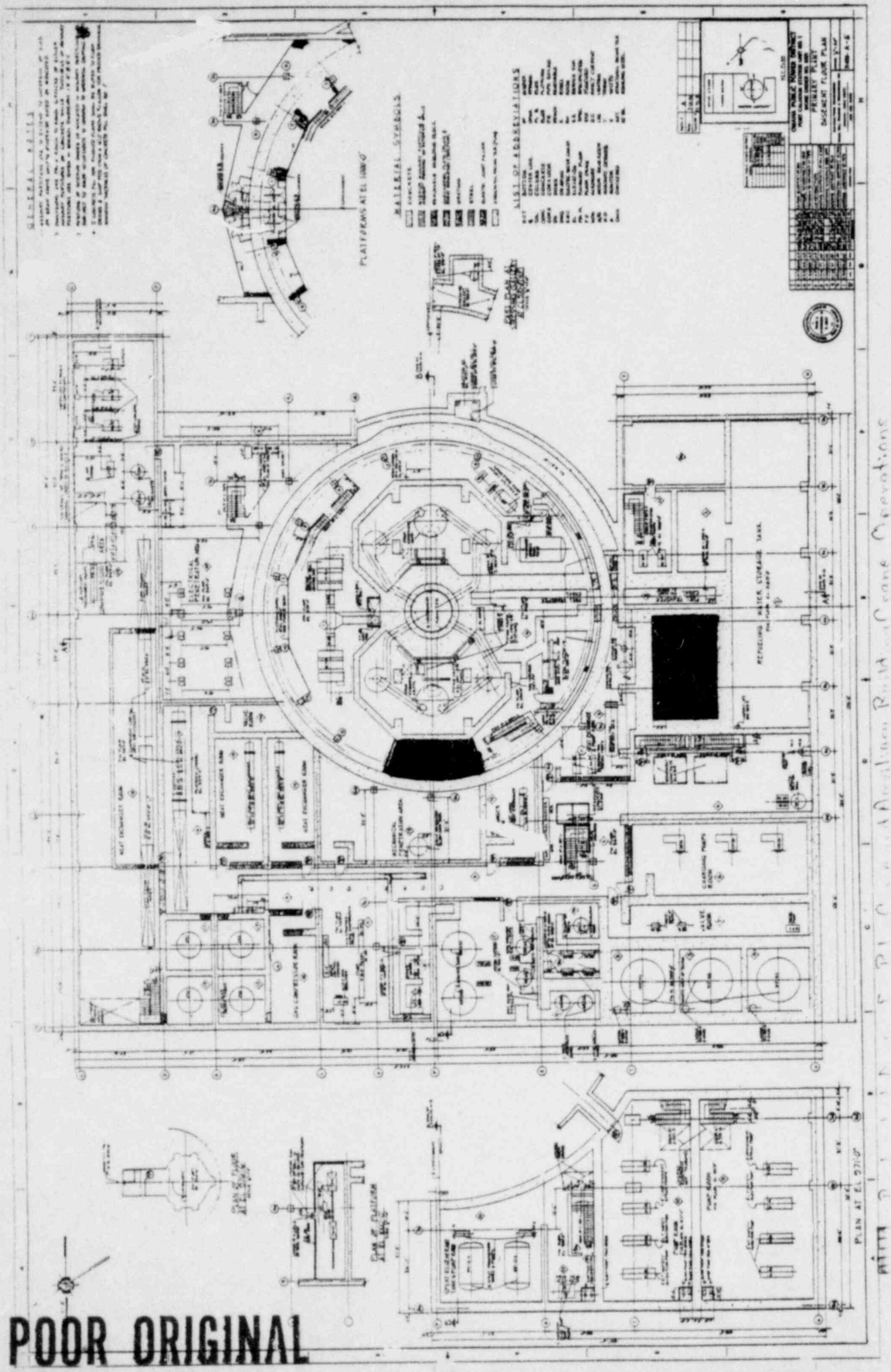
DISCUSSION:

A review of Fort Calhoun's crane operator training program has shown that it does comply with Chapters 2-3 of ANSI B30.2.-1976. However to insure that the intent of the specific questions is met, a reference to Chapters 2-3 of ANSI B.30.2-76 will be included in our current program, and a review of that document will also be provided.

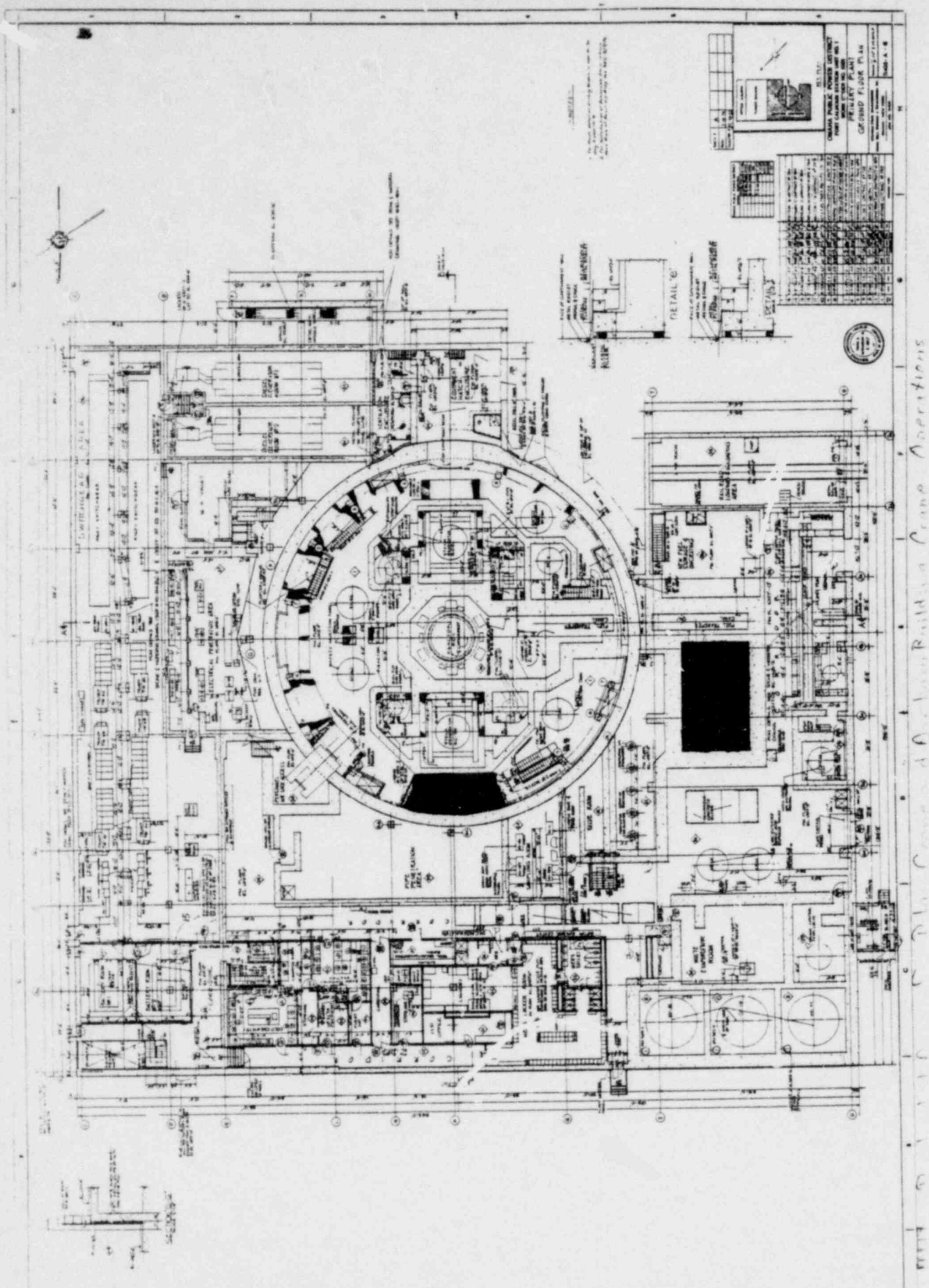
4) In Item 5) of paragraph 5.1.1 of NUREG 0612, Special Lifting Devices, a requirement is made for satisfying the guidelines of ANSI N14.6-1978.

Discussion:

We cannot at this point in time show compliance or noncompliance due to lack of information on the design of our lifting rigs. However if it is shown that our design deviates greatly from the requirements of ANSI N14.6-1978 we will be prepared to make the necessary changes to comply with this standard. We will inform the Commission at a later date as to the modifications if any to be performed to show compliance to item 3 NUREG 5.1.1.



POOR ORIGINAL



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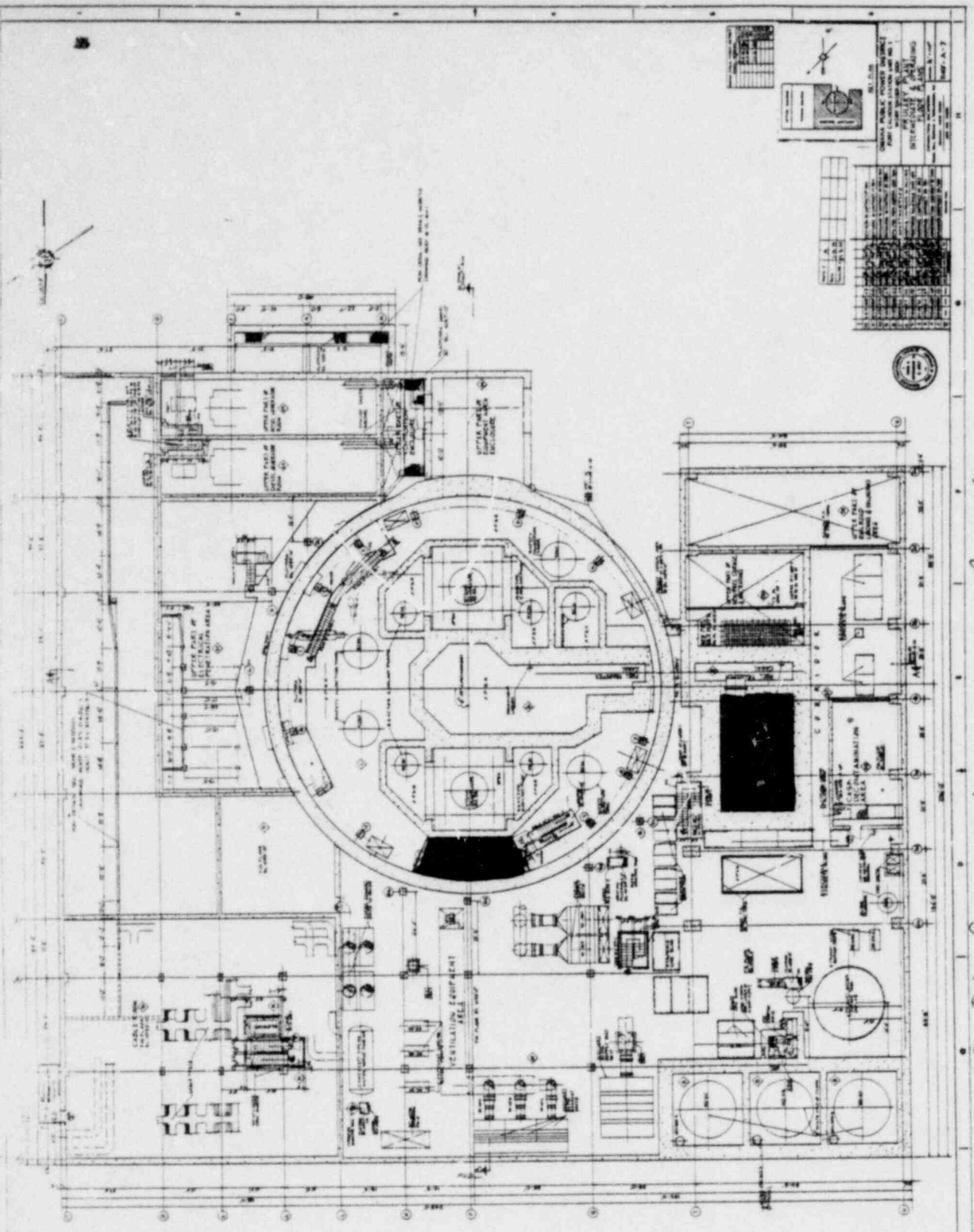
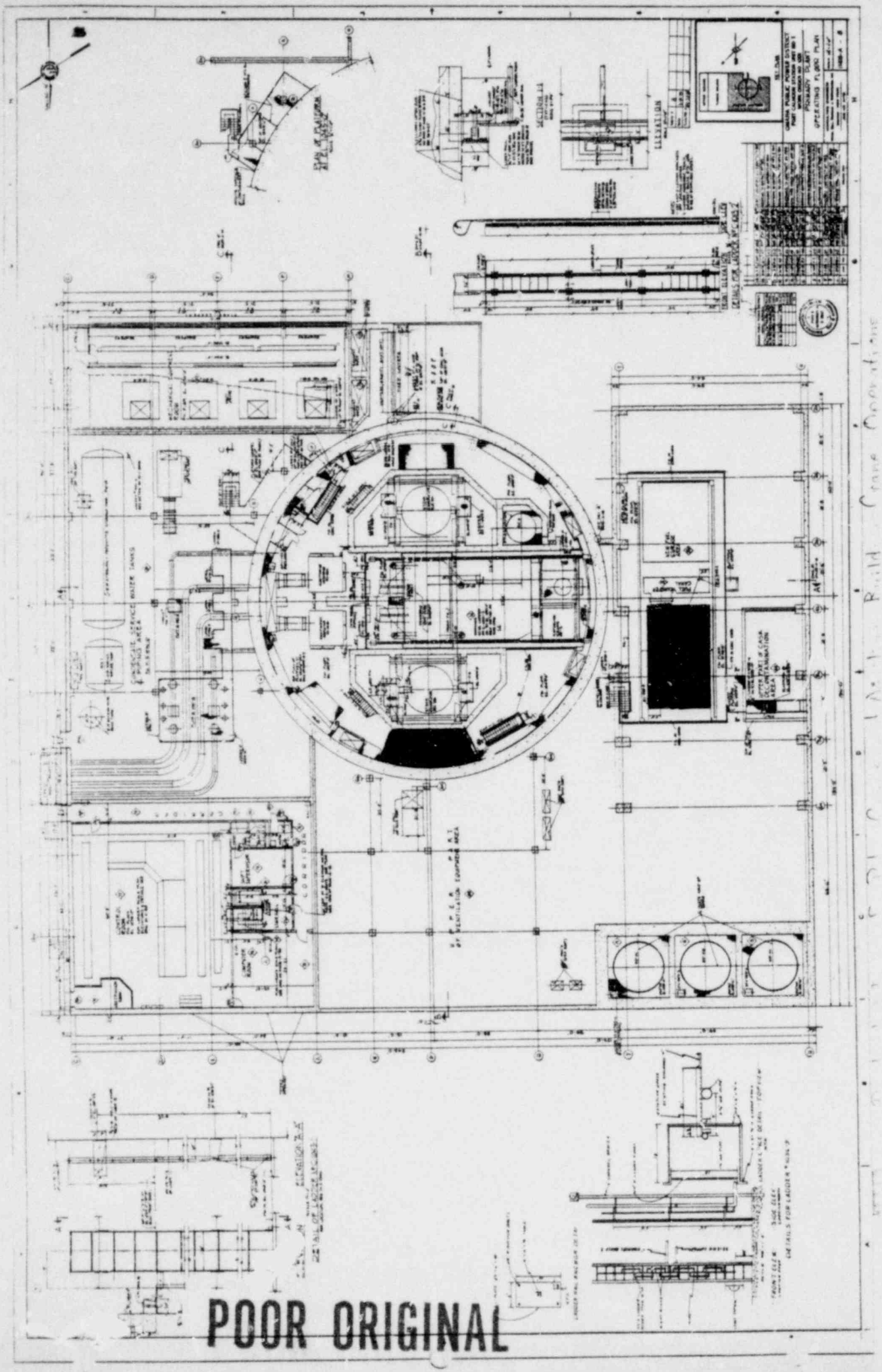


Figure 9.1-1 Polar Crane and Auxiliary Building Crane Operations



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