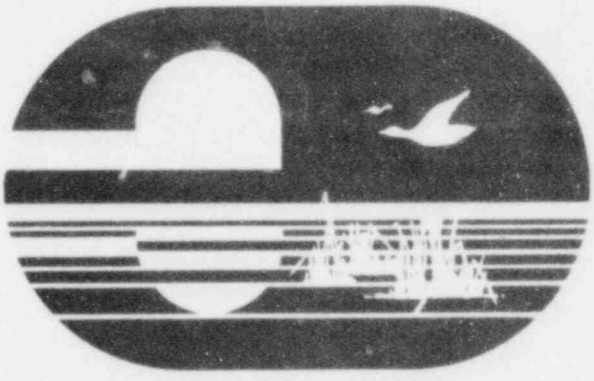
DOCKET NOS.: 50-443
50-444

SEABROOK STATION

RESPONSE TO NRC
GENERIC REQUEST FOR
ADDITIONAL INFORMATION
RELATING TO

NUREG - 0612

"CONTROL OF HEAVY LOADS"



SEABROOK STATION

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

SEABROOK, NEW HAMPSHIRE

SEPTEMBER 1982

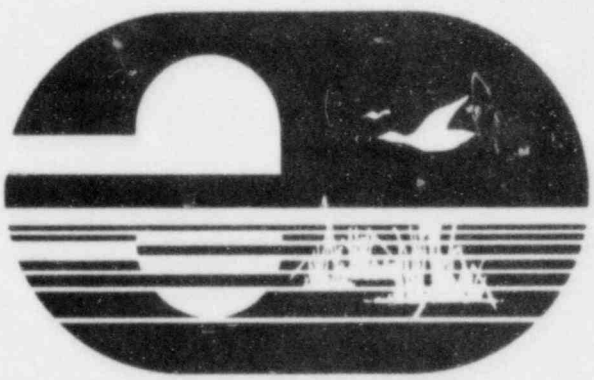
DOCKET NOS.: 50-443
50-444

SEABROOK STATION

RESPONSE TO NRC
GENERIC REQUEST FOR
ADDITIONAL INFORMATION
RELATING TO

NUREG - 0612

"CONTROL OF HEAVY LOADS"



SEABROOK STATION

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

SEABROOK, NEW HAMPSHIRE

SEPTEMBER 1982

TABLE OF CONTENTS

TAB

1. INTRODUCTION

2. NRC LETTER OF REQUEST

3. SUMMARY

4. RESPONSE TO SECTION 2.1 (ENCLOSURE 3)

   General Requirements for Overhead Handling Systems

5. RESPONSE TO SECTION 2.2 (ENCLOSURE 3)

   Specific Requirements for Overhead Handling Systems Operating in the Vicinity of Fuel Storage Pools

6. RESPONSE TO SECTION 2.3 (ENCLOSURE 3)

   Specific Requirements for Overhead Handling Systems Operating in the Containment

7. RESPONSE TO SECTION 2.4 (ENCLOSURE 3)

   Specific Requirements for Overhead Handling Systems Operating in Plant Areas Containing Equipment Required for Reactor Shutdown, Core Decay Heat Removal, or Spent Fuel Pool Cooling.

8. TABLES

   Table 4-1 Tabulation of Heavy Loads

   Table 7-1 Load/Impact Area Matrices, Sheets 1 through 10.

TABLE OF CONTENTS

TAB		
9	APPENDICES	
	Appendix I	Analysis of RV Head Lifting Rig and Internals Lifting Rig (Special Lifting Devices)
	Appendix II	Method of Analysis of Plant Structures
	Appendix III	Analysis of Filter Cask Lifting Device
10	ATTACHMENTS	
	Attachment A	Conduit and Cable Tray Review
	Attachment B	Piping Review
	Attachment C	Safety-Related Equipment Review
	Attachment D	HVAC Review
11	LOAD PATH DRAWINGS	
	9763-F-805272	
	9763-F-805273	
	9763-F-805274	
	9763-F-805275	
	9763-F-805276	
	9763-F-805277	
	9763-F-805278	
	9763-F-805279	
	9763-F-805280	
	9763-F-805281	

1. INTRODUCTION

This report is in response to the NRC request for a review of the control of heavy loads at nuclear power plants, as contained in their letter dated December 22, 1980, and included herein in Section 2 for ease of reference. The report documents the results of a comprehensive review of the load handling operations at Seabrook Station and specifically addresses Enclosure 3 to the above letter, "Request for Additional Information on Control of Heavy Loads."

The information is presented in a request/response format which follows the same general format of Enclosure 3.

The above NRC letter requested that the report be submitted in two parts:

Part I - Response to Section 2.1 of Enclosure 3.

Part II - Response to Sections 2.2, 2.3 and 2.4 of Enclosure 3.

Since the Seabrook Station is not yet operational, all the information requested is being provided in this one combined report without any reference to Part I or Part II.

For the purposes of this evaluation, a heavy load is defined in accordance with NUREG-0612, as a load whose weight is greater than the combined weight of a single spent fuel assembly and its handling tool, i.e., a load greater than 2000 pounds.

2. NRC LETTER OF REQUEST

The generic letter which follows was sent to all licensees of Operating Plants and Applicants for Operating Licenses and Holders of Construction Permits.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 13 1981

December 22, 1980

TO ALL LICENSEES OF OPERATING PLANTS AND
APPLICANTS FOR OPERATING LICENSES AND
HOLDERS OF CONSTRUCTION PERMITS*

Gentlemen:

Subject: Control of Heavy Loads

In January 1978, the NRC published NUREG-0410 entitled, "NRC Program for the Resolution of Generic Issues Related to Nuclear Power Plants - Report to Congress." As part of this program, the Task Action Plan for Unresolved Safety Issue Task No. A-36, "Control of Heavy Loads Near Spent Fuel," was issued.

We have completed our review of load handling operations at nuclear power plants. A report describing the results of this review has been issued as NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants - Resolution of TAP A-36." This report contains several recommendations to be implemented by all licensees and applicants to ensure the safe handling of heavy loads.

The purpose of this letter is to request that you review your controls for the handling of heavy loads to determine the extent to which the guidelines of Enclosure 1 are presently satisfied at your facility, and to identify the changes and modifications that would be required in order to fully satisfy these guidelines.

To expedite your compliance with this request, we have enclosed the following:

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" (Enclosure 1).

Staff Position - Interim Actions for Control of Heavy Loads (Enclosure 2).

Request for Additional Information on Control of Heavy Loads (Enclosure 3).

*With the exception of licensees for Indian Point 2 and 3, Zion 1 and 2 and Three Mile Island 1 (These were previously sent a letter)

You are requested to implement the interim actions described in Enclosure 2 as soon as possible but no later than 90 days from the date of this letter.

In order to enable the NRC to determine whether operating licenses should be modified (10 CFR 50.54(f)), operating reactor licensees are requested to provide the following:

1. Submit a report documenting the results of your review and the required changes and modifications. This report should include the information identified in Sections 2.1 through 2.4 of Enclosure 3, on how the guidelines of NUREG-0612 will be satisfied. This report should be submitted in two parts according to the following schedule:

   - Submit the Section 2.1 information within six months from the date of this letter.

   - Submit the Sections 2.2, 2.3 and 2.4 information within nine months.

2. Furnish confirmation within six months that implementation of those changes and modifications you find are necessary will commence as soon as possible without waiting on staff review, so that all such changes, beyond the above interim actions, will be completed within two years of submittal of Section 2.4 for the above report.

3. Furnish justification within six months for any changes or modifications that would be required to fully satisfy the guidelines of Enclosure 1 which you believe are not necessary.

The criteria in NUREG-0612 are also applicable to applicants for operating licenses. Such applicants are expected to provide the information requested by item 1 above and to meet the same schedule of implementation as indicated in 2 above. Any item for which the implementation date is prior to the expected date of issuance of an operating license will be considered to be a prerequisite to obtaining that license.

For any date that cannot be met, furnish a proposed revised date, justification for the delay, and any planned compensating safety actions during the interim.

This request for information was approved by GAO under a blanket clearance number R0072 which expires November 30, 1983. Comments on burden and duplication may be directed to the U.S. General Accounting Office, Regulatory Reports Review, Room 5106, 441 G Street, N.W., Washington, D.C. 20548.

Sincerely,

Darrell G. Eisenhut, Director
Division of Licensing

Enclosures:
1. NUREG-0612
2. Staff Position
3. Request for Additional Information

cc: w/o Enclosure (1)
Service List

3. SUMMARY

A systematic evaluation of all load handling systems has been performed to determine the extent to which the guidelines of NUREG-0612 are satisfied for Seabrook Station. Since the principal causes of load handling accidents reported in the past include operator errors, rigging failures, lack of adequate inspection and inadequate procedures, greater emphasis has been placed in these areas in assuring safe handling of the heavy loads. The crane operator training program and periodic inspection and maintenance program for the cranes, monorail systems and lifting equipment will meet all applicable requirements outlined in NUREG-0612 and other standards such as ANSI B30.2, ANSI B30.9, ANSI B30.10, ANSI N14.6, ANSI B30.11, ANSI B30.16, 29 CFR Part 1910, and Occupational Safety and Health Administration standards. The load handling operations will be governed by approved procedures and safe load path drawings, as applicable.

A review of the plant general arrangement drawings indicates that, in general, either the cranes do not travel over spent fuel or safety related equipment, or the reliability of the load handling system is enhanced by providing increased safety factors and increased inspection of the critical components. In some instances, redundancy and physical separation of the safety related equipment continues to maintain the safe shutdown and decay heat removal capabilities following a load drop.

Analysis of the reactor vessel head lifting rig and the internals lifting rig to verify compliance with the applicable standards (ANSI N14.6-1978 and NUREG-0612) is being performed by Westinghouse.

The lifting devices for the spent fuel cask and the filter transfer cask have not yet been designed or selected. An evaluation of these special lifting devices will be provided at a later date, prior to any cask handling operations at the plant site.

Some floor slabs/plant structures, as identified in this report, are being analyzed for their load carrying capabilities to ensure that they can withstand the postulated load drops without causing any damage to the safety related equipment. Pending the results of these analyses, it is considered that the intent of NUREG-0612 has been met in regard to assuring safe handling of the heavy loads at Seabrook Station. (Once these analyses have been completed, overall conclusion of this evaluation will be reviewed again.)

Some exceptions have been taken to the requirements of NUREG 0612 and Enclosure 3 to the NRC letter; however, these exceptions do not reduce the reliability of the load handling operations. Alternatives in lieu of literal compliance with these requirements are discussed to demonstrate their equivalence and/or adequacy.

4. RESPONSE TO SECTION 2.1 (ENCLOSURE 3)

GENERAL REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS

"NUREG 0612, Section 5.1.1, identifies several general guidelines related to the design and operation of overhead load-handling systems in the areas where the spent fuel is stored, in the vicinity of the reactor core, and in other areas of the plant where a load drop could result in damage to equipment required for safe shutdown or decay heat removal. Information provided in response to this section should identify the extent of potentially hazardous load-handling operations at a site and the extent of conformance to appropriate load-handling guidance."

REQUEST 2.1-1

"Report the results of your review of plant arrangements to identify 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 TO 2.1-1

The overhead load handling systems identified during our plant review are listed below along with their capacities and locations:

TAG NO.	HANDLING SYSTEM	CAPACITY	LOCATION
MM-CR-3	Polar Gantry Crane	420 Ton Main 50 Ton Auxiliary	Containment
FH-RE-24*	Radial Arm Stud Tensioner Hoists (3)	2 Tons	Containment
CS-CR-5	Filter Cask Monorail Hoist	4.5 Tons	Primary Auxiliary Building
CS-CR-6	Boric Acid Batching Monorail Hoist	4.5 Tons	Primary Auxiliary Building
CS-CR-13	CVCS Heat Exchanger Service Monorail Hoist	3.5 Tons	Primary Auxiliary Building
CS-CR-14A,14B & 14C*	Charging Pump Service Monorail Hoist	2.5/2.5/6.0 Tons	Primary Auxiliary Building
CC-CR-15A & 15B	Component Cooling Water Pump Service Monorail Hoist	3 Tons	Primary Auxiliary Building
CBS-CR-18A & 18B*	Radioactive Pipe Tunnel Service Monorail Hoist	2 Tons	Radioactive Pipe Tunnel
MS-CR-25A & 25B*	Main Steam and Feedwater Pipe Chase Crane	7.5 Tons	MS and FW Pipe Chase

RESPONSE 2.1-1 (Cont'd)

TAG No.	Handling System	CAPACITY	LOCATION
FW-CR-27	Emergency Feed Pump Monorail Hoist	4 Tons	Emergency Feed-water Pump Building
DG-CR-28A & 28B*	Diesel Generator Service Crane	8 Tons	Diesel Generator Building

* These monorails and cranes are listed here for completeness only, and are not considered in detail in this Section. The bases for their exclusion from detailed evaluation are discussed in Section 7 of this report under Response to Section 2.4 of Enclosure 3.

REQUEST 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 TO 2.1-2

The following load handling systems have been excluded from the above category because no safety related systems or components required for plant shutdown or decay heat removal are located in the areas served by these overhead handling systems:

TAG NO.	HANDLING SYSTEM	CAPACITY	LOCATION
MM-CR-1	Turbine Building Crane	210 Ton Main 30 Ton Auxiliary	Turbine Building
MM-CR-2	Heater Bay Crane	100 Ton Main 15 Ton Auxiliary	Turbine Building
ES-CR-26	Generator Breaker Crane	5.5 Tons	Turbine Building
CO-CR-29A To 29X	Condenser Water Box Monorail Hoist	4 Tons	Turbine Building
CW-CR-22	Circulating Water Stop Log Monorail Hoist	10 Tons	Service and CW Pump House
CW-CR-23	Pump House Trash Removal Basket Monorail Hoist	1 Ton	Service and CW Pump House
PAH-CR-17	Ventilation Service Monorail Hoist	1 Ton	Primary Auxiliary Building
WS-CR-7	Waste Process General Service 80 Monorail Hoist	4 Tons	Waste Processing Building
WS-CR-8	Waste Process General Service 40 Monorail Hoist	4 Tons	Waste Processing Building
RS-CR-12	Resin Sluice Service Monorail Hoist	2 Tons	Waste Processing Building

RESPONSE TO 2.1-2 (Cont'd)

TAG NO.	HANDLING SYSTEM	CAPACITY	LOCATION
WS-CR-4	Solid Waste Handling Crane	30 Tons	Waste Processing Building
FH-RE-1	Spent Fuel Cask Handling Crane	125 Ton Main 2 Aux. Hooks 5 Ton each	Fuel Storage Building
AAH-CR-20	Decontamination Service Monorail Hoist	5 Tons	Administration and Service Building
MH-CR-30	RCA Shop Crane	5 Tons	Administration & Service Building

In addition, the following systems are excluded from further consideration since they do not handle heavy loads. A "heavy load" is defined in accordance with Section 1.1 of NUREG-0612, i.e., a load whose weight is greater than the combined weight of a single spent fuel assembly and its handling tool. (A load greater than 2000 pounds.)

TAG NO.	HANDLING SYSTEM	CAPACITY	LOCATION
FH-CR-33	Jib Crane	0.75 Tons	Containment
FH-RE-5	Manipulator Crane Auxiliary Hoist	1.5 Tons	Containment
FH-RE-2	Spent Fuel Pool Bridge and Hoist	2 Tons	Fuel Storage Building
RH-CR-32	RHR, CS, SI Equipment Vault Monorail Hoist	0.75 Tons	Equipment Vault (P.A.B.)
SW-CR-16	Service Water Strainer Monorail Hoist	1 Ton	Outside Primary Auxiliary Building

REQUEST 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:

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

RESPONSE TO 2.1-3 (a)

The following drawings depict the safe travel paths for heavy loads which, if dropped, could impact the irradiated fuel or components in the systems required for shutdown or decay heat removal. Also shown on these layout drawings are the locations of the safety related equipment and spent fuel, where applicable. To the maximum extent practicable, handling of heavy loads over safety related equipment is avoided in identifying the safe load paths. Also, in defining these load paths consideration has been given to the safety related equipment located on lower elevations below the operating floor for the load handling system in question. Where safety related equipment is likely to be damaged by a load drop, adequacy of the intervening floor to sustain the load impact is being verified.

Drawing No.	Title
9763-F-805272	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 1 of 6)

RESPONSE TO 2.1-3 (a) (Cont'd)

Drawing No.	Title
9763-F-805273	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 2 of 6)
9763-F-805274	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 3 of 6)
9763-F-805275	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 4 of 6)
9763-F-805276	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 5 of 6)
9763-F-805277	Containment Building Elev. 25'-0" Safe Load Paths for Polar Crane (Sheet 6 of 6)
9763-F-805279	Fuel Storage Building Elev. 25'-0" Safe Load Paths for Cask Handling Crane
9763-F-805280	Primary Auxiliary Building Elev. 25'-0" Safe Load Paths for Monorails
9763-F-805281	Primary Auxiliary Building Elev. 53'-0" Safe Load Paths for Monorails
9763-F-805278	Emergency Feedwater Pump Bldg. Elev. 27'-0" Safe Load Paths for Monorails

One of the requirements of Section 5.1.1 - (1) of NUREG 0612 is that--"These load paths should be clearly marked on the floor in the area where the load is to be handled." PSNH, however, takes exception to this requirement due to the following considerations:

The safe load paths have been delineated on the drawings listed above. During the crane operator training program, emphasis will be placed on the need to adhere to these safe load paths. Again, these load paths will be thoroughly reviewed with the crane operators and other maintenance personnel prior to the commencement of any load handling operations. Heavy loads will be moved by the safest and shortest routes in accordance with the approved load handling procedures and the safe load path drawings. Due to the number of paths and their configurations (particularly in the Containment), it is felt that marked load paths, in general, will not contribute to ensuring the safe handling of the heavy loads at Seabrook. Therefore, load paths will not be marked on the floor.

REQUEST 2.1-3 (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."

RESPONSE TO 2.1-3 (b)

All heavy loads identified in response to Section 2.1-3 (c) (to follow) will be handled along the well defined safe load paths or within safe operating areas. The drawings showing safe load paths will be referenced on the applicable load handling procedures which form part of the overall plant operation and maintenance procedures. Prior to starting any maintenance or refueling operations, the work crews will be instructed by the maintenance supervisor regarding the procedure, and the travel paths to be followed by the heavy loads.

The load paths identified on the layout drawings follow the safest and shortest routes with consideration given to maintaining safe distances from spent fuel and safe shutdown equipment. In general, a load will be moved as close to the floor as practical except to clear any equipment or other physical obstructions in the travel path. In addition, appropriate notes of the precautionary nature are also included, as required, on the load path drawings. Any deviations from these safe load paths or written procedures governing the load handling operations will require the approval of the Plant Operating Review Committee.

To summarize, loads will be handled along established safe load paths in accordance with the approved procedures by trained and experienced personnel under the supervision of competent maintenance supervisors.

REQUEST 2.1-3 (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)."

RESPONSE TO 2.1-3 (c)

Heavy loads that will be handled by the cranes and monorail-hoists identified in response to section 2.1-1, above, are listed in Table 4-1. For each load handling system tabulated, the loads to be carried are included along with the estimated weight of the load, its designated lifting device, applicable load path drawing and the reference drawing/s.

Also included for each load is the reference to the load handling procedure, i.e., whether a 'general' or 'specific' procedure will be prepared for a particular load. The procedures will be developed in accordance with Section 5.1.1 (2) of NUREG-0612 and will be available prior to use of the load handling system. Finalized and approved procedures will be assigned identification numbers and the same will be incorporated in Table 4-1.

Each 'specific'procedure (See Table 4-1) will contain detailed step-by-step instructions for handling a particular load including responsibility, identification of required equipment, safe rigging practices, safety precautions and reference to safe load paths. Where a 'specific' procedure is not intended, a 'general' procedure (See Table 4-1) encompassing the above information will be developed to cover the handling of miscellaneous loads.

REQUEST 2.1-3 (d)

"Verification that lifting devices identified in 2.1.3-C, above, comply with the requirements of ANSI N14.6-1978 or ANSI B 30.9-1971 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 TO 2.1-3 (d)

The various lifting devices employed in handling the heavy loads at Seabrook are identified in Table 4-1. Of these devices, the following are categorized as special lifting devices:

(i) Reactor Vessel Head Lifting Rig, Load Cell and Load Cell Linkage Assembly.

(ii) Internals Lifting Rig, Load Cell and Load Cell Linkage Assembly.

(iii) Spent Fuel Cask Lifting Device

(iV) Reactor Coolant Pump Motor Lifting Slings

(V) Filter Cask Lifting Device

The head and internals lifting rigs and associated load cell and linkage assemblies are being evaluated by Westinghouse to verify compliance with the requirements of ANSI N14.6 and NUREG 0612, Section 5.1.1 (4). The results of this assessment will be included later in Appendix I.

The design of the spent fuel cask and lifting device has not yet been finalized. A detailed review of the lifting device will be performed to verify

RESPONSE TO 2.1-3 (d) (Cont'd)

compliance with ANSI N14.6-1978, once the cask design has been selected, and the results of the analysis will be provided to the NRC prior to any cask handling operations at the plant site.

The reactor coolant pump motor lifting slings will comply with the requirements of ANSI N14.6-1978 and NUREG-0612 Sections 5.1.1 and 5.1.6. The design of the filter cask lifting device has not been finalized. An evaluation of this special lifting device with regard to compliance with the above applicable standards will be appended to this report at a later date, and made available to the NRC prior to handling of the filter cask.

All special lifting devices will be subjected to periodic testing and inspection to verify continued compliance in accordance with the provisions of Section 5 of ANSI N14.6-1978 with the following clarifications/exceptions:

(a) The required tests or inspections will be performed prior to use of the lifting device if it is not used for a period exceeding one year.

(b) Where the usage frequency is more than once a year, the tests and inspections will be performed annually.

(c) Instead of the load test, dimensional testing, visual inspection and non-destructive examination will be performed as per Section 5.3.1 (2).

(d) All special lifting devices will be visually inspected by maintenance personnel prior to each use instead of every three months (5.3.7) for indications of damage or deformation.

RESPONSE TO 2.1-3 (d) (Cont'd)

The standard lifting devices (which are not specially designed) listed in Table 4-1, such as slings, shackles, etc. will meet the requirements of ANSI B30.9-1971 as supplemented by Section 5.1.1 (5), NUREG 0612. The standard lifting devices used to carry heavy loads will maintain a minimum safety factor of five based upon nominal breaking strength. Where the loads are handled over or near spent fuel and/or safety related equipment, a safety factor of 10 will be maintained as indicated on the load path drawings. In selecting the proper sling size, the rated load used will be the sum of the static and dynamic loads, the dynamic load being the greater of 15% of the static load or 0.5% of static load for each foot per minute of hook speed. PSNH takes no exceptions to the requirements of B30.9-1971 or Section 5.1.1(5).

REQUEST 2.1-3 (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."

RESPONSE TO 2.1-3 (e)

A crane inspection, testing and maintenance program will be developed and implemented in accordance with the requirements of Chapter 2-2 of ANSI B30.2-1976, as well as other applicable standards such as Occupational Safety and Health Administration Standards, Section 179 of 29 CFR Part 1910, ANSI B30.9 (Slings) and ANSI B30.10 (Hooks). Frequency of tests and inspections will be as per Section 5.1.1 (6) of NUREG 0612.

REQUEST 2.1-3 (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."

RESPONSE TO 2.1-3 (f)

Overhead and Gantry Cranes (Top Running Bridge)

The polar gantry crane and the spent fuel cask handling crane have been designed in accordance with the guidelines of CMAA Specification No. 70 and ANSI B30.2-1967 Overhead and Gantry Cranes. At the time of design and fabrication of both these cranes, ANSI standard B30.2-1976 was not in existence. A comparison of design revisions of Chapter 2-1 from 1967 to 1976 edition and the review of United Engineers and Constructors crane specifications 9763.006-257-2 and 9763.006-257-3 indicates that the design of the cranes complies with the requirements of ANSI B30.2-1976.

Monorail Systems and Underhung Cranes

The miscellaneous monorail-hoists and the two underhung cranes — diesel generator service crane and main steam and feedwater pipe chase crane — identified above in Table 4.1, are designed to the following applicable ANSI standards:

ANSI B30.11 ——— Monorail Systems and Underhung Cranes

ANSI B30.16 ——— Overhead Hoists (Underhung)

RESPONSE TO 2.1-3 (f) (Cont'd)

In addition, the design complies with the applicable specifications of Monorail Manufacturers Association (MMA) and Hoist Manufacturers Institute (HMI). Since the applicable volumes of the overall general standard B30 for monorails and underhung cranes are B30.11 and B30.16, it is considered that the intent of the Request 2.1-3 (f) in regard to the design of these load handling systems has been met.

REQUEST 2.1 (3) - (g)

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

RESPONSE TO 2.1-3 (g)

No exceptions are taken to the requirements of ANSI B30.2-1976 in regard to qualification, training or conduct of crane operators. The crane operators and signalmen will be trained in accordance with the requirements of Chapter 2-3 of B30.2-1976. A crane operator training and qualification program will be developed and implemented prior to fuel loading and start-up of the plant. This program will play an important role in assuring safe handling of the heavy loads at Seabrook.

The crane operators will be required to receive class-room instruction, and gain practical operating experience under the direction of other qualified operators, for each crane on which they are to become qualified. In addition to a physical examination as per Section 2-3.1.2 (b) of B30.2-1976, each operator trainee will be required to pass a written examination at the end of the formal instruction program. The practical training will continue until the trainee can demonstrate competent operation of the crane and pass the practical test. Proper training records documenting this operator training will be kept at the plant site.

5. Response to Section 2.2 (Enclosure 3)

Specific Requirements for Overhead Handling Systems Operating in the Vicinity of Fuel Storage Pools

"NUREG 0612, Section 5.1.2, provides guidelines concerning the design and operation of load-handling systems in the vicinity of stored, spent fuel. Information provided in response to this section should demonstrate that adequate measures have been taken to insure that in this area, either the likelihood of a load drop which might damage spent fuel is extremely small, or that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG 0612, Section 5.1, Criteria I thru III".

REQUEST 2.2.1

"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 TO 2.2-1

There are no such cranes.

Both the spent fuel pool bridge and hoist, and the cask handling crane in the Fuel Storage Building are excluded, and the justification is provided below in Response 2.2-2.

Request 2.2-2

"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 To 2.2-2

The following cranes are excluded from our response to 2.2-1, above:

EQUIPMENT NO.	CRANE	MANUFACTURER	CAPACITY
FH-RE-2	Spent Fuel Pool Bridge and Hoist	Dwight Foote Inc. (Hoist by P&H)	2 Tons
FH-RE-1	Spent Fuel Cask Handling Crane	Whiting Corp. (5 Ton Hoists by P&H)	125 Ton Main 2 @ 5 Ton Aux.

1. Spent Fuel Pool Bridge and Hoist

The spent fuel pool bridge and hoist does not handle heavy loads. The only loads carried by the hoist over the spent fuel pool are the fuel assemblies with or without control elements, and their associated handling tools. Therefore, this load handling system has not been included.

2. Spent Fuel Cask Handling Crane

The cask handling crane is excluded because of its location in the Fuel Storage Building relative to the spent fuel storage pool. The design of the layout of the cask loading pool, spent fuel storage area and cask storage and decontamination area eliminates the need to move the cask and other heavy loads over the spent fuel. Since both the cask handling crane rails are outside the boundaries of the spent fuel storage pool--both rails are on the north side--it is physically impossible for any of the three hooks to travel over the spent fuel storage pool.

The cask loading pool is separated from the spent fuel storage area by a six foot thick reinforced concrete wall with a stainless steel liner on each side. An isolation gate is provided in the wall, with the lowest point of the gate opening being above the top of the fuel in the storage racks. The steel gate is in the closed position whenever the spent fuel cask or other heavy loads are handled over the cask loading pool. Figure 5-1 shows approximate locations of the above areas and limits of travel of the main and auxiliary hooks.

In the extreme position of the trolley, the centerline of the 125 ton main hook is 10 feet away from the spent fuel storage pool boundary. The cask design has not yet been finalized; however, use of the preliminary dimensions in the load drop analysis indicates that in the unlikely event of a cask drop in the loading pool, integrity of the storage pool will not be breached nor would any damage occur to the stored spent fuel. A loss of spent fuel storage pool water will be prevented by the isolation gate in the wall.

The centerline of the two 5 ton auxiliary hooks, in the extreme position of the hoists, cannot move closer than 8'-8" to the storage pool boundary.

The auxiliary hook number 1 is normally used to handle single fuel elements. The new fuel containers, each weighing about 6,700 pounds, are normally handled by auxiliary hook number 2. The area in the Fuel Storage Building allocated to storage and handling of the new fuel containers eliminates the need to carry the containers near the spent fuel storage area or the cask loading pool. In the unlikely event of inadvertent carrying of the new fuel containers near the spent fuel storage area and coincident failure of the load handling system, the container will fall in the cask loading pool only since the center of gravity of the load falls approximately 2'-8" from the outer edge (or 8'-8" from the inner edge) of the spent fuel storage pool wall.

PSNH takes exception, on the basis of plant specific design, to the 15 feet requirement for minimum distance of the hook centerline from the spent fuel pool boundary. The ten (10) feet separation presently allowed in the Seabrook Station design is more than sufficient, due to the physical layout, to ensure that the cask, if dropped, does not fall into the spent fuel storage pool or compromise its integrity. The limits imposed on the hook travel will again be reviewed, when the cask dimensions are finalized; and, if necessary, feasibility of moving the fixed mechanical stops to increase this distance will be examined.

The cask handling crane is not a seismic Category 1 component; however, in compliance with Regulatory Guide 1.29 the crane design parameters are specified to provide adequate quality control of fabrication and design so that in the event of an Operating Basis Earthquake (OBE) or Safe Shutdown Earthquake (SSE), the crane will not fail in such a manner as to impair the functioning of any plant feature designated as seismic Category I. The crane is prevented from being dislodged off its rails during the SSE by mechanical anti-derailing devices.

In addition, the cask handling crane includes the following safety features which contribute to the reliability of the load handling operations:

a) Dual limit switches, each of different design, are provided in series to stop the main and auxiliary hooks in their highest safe positions and prevent a "two-blocking" incident. Limit switches are also provided to restrict the downward travel of the hooks.

b) Low or no voltage for any motion automatically stops the motion and sets brakes.

c) The drives for the bridge, trolleys and hoists are variable speed with an inching control on the main hoist. Controls for all motions are full magnetic, 5 step timed acceleration type. In addition, main hoist control includes magnet operated electric shoe type brakes to provide positive controlled speed regulation in both hoisting and lowering.

d) The hoist motor shaft is provided with two electrically released, spring actuated double shoe type DC load holding brakes each rated at 150 percent of motor full load torque.

e) The crane is designed for a minimum safety factor of 5 in accordance with CMAA Specification No. 70 and ANSI B30.2-1967. However, taking into consideration the actual weight of the heaviest anticipated load handled, the factor of safety provided is expected to be more than five.

Furthermore, the spent fuel shipping cask or other heavy loads cannot travel over any safety related equipment. The spent fuel pool cooling equipment is located in a separate area in the Fuel Storage Building beyond the operating area of the cask handling crane. Although no credit is taken in the above discussion for safe load paths, load handling procedures and other technical specifications; it is, however, pointed out that the administrative controls, proper operator training, load paths and procedures will help ensure the safe handling of the heavy loads, with loads being maintained as far away from the spent fuel pool boundary and as close to the floor as practical.

REQUEST 2.2-3

"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 TO 2.2-3

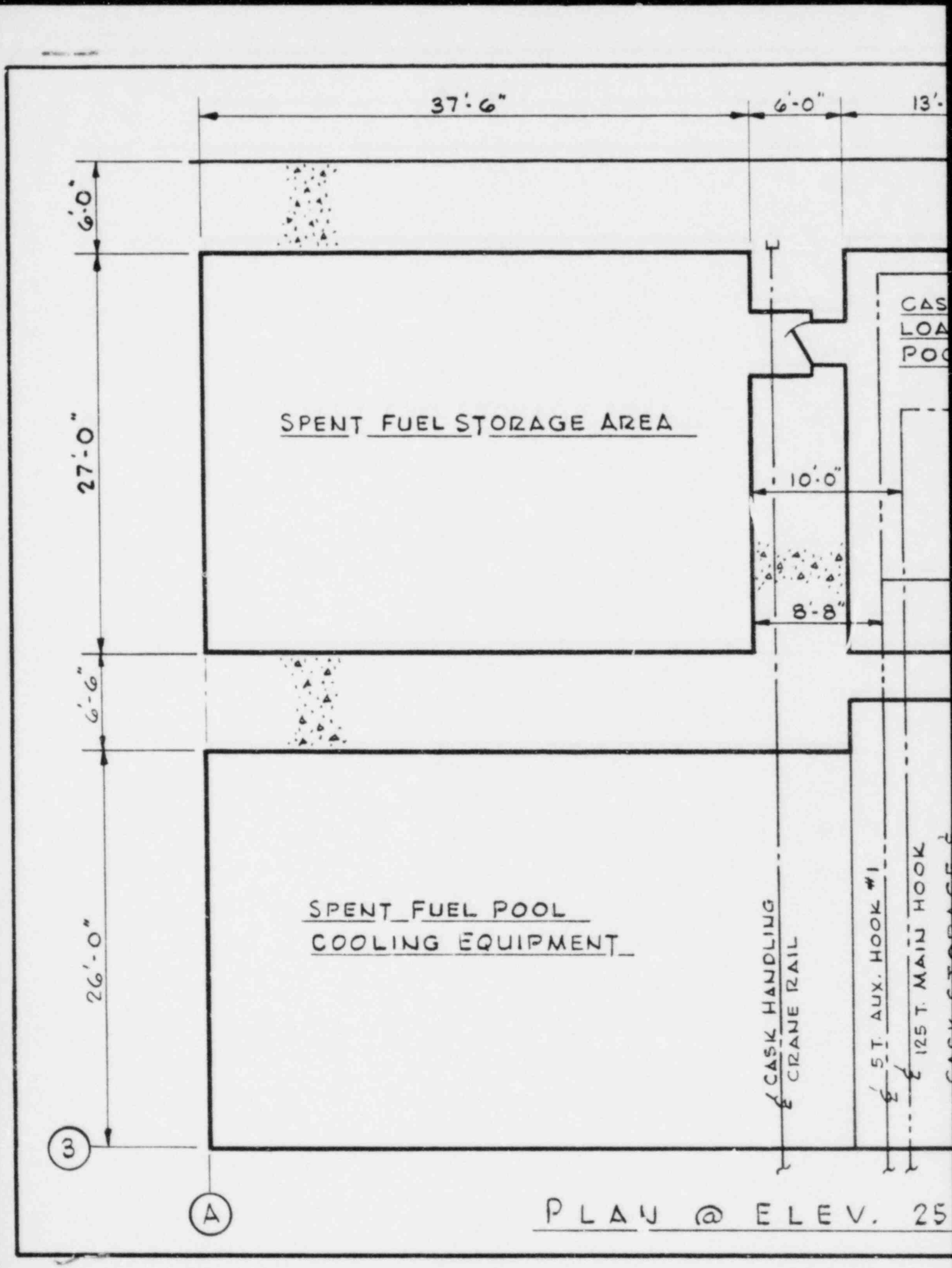
Refer to Response 2.2-1.

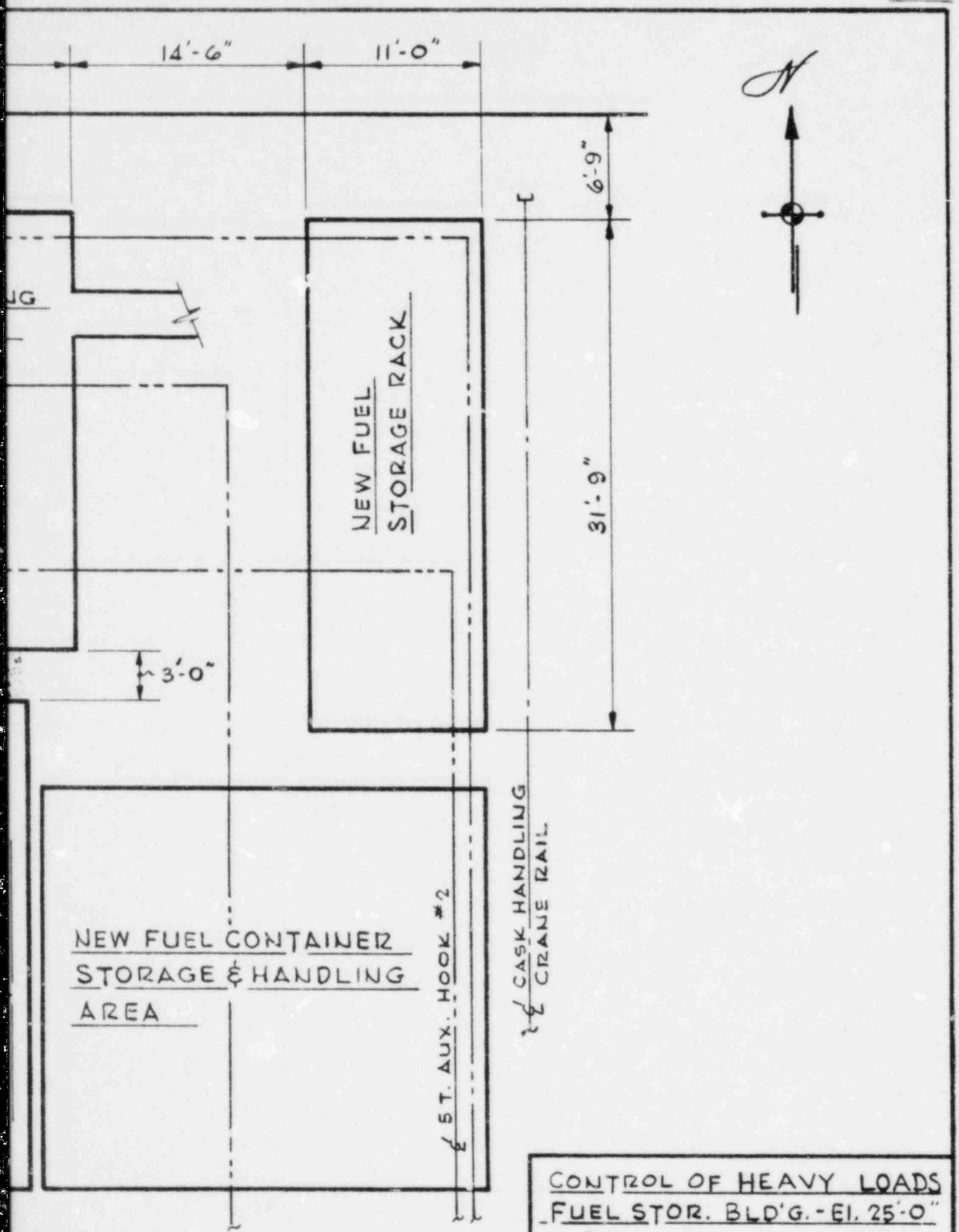
REQUEST 2.2-4

"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."

RESPONSE TO 2.2-4

Refer to Response 2.2-1. No cranes fall in this category.


37'-6"
6'-0"
13'-
6'-0"
27'-0"
SPENT FUEL STORAGE AREA
10'-0"
8'-8"
6'-6"
26'-0"
SPENT FUEL POOL
COOLING EQUIPMENT
CASK HANDLING
CRANE RAIL
5 T. AUX. HOOK #1
125 T. MAIN HOOK
3
A
PLAN @ ELEV. 25



CONTROL OF HEAVY LOADS
FUEL STOR. BLD'G. - EL. 25'-0"
SEABROOK STATION
UNITS 1 & 2 FIGURE 5-1

6. RESPONSE TO SECTION 2.3 (ENCLOSURE 3)

Specific Requirements for Overhead Handling Systems Operating in the Containment

"NUREG 0612, Section 5.1.3 provides guidelines concerning the design and operation of load-handling systems in the vicinity of the reactor core. Information provided in response to this section should be sufficient to demonstrate that adequate measures have been taken to ensure that in this area, either the likelihood of a load drop which might damage spent fuel is extremely small, or that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG 0612, section 5.1, Criteria I through III."

REQUEST 2.3-1

"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 TO 2.3-1

The following cranes and monorail-hoists can carry heavy loads over the reactor vessel:

EQUIPMENT NO.	CRANE	TYPE	CAPACITY
MM-CR-3	Polar Gantry Crane	Revolving Overhead Bridge	420 Ton Main 50 Ton Aux.
FH-RE-24	Radial Arm Stud Tensioner Hoists (3)	Monorail	2 Ton each

REQUEST 2.3-2

"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 TO 2.3-2

The following load handling systems are not listed above in Response 2.3-1. The justification for their exclusion is provided below:

EQUIPMENT NO.	CRANE	TYPE	CAPACITY
FH-CR-33	Jib Crane	Jib	0.75 tons
FH-RE-5	Manipulator Crane Auxiliary Hoist	Traveling Bridge and Hoist	1.5 tons

The jib crane is not capable of carrying heavy loads. It is used primarily to handle studs, and tools required to unbolt and remove the reactor vessel head during refueling operations.

The manipulator crane auxiliary hoist handles only light loads such as control rod drive shaft, drive shaft unlatching tool, guide tube cover and cover handling tool. (The main hoist system is supplied with redundant paths of load support such that failure of any one component will not result in a drop of the fuel assembly).

REQUEST 2.3-3

"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 I.

RESPONSE TO 2.3-3

The polar gantry crane has been evaluated as having sufficient design features to make the likelihood of a load drop extremely small. The basis selected for this evaluation is essential compliance with NUREG 0612, Section 5.1.6, supplemented by additional design features.

Polar Gantry Crane

1. Rated Capacity

Manufacturer	Whiting Corporation
Design Rated Load (DRL)	420 ton Main 50 ton Auxiliary
Maximum Critical Load (MCL)	160 tons

2. Point-By-Point Comparison with NUREG 0554

The following evaluation is a point-by-point comparison of the design, fabrication, inspection, testing, and maintenance of the polar crane to the requirements delineated in NUREG 0554. Where the design features differ from those of NUREG 0554, they are presented along with an explanation to demonstrate their equivalency and/or adequacy.

Section 1. Introduction

Section 2. Specification and Design Criteria

2.1 Construction and Operating Periods

Requirement: The allowable design stress limits for the crane intended for plant operation should be those indicated in Table 3.3.3.1.3-1 of CMAA specification No. 70 reflecting the appropriate duty cycle.

Actual: This requirement is met. The allowable stresses used in the design of the polar crane are as per CMAA Specification No. 70 for Class A1 (Standby Service).

2.2 Maximum Critical Load (MCL)

Requirement: The Design Rated Load (DRL) should be at least 15% greater than the Maximum Critical Load (MCL).

Actual: The requirement is met. The DRL is 263% greater than the MCL, and is considered to be an important factor in proving the adequacy of the polar gantry crane.

2.3 Operating Environment

Requirement: The operating environment including minimum and maximum pressure, maximum rate of pressure increase, temperature, humidity and emergency corrosive or hazardous conditions should be specified as well as proper venting and drainage requirements to avoid collapse and standing water.

Actual: The crane design complies with this section of NUREG 0554. The following service conditions are specified in the Polar Crane Specification 9763-006-257-2:

Design Temperature, Minimum	-20°F
Design Temperature, Maximum	+120°F
Temperature (accident conditions)	296°F
Wind Loading	35 mph (while in operation.) 110 mph (while not in use)
Pressure (normal operation)	Atmospheric to 15.7 psia
Pressure (accident conditions)	52 psig
Pressure (pressure test)	60 psig
Pressure Change	4 psi/sec
Relative Humidity	30-100%

Radiation Dose	50 mR/Hour
Aqueous Spray	
pH	8.0-10.5
Boron (calculated as boric acid)	4 w%
Sodium Hydroxide	1.75 w%

All enclosed portions of the crane equipment have positive openings to the environment.

2.4 Material Properties

Requirement: Materials for structural members essential to structural integrity should be tested for brittle fracture per ASTM E-208 (Drop Weight Test) or ASTM A-370 (Charpy Test). Minimum operating temperatures based on drop weight test should be obtained from paragraph NC 2300 of Section III or for Charpy test from paragraph ND 2300 of Section III of the ASME Boiler and Pressure Vessel Code.

OR

Cold-proof load test should be performed.

Actual: Material testing for brittle fracture was in accordance with the above requirements. Load bearing members of cranes including weld metal and bolting whose failure could damage components were impact tested in conformance with United Engineers Specification No. 9763-MPS-2 including the following:

Impact testing shall be performed in accordance with ASME Section VIII Division II, Article M-2 (including exemptions) as modified below:

(a) Testing is not required for material thickness of 5/8" or less.

(b) Testing is not required for all thicknesses of material for pipe, tube, fittings, pumps and valves with a nominal pipe size of 6" diameter or less.

(c) Testing of support and crane welds when required shall be performed as required by Article T-2 as specified for Category B joints.

(d) Impact testing of materials for cranes shall be conducted at 30°F below the lowest service temperature.

(e) The lateral expansion value in Table AM 211.1 shall be 0.025" in lieu of 0.015".

2.5 Seismic Design

Requirement: Crane should be designed to retain load during an SSE; and the bridge and trolley should remain on their respective runways with wheels prevented from leaving the tracks. Design should also be in accordance with regulatory position 2 of Reg. Guide 1.29, Seismic Design Classification.

Actual: Although the polar crane is not classified as Seismic Category I equipment, the design does include consideration of Safe Shutdown Earthquake (SSE) and Operating Basis Earthquake (OBE). The dynamic forces resulting from SSE and OBE accelerations corresponding to the response spectra for the containment operating floor were considered in the modal seismic analysis of the crane load bearing

elements. The dynamic analysis was performed in accordance with the procedures stipulated in United Engineers Specification 9763-SD-257-2. The analysis assumed that the crane and trolley were both in the parked position and that the crane was unloaded. Due to the infrequent use anticipated for this crane, the combined probability of the event involving a heavy load lift and the occurrence of an SSE is expected to be extremely low. Therefore, this assumption is considered to be valid.

The crane design and construction is in accordance with regulatory position C2 of Reg. Guide 1.29, i.e., the crane will not fail in such a manner as to damage safety related equipment or in any way prevent the performance of their safety function in the event of a seismic event equal to SSE. The bridge and trolley are equipped with earthquake restraints (up-kick lugs) which are designed to prevent the crane from overturning and leaving the rails during an SSE.

2.6 Lamellar Tearing

Requirement: All weld joints whose failure could result in the drop of a critical load, and the base metal at the joints susceptible to lamellar tearing should be non-destructively examined.

Actual: These requirements are met. The polar crane specification 9763-006-257-2 required the crane supplier to perform radiographic examination on the cover plate splice welds in the tension members of the bridge girders in accordance with the United Engineers Standard 9763-WS-3. All other welds were required to be examined by magnetic particle technique as per 9763-WS-3. All load bearing welds were specified to be full penetration type.

2.7 Structural Fatigue

Requirement: Fatigue analysis for the critical load bearing structures and components should be performed. The cumulative fatigue usage factors should reflect effects of the cyclic loading from both the construction and operating periods.

Actual: Construction usage was identified in the crane specification 9763-006-257-2, and therefore was considered by the crane manufacturer in order to assure placement of the crane into the proper classification. The polar crane was designed in accordance with CMAA Specification No. 70. The allowable stress range values for the polar crane are in accordance with Table 3.3.3.1.3-1 which takes into consideration the number of loading cycles. The polar crane is classified as A1 and meets the intent of Section 2.7.

2.8 Welding Procedures

Requirement: Preheat and postweld heat treatment temperatures should be specified for all welds. Welds whose failure could result in the drop of a critical load should be postweld heat treated per Subarticle 3.9 of AWS D1.1, Structural Welding Code.

Actual: This requirement is met. Welding was performed in accordance with United Engineers Specification 9763-WS-3 which further makes reference to AWS D1.1 as the applicable standard for welding, welding procedure qualifications and welder performance qualifications. All welding procedures and qualifications were approved by United Engineers.

Section 3.0 Safety Features

3.1 General

3.2 Auxiliary Systems

Requirement: 1. Auxiliary hoisting systems employed to lift or assist in handling critical loads should be single-failure-proof.

2. The main hoisting mechanism should be provided with redundant or dual components.

Actual: 1 & 2. The main and auxiliary hoists are not single-failure proof; however, they have sufficient design features to guard against a load drop. The hoists are equipped with dual upper limit switches to prevent two-blocking. The heavy loads identified in Table 4-1 do not exceed

50% of the rated capacity of the hoists, thereby increasing the available safety factors to 10 or greater. The Preventive Maintenance and Inspection Program to be implemented for all cranes will reveal any deterioration of the lifting equipment and allow for repairs prior to component failure.

3.3 Electric Control Systems

Requirement: Provide fail safe controls and limiting devices such that when disorders due to inadvertent operator action, component malfunction or disarrangement of subsystem control functions occur singly or in combination during load handling, disorders will not prevent the handling system from stopping and holding the load. An emergency stop button should be added at the control station.

Actual: The crane design complies with this requirement. The polar crane is controlled from either the cab or from the operating floor by a push button pendant station. All push buttons and master switches are of the momentary contact or spring-return type. Release of the push button or switch automatically stops the motion and sets brakes and thus a positive operator action is required to initiate and sustain any crane motion. The controllers are equipped with start and stop buttons. The stop button may be used during an emergency to stop the crane, should it become necessary. In addition, an electrically operated main line circuit breaker is mounted within easy reach of the operator

3.4 Emergency Repairs

Requirement: Means should be provided for repairing, adjusting or replacing the failed component or subsystem, when failure of an active component or subsystem has occurred and the load is supported and retained in the safe (temporary) position. Alternatively, a means should be provided for safely transferring the immobilized hoisting system with its load to a safe laydown area.

Actual: This requirement is met. Depending upon the failure, repairs can be made in place while load is safely suspended in a temporary position, or load may be manually transferred to a safe laydown area that will accept the load while repairs are being made.

Section 4 Hoisting Machinery

4.1 Reeving System

Requirement:

1. Dual reeving system each providing separate load balance on the head and load blocks through a configuration of ropes and rope equalizers, is required.
2. Rope sizing should include effects of impact loads, acceleration and emergency stops. Maximum loads (including static and inertia forces) on each individual wire rope in the dual reeving system with MCL attached, should not exceed 10% of the manufacturer's published breaking strength.

3. Maximum fleet angle from drum to lead sheave in the load block or between individual sheaves should not exceed 3 1/2° at any one point during hoisting, except that for the last 3 feet of maximum lift elevation, the fleet angle may increase slightly. The use of reverse bends should be limited.

4. The pitch diameter of running sheaves should be selected in accordance with CMAA Specification 70.

Actual:

1. The main hoist reeving system is a 2-rope system using dual drums and two separate ropes, each reeved through upper and lower sheaves to an equalizer sheave and anchored to one drum. The reeving configuration consists of 32 parts (2 ropes x 16) of 1 1/4" diameter 6 x 37 IWRC extra improved plow steel wire rope.

2. The ropes have been sized to include effects of impact loading, acceleration and emergency stops. The maximum load on each of the individual wire ropes in the reeving system, with the MCL attached, does not exceed 7% of the published breaking strength.

3. The reeving is designed such that the fleet angle relative to the drum or sheaves does not exeed 4.75° during any operating condition. As per Appendix C to NUREG 0612, Modification of Existing Cranes, larger

than recommended fleet angles have been accepted for similar applications. The crane inspection and preventive maintenance program to be implemented at Seabrook will assure the continued integrity of the wire ropes.

4. The polar crane has been designed in accordance with CMAA Specification 70. The pitch diameter of all running sheaves is 24 times the rope diameter.

   The auxiliary hook is equipped with a single rope reeving system employing a single drum and 12 parts of 5/8" diameter 6 x 37 regular lay wire center rope. The anticipated loads to be handled by this hook during plant operation are expected to provide design safety factors of greater than 10.

4.2 Drum Support

Requirement: The load hoisting drum should be provided with structural and mechanical safety devices to limit the drop of the drum and thereby prevent it from disengaging from its holding brake system if the drum shaft or bearings were to fail or fracture.

Actual: Each of the two load hoisting drums is supported at each end by a roller bearing mounted in a pedestal, and is driven through a gear and pinion at one end. The crane design does not include any special retaining features to limit the excessive drop of the drum in the event of a shaft or bearing failure. Therefore, depending upon the failure, the drum might disengage from the driving

pinion, or alternatively in the case of a small drop it may still remain partially engaged. However, this failure is not credible because of increased safety margins allowed in the design of the polar crane. By considering an MCL of 160 tons, the safety factor provided is 13.1 (or 11.4 if 15% allowance for the impact loading is added to the MCL).

4.3 Head and Load Blocks

Requirement:

1. The load block assembly should be provided with two load-attaching points, each designed to support a load of three times the load being handled without permanent deformation.
2. The individual component parts of the hoisting system should each be designed for a static load of 200% of the MCL.
3. Each load-attaching point should be load tested at 200% of the MCL. Dimensional measurements of the hook configuration should be made, and NDE should be performed both before and after the test.
4. The load blocks should be non-destructively examined by surface and volumetric techniques, and the results should be documented.

Actual:

1. The crane is equipped with a single attachment sister hook (main) with a pin hole and safety latches. As per Appendix C to NUREG 0612, a safety factor in excess of 10 (approximately 11.4 by allowing 15% for the impact loading) is provided to compensate for loss of the single-failure-proof feature.

2. The individual components of the vertical hoisting system are designed for a static load of 263% of the MCL.

3. The main hook including pin hole was load tested in the shop at 150% of the design rating or about 395% of the MCL. A longitudinal magnetic particle test and ultrasonic inspection were performed as per above requirements. The load-attaching points were also subjected to a load test in the field in accordance with ANSI B30.2 at about 328% of the MCL.

4. The load blocks were examined by magnetic particle and ultrasonic inspection techniques during manufacture, in accordance with the polar crane specification and other applicable standards. The results of the NDE have been documented.

The 50 ton auxiliary hook is of the single prong type and is equipped with a safety latch. The increased safety factors provided for the auxiliary hoisting system enhance the reliability of the load hoisting system. The above load tests and NDE were also performed on the auxiliary hook.

4.4 Hoisting Speed

Requirement: Maximum hoisting speed for the critical load should be limited to that given in the 'slow' column of Figure 70-6 of CMAA Specification No. 70.

Actual: The polar crane hoist speeds comply with the above requirement.

4.5 Design Against Two-Blocking

Requirement: 1. Provide means within the reeving system located on the head or load block combinations to absorb or control the kinetic energy of rotating machinery during a two-blocking incident. OR

Provide two independent travel limit devices of different design and activated by separate mechanical means.

2. The protective control system for load hang-up should consist of load cell systems in the drive train or motor current sensing devices or mechanical load limiting devices.

3. The auxiliary hoist, if supplied, should be equipped with two independent travel limit switches.

Actual: These requirements are met.

1. The main hoist is equipped with dual upper limit switches to prevent two-blocking. One of the two load hoisting drums contains a screw type limit switch (which also limits the downward travel) in addition to a weight type limit switch which is directly actuated by the traveling load block.

2. A load cell on the main hoist provides load indication in the cab and is equipped with an adjustment feature. The power supply to the hoist motor is interrupted at a preset load value.
3. The auxiliary hoist is provided with two independent travel limit swtiches.

4.6 Lifting Devices

Requirement: The lifting devices that are attached to the load block should be conservatively designed with a dual or auxiliary device or combinations thereof. Each device should be designed to support a load of three times the load (static and dynamic) being handled without permanent deformation.

Actual: Refer to item 4 in this section on polar crane for a detailed evaluation of the lifting devices.

4.7 Wire Rope Protection

Requirement: If side loads cannot be avoided, the reeving system should be equipped with a guard that would keep the wire rope properly located in the grooves on the drum.

Actual: The proper operator training and load handling procedures will assure that the significant side pulls are avoided under all circumstances.

4.8 Machinery Alignment

Requirement: Where gear trains are interposed between the holding brakes and the hoisting drum, these gear trains should be of single failure proof design.

Actual: The hoisting machinery is not equipped with single failure proof or redundant gear trains. Depending upon the failure, a single active component failure in the gear train between the holding brakes and the hoisting drum could render the train ineffective in transmitting power or holding the drum with the brakes activated. However, increased factors of safety, of the order of 11.4 (based upon MCL of 160 tons plus 15% for dynamic loading) employed in the design of the gear case and other components will make such failures incredible.

4.9 Hoist Braking System

Requirement:

1. The minimum hoist braking system should include one power control braking system and two holding brakes. Each holding brake should have a minimum capacity of 125% of the torque developed during the hoisting operation at the point of brake application.
2. The holding brake system should be single failure proof.
3. Provision for manual operation of the hoisting brakes during emergency conditions should be included in the crane design.

Actual

1. Both the main and the auxiliary hoist are each equipped with a separate braking system which is comprised of an eddy current brake and two DC load holding brakes. Each holding brake is rated at 150% of the motor full load torque.
2. One of the two holding brakes is directly applied to the motor shaft and the other with a time delay is designed to apply to an intermediate shaft in the gear train. Following a malfunction or failure of one brake, the other independant brake is capable of holding the hoisting drums to eliminate the possibility of an accidental load drop. The interposing gear trains are discussed in 4.8, above. The brakes are automatically applied upon power interruption or in the event of an overspeed or overload condition.
3. The load can be manually lowered under emergency conditions.

Section 5 Bridge and Trolley

5.1 Braking Capacity

Requirement:

1. The maximum torque capability of the driving motor and gear reducer for trolley and bridge should not exceed the capability of the gear train and brakes to stop the trolley or bridge from maximum speed with DRL attached.

2. Mechanical drag-type brakes should not be used to control movements of the bridge and trolley. Control and holding brakes should each be rated at 100% of maximum drive torque.
3. Brakes should be activated in the event of a power shut-off, malfunction in the power supply or an over-speed condition.
4. Opposite-drive wheels on bridge or trolley should be matched and have identical diameters.
5. Trolley and bridge speeds should be limited as per CMAA Specification No. 70.

Actual: The braking system is generally in accordance with the above requirements; and also complies with the requirements of CMAA Specification No. 70. Each bridge drive motor is equipped with a Whiting 6" solenoid brake type "SESA" (Covered), designed for a minimum torque of 100% of the rated full load torque. The trolley brake provides a minimum torque of 50% of the rated full load torque of the drive motor as per CMAA Spec. # 70. Both the bridge and trolley brakes automatically apply torque and act as parking, fail-safe brakes upon loss of power or full release of the controller button. Controls for all motions are specified to be full magnetic ,5 step, timed acceleration type.

5.2 Safety Stops

Requirements: Mechanical and/or electrical limiting devices should be provided to prevent over-travel or overspeed of the trolley and bridge.

Actual: The crane design complies with this requirement. Four (4) fixed mechanical stops are provided at the end of the trolley rails, and prevent overtravel of the trolley by coming in contact with spring bumpers attached to the trolley trucks. No stops are required for the revolving bridge.

Section 6 Drivers and Controls

6.1 Driver Selection

Requirement: The maximum torque capability of the electric motor drive for hoisting should not exceed the rating or capability of the individual components required to hoist the MCL at maximum design speed.

Actual: The electric drive motors were selected in accordance with the requirements established in CMAA Specification No. 70, and meet the intent of this Section.

6.2 Driver Control Systems

Requirement: If the crane is used to lift spent fuel assemblies, the control system should be adaptable to include interlocks that will prevent trolley and bridge movements while the load is being hoisted free of the reactor vessel or storage rack.

Actual: The polar gantry crane does not handle spent fuel assemblies.

6.3 Malfunction Protection

Requirement: Means should be provided in the motor control circuits to sense and respond to excessive current, excessive temperature, overspeed, overload and over-travel. Controls should be provided to absorb the kinetic energy of the rotating machinery and stop the hoisting movement if one rope or one of the dual reeving systems should fail or if an overloading or overspeed condition should occur.

Actual: The design of the motor control circuitry is in compliance with the above requirements; and includes necessary protection features such as overload relays, overspeed switch, load sensing devices and under voltage protection.

6.4 Slow Speed Drives

Requirement: If jogging or plugging is to be used, the control circuit should include features to prevent abrupt change in motion.

Actual: This requirement is met. Precision or inching drives are provided to reduce the main hoist speed to 2.4 inches per minute and the auxiliary hoist speed to 22.8 inches per minute. The normal or slow speed for either hoist can be selected from the "NORMAL-INCHING" switch located on the control panel in the cab or from a similar switch on the pendant station. The control system is considered to be adequate to protect against an abrupt change in motion. Also, the proper training program will stress the need to avoid any abrupt change in motion which could cause load swings.

6.5 Safety Devices

Requirement : Safety devices such as limit switches provided for malfunction, inadvertent operator action or failure should be in addition to and separate from the limiting means or control devices provided for operation.

Actual: The design of the polar crane complies with this requirement. The travel limit switches as discussed in the preceding sections are separate from normal control functions provided for operation.

6.6 Control Stations

Requirement: The controls for normal operation, and provisions for emergency controls should preferably be located in a cab on the bridge. Additional operator stations, when provided, should have control systems similar to the main station. Electrical interlocks should be included so as to permit the crane operation from only one control station at any one time.

Actual: The requirement is met.
The polar crane is equipped with two control stations, a cab mounted on the underside of the bridge and a push-button pendant station. Both these stations have similar control functions with proper electrical interlocks as per above requirements. Emergency operation is possible by manual controls for lowering and traversing the load.

Section 7 Installation Instructions

7.1 General

Requirement: Installation instructions should be provided by the manufacturer.

Actual: The requirement is met. Complete instructions for unloading, extended storage, erection and testing of the polar crane were provided by the manufacturer.

7.2 Construction and Operating Periods

Requirement: 1. The construction operating requirements should be defined separately.

2. At the end of the construction period, the crane should be modified as needed for the performance requirements of the plant operating service.
3. After construction use, the crane should be thoroughly inspected by NDE and load tested for the operating phase.
4. NDE extent and acceptance criteria should be defined in the design specification.
5. If allowable stress limits are to be exceeded during construction, added inspection supplementing that described in Section 2.6 should be specified and developed.
6. During and after installation of the crane, the proper assembly of electrical and structural components should be verified.
7. The integrity of control, operating and safety systems should be verified.

Actual: The above requirements are met.

1. The operating requirements for the construction phase were defined in the polar crane specification.
2. Modification of the polar crane is not required.
3. The polar crane will be thoroughly inspected, and refurbished, if necessary, to restore the crane to its original new condition. The crane will be re-load tested if major modification or repairs are required.

4. NDE extent and acceptance criteria were not defined in the crane specification for removal from construction phase to plant operation phase. These will be defined in a written procedure prior to use of the crane in the operation phase.
5. Allowable stress limits will not be exceeded during the construction phase.
6. Proper assembly of electrical, structural and mechanical components was verified.
7. Integrity of control, operating, and safety systems was verified during crane checkout and load test.

Section 8 Testing and Preventive Maintenance

8.1 General

Requirement:
1. Make a complete check of all mechanical and electrical systems of the crane before the tests.
2. Information concerning shop testing should be available at the plant site.

Actual: These requirements are met.
1. All mechanical and electrical systems were thoroughly inspected and checked out prior to the field acceptance tests.
2. In addition to required tests and inspection as per technical specifications, all hooks were load tested in the shop to 1.5 times the design rating. A longitudinal magnetic particle test and ultrasonic inspection were performed on the hooks both before and after the load test. A no-load running test of all motors was conducted. The necessary documentation concerning

these tests is available in QA files at the plant.

8.2 Static and Dynamic Load Tests

Requirement: A static load test at 125% of the maximum critical load (MCL) should be performed. Full performance test with 100% of the MCL including verification of the proper functioning of all limiting and safety control devices should be conducted.

Actual: The polar crane complies with this requirement A no-load and loaded running test for all crane motions using a test load equal to 125% of the design rated load (DRL) was performed in accordance with ANSI B30.2.

8.3 Two-Block Test

Requirement:

1. When equipped with an energy-controlling device between the load block and the head block, the complete hoisting machinery should be allowed to two-block. The test should be conducted at slow speed without load.
2. Crane should be tested for load hangup.

Actual:

1. Appendix C to NUREG 0612, allows the crane to be furnished with two independent travel limit switches in lieu of a design to withstand a two-blocking incident. This alternative is selected for the polar crane; and the proper functioning of the dual upper limit switches was verified during rated load test and operational tests.

2. Interlock alternative as outlined in Appendix C is selected in lieu of load hang-up protection. An overload sensing system is provided on the main hoist with read-out and adjustment in the control cab. In the event, the hoist load exceeds the set-point of the load sensing device, power supply to the hoist motor is interrupted, thus preventing over-loading of the hoisting machinery.

8.4 Operational Tests

Requirement: Operational tests should be performed to verify the proper functioning of limit switches and other safety devices.

Actual: The requirement is met. Inspection and operational tests were performed in accordance with ANSI B30.2.

8.5 Maintenance

Requirement: The critical load handling cranes should be continuously maintained above MCL capacity. The MCL should be clearly marked for each hoisting unit.

Actual: The polar crane as well as other cranes and monorails are subject to a periodic inspection and maintenance program as outlined in this report. The crane inspection, testing and maintenance program is considered an extremely important component in the overall safe load handling operations at Seabrook. The DRL is marked on the crane instead of MCL.

Section 9 Operating Manual

Requirement: Manufacturer should provide an operating manual for the crane.

Actual: This requirement is met. Whiting Corporation provided a crane manual which contains information on checking, operating, and maintaining the polar crane.

Section 10 Quality Assurance

Requirement: A quality assurance program should be established to the extent necessary to include recommendations of NUREG 0554 for the design, fabrication, installation, testing, and operation of the cranes. The applicable procurement documents should specify a quality assurance program consistent with the pertinent provisions of Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)".

Actual: A quality assurance program in accordance with the requirements of United Engineers Standard 9763-QAS-2, which applies to non-nuclear safety (NNS) class items, was specified for the polar crane. A quality assurance manual and written procedures such as welding procedures; welding procedure qualifications; heat treatment, NDE, test, inspection and cleaning procedures is a requirement of this standard. Under this program, material certifications or material test reports are required to satisfy code or specification requirements. The procedures and documents contain appropriate quantitative or qualitative criteria for determining

compliance with the applicable standards or specifications. Sufficient records are prepared as work is performed to furnish documentary evidence of the quality of item. All fabrication, inspection, and test operations performed by Contractors and their Subcontractors are subject to surveillance by the Engineer and the Owner.

3. Seismic Analysis

The crane is designed to remain in place during and after the seismic event. As described above under point-by-point comparison, both the bridge and trolley wheel trucks are equipped with anti-derailing devices which prevent the bridge and trolley from disengaging from their respective runway rails when the crane is subjected to seismic excitations. A general purpose computer program, ANSYS, was used to perform the modal dynamic analysis of the crane. A detailed description of the method of analysis and assumptions are given in Section RAI 220.23 (3.7(B).3) of the FSAR.

The mathematical model assumed the crane to be in a parked position at the time of the seismic event equivalent to SSE. Also, no lifted load was considered in the seismic analysis. This assumption is based upon the fact that the crane will not be in use for a great majority of the time during plant operation phase. The seismic occurrence at the time the crane is in use and carrying a heavy load, is considered to be a low probability event.

4. Lifting Devices

An evaluation of the lifting devices for the polar crane with respect to the guidelines of NUREG 0612, Section 5.1.6 is provided below:

(a) Standard Lifting Slings

The standard lifting slings and associated fittings will meet the requirements of ANSI B30.9-1971. An allowance for dynamic

loading will be added to the static load as per Section 5.1.1(5) of NUREG 0612. Furthermore, in selecting the proper sling size, the load used will be twice the sum of the static and dynamic loads so derived; i.e., a safety factor of 10 or greater will be maintained in accordance with the requirements of Section 5.1.6.

(b) RV Head Lifting Rig, Load Cell and Load Cell Linkage Assembly

Refer to Appendix I (Westinghouse Analysis).

(c) Spreader Assembly

The spreader assembly is part of the RV head lifting rig and is used to handle reactor missile shield during refueling operations. Analysis of the spreader assembly is included in Appendix I.

(d) Internals Lifting Rig, Load Cell and Load Cell Linkage Assembly

Refer to Appendix I (Westinghouse Analysis).

(e) RC Pump Motor Lifting Slings

The reactor coolant pump motor lifting slings will meet the requirements of applicable standards, ANSI N14.6-1978 as supplemented by NUREG-0612, Sections 5.1.1 and 5.1.6.

5. Interfacing Lift Points

An evaluation of the attachment points for heavy loads with respect to the guidelines of NUREG 0612, Section 5.1.6 follows:

(a) Reactor Vessel Head, Upper Internals and Lower Internals

Refer to Appendix I, Analysis of Special Lifting Devices.

(b) RC Pump Motor Lifting Lugs

The four lifting lugs for the reactor coolant pump motor are designed with a safety factor of 6, based upon ultimate strength. In the event of a failure of a single lift point, the load will be transferred to the other two points with the safety factor reduced to 3. Because of a four lift point system, the load is expected to be retained under these conditions.

(c) Neutron Shield Panels

Each shield panel is provided with three lifting lugs with a design safety factor of about 8 based upon ultimate strength. Failure of a single attachment point would result in an uncontrolled movement of the panel, but not necessarily a load drop. The safety factor is considered to be adequate since the load would be immediately set down and not moved until repairs are made to the failed lift point.

(d) Reactor Cavity Seal Ring

The seal ring is equipped with twelve (12) 3/4" shoulder eye bolts for lifting purposes which are equi-spaced along the circumference, with two bolts provided at each of the six locations. Failure of a single eye bolt is not expected to disturb the static balance or result in a load drop.

(e) Reactor Missile Shield

The three lifting lugs are designed with a safety factor of five (5) which is considered to be adequate to provide sufficient safety margin against a load drop.

(f) Stud Tensioner

The two stud tensioner lifting eyes have a safety factor of greater than 10.

(g) Equipment Hatch Cover

The equipment hatch cover is equipped with four lifting lugs with a safety factor of about seven (7). Failure of a single lift point would result in transfer of the load to two points with a reduction in safety factor by 50%. A load drop is, however, not expected to occur.

The above evaluation indicates that the polar crane is substantially in compliance with the guidelines of NUREG 0554, although some design features required by 0554 may not be present. This is further supplemented by the fact that the heavy loads anticipated during plant operation phase do not exceed half the hoist design capacities. The increased safety factors, as a result, will contribute significantly to the overall reliability of the load handling systems in the Containment. In addition, the periodic inspection and maintenance program to be developed and implemented in accordance with the applicable standards, coupled with a comprehensive operator training program, proper load handling procedures and load path drawings will help assure the safe handling of the loads in this area.

REQUEST 2.3-4

"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 domonstrated in your response to Section 2.4 of this report. 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 TO 2.3-4

The only other crane which is not categorized according to 2.3-3 above, is the radial arm stud tensioner hoist. These three (3) stud tensioner hoists of 2 ton capacity each are, however, not evaluated as per this subsection. These hoists are excluded because of the following reasons:

The stud tensioner hoists are used for removal and replacement of the reactor vessel head studs during refueling operations. In normal operation, these hoists are not stored on the monorails attached to the underside of the head lifting device, and therefore do not pose any safety hazard. During refueling shutdowns, the hoists are suspended from the monorails and handle studs and stud tensioners. The heaviest load is the stud tensioner weighing about 2,500 pounds. Since these components are handled only when the head is still covering the reactor vessel, no damage can be caused to the irradiated fuel or safety related equipment. When the head is removed to its storage location, the stud tensioner hoists are also removed along with the head lifting device.

7. RESPONSE TO SECTION 2.4 (ENCLOSURE 3)

Specific Requirements for Overhead Handling Systems Operating in Plant Areas Containing Equipment Required for Reactor Shutdown, Core Decay Heat Removal, or Spent Fuel Pool Cooling.

"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"

REQUEST 2.4-1

"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 TO 2.4-1

The polar gantry crane has sufficient design features to make the likelihood of a load drop extremely small. A detailed evaluation of the design, fabrication, installation, inspection, etc. of the polar crane appears in our response to Section 2.3. The cask handling crane and the stud tensioner hoists have been excluded for reasons given in the preceding sections. A comprehensive hazard evaluation of the remainder of the cranes listed in 2.1-1 is provided in this section.

REQUEST 2.4-2

"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 TO 2.4-2-a

The load/impact area matrices showing loads that will be handled by the crane or monorail-hoist and the potential impact areas are included in Table 7-1, Sheets 1 through 10.

REQUEST 2.4-2-b

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 TO 2.4-2-b

All load and impact area combinations for the following cranes have been eliminated because of separation and redundancy of safety-related equipment and other site specific considerations such as maintenance sequencing.

(i) Charging Pump Service Monorail Hoists (CS-CR-14A, 14B & 14C)

Three service hoists, each located in a separate room, are provided for maintenance of the charging pumps. A load drop can damage only a single pump which has already been taken out of service for repair or maintenance. Since normal plant shutdown can be accomplished with any one of the three charging pumps, a load drop in the event of a handling system failure cannot prevent the chemical and volume control system from performing its safety-related functions.

(ii) Radioactive Pipe Tunnel Service Monorail Hoists (CBS-CR-18A & 18B)

A separate monorail-hoist is provided to service the sump isolation valve and associated encapsulation vessel in each of the two independent and fully redundant trains of the containment spray system. The two trains and monorail-hoists are separated by a 24-inch thick reinforced concrete wall. In the unlikely event of a load drop in one area, the redundant system would remain functional. Therefore, a load drop will not result in the loss of safety functions of the containment spray system.

(iii) Main Steam and Feedwater Pipe Chase Cranes (MS-CR-25A & 25B)

These cranes, 25A located in West Chase and 25B in East Chase, service the main steam and feedwater containment isolation valves and are used only after the reactor coolant system has been cooled down, with the

(iii) Main Steam and Feedwater Pipe Chase Cranes (MS-CR-25A & 25B) (Cont'd)

residual heat removal system removing decay heat. Therefore, any potential damage to the main steam and feedwater systems resulting from a load drop cannot affect the decay heat removal process.

(iv) Diesel Generator Service Cranes (DG-CR-28A & 28B)

The two redundant diesel generator units and their associated auxiliaries are located in separate and independent enclosures within a seismic Category I building. One service crane is provided in each enclosure for repair and maintenance of the diesel generator. Since only one diesel generator will be removed from service at any one time, a load drop could result in damage to only this one unit and/or its auxiliary systems. The redundancy of the other generator will allow for plant operations for 7 days, with no loss of safety-related functions. However, as specified in the Seabrook technical specifications, if the damaged unit cannot be restored to OPERABLE status within 72 hours, the plant will be brought to at least HOT STANDBY within the next 6 hours and to COLD SHUTDOWN within the following 30 hours.

REQUEST 2.4-2-C

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 TO 2.4-2-C

The boric acid batching monorail hoist and the emergency feed pump monorail hoist have sufficient design features to make the likelihood of a load drop small.

BORIC ACID BATCHING MONORAIL HOIST (CS-CR-6)

The boric acid batching monorail hoist is designed for a capacity of 4.5 tons using a safety factor of 5. However, the normal loads anticipated for this hoist do not exceed half the capacity, thus providing a large safety margin and consequently increasing the reliability of the load handling system. In addition, the standard lifting apparatus will have a safety factor of 10 or greater, or will be of redundant design.

The load carrying capability of the reinforced concrete slab at 53'-0" elevation is being verified for impact loading to preclude any damage to the boric acid tank CS-TK-4B, located below at floor elevation 25'-0", in the unlikely event of a load drop in this area. In the event of any damage occurring to this boric acid storage tank, which is located directly below

the batching tank, the other storage tank will provide a source of boric acid. With the complete boric acid storage system unavailable, two boration paths from the refueling water storage tank can be relied upon for safe shutdown of the plant. If the boric acid storage system cannot be restored to OPERABLE status within 72 hours, the plant will be put in at least HOT STANDBY mode within the next 6 hours in accordance with the technical specifications.

EMERGENCY FEED PUMP MONORAIL HOIST (FW-CR-27)

This is a 4 ton monorail hoist normally used to handle individual pump components during maintenance or repair of the two emergency feed pumps. All these loads are not expected to weigh more than 4000 pounds each, which will ensure a safety factor of at least 10 for each load handling system combination. Even if there is a need to lift the entire pump, motor or turbine unit, the only loads heavier than 4000 pounds are feed pump and motor which will still provide safety factors of 7 and 8.3 respectively. Considering these increased hoist safety factors for individual loads together with a safety factor of 10 or greater for the standard lifting devices, the likelihood of a load drop is extremely small.

Furthermore, the maximum time allowed by the technical specifications for any emergency feed pump to be out of service for repair or maintenance is 72 hours. If during this period, the other pump is rendered inoperable because of a load drop, the plant will be brought to HOT STANDBY within 6 hours and to HOT SHUTDOWN within the following 6 hours as per operational limits specified in the technical specifications. Any potential damage to the system piping or valves resulting from a load drop will not impair the

Response to 2.4-2-C (Cont'd)

main feedwater system including the 5% startup feed pump, since the check valves in the individual steam generator feed lines are located in the Main Steam and Feedwater Pipe Chase.

REQUEST 2.4-2-d

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 TO 2.4-2-d

All load-impact area combinations for the filter cask monorail, heat exchanger service monorail and the component cooling water pump service monorails have been evaluated in detail. The analysis demonstrates that either the load does not impact the safety related equipment or damage is limited so as not to result in loss of the safety functions of the systems under consideration. A detailed discussion for these monorail systems is provided below:

FILTER CASK MONORAIL HOIST (CS-CR-5)

The reactor coolant filter, seal water return and injection filters, demineralizer pre-filter, and spent fuel pool cooling and cleanup filters served by this 4.5 ton monorail are located in their individual compartments/cubicles

RESPONSE TO 2.4-2-d

below 3 foot thick reinforced concrete slab. Only one filter will be taken out of service at any one time for removal and replacement of the filter element. Since all other compartments will be covered with floor plugs during cask handling operations, damage in the event of a load drop could occur only to this one filter which has already been valved out.

In addition, the maximum height of the filter transfer cask will be limited to about 12" above the operating floor due to headroom restrictions. A confirmatory structural analysis is being performed for the floor slab at 25'-0" elevation to verify that the slab will sustain anticipated load drops in the event of a handling system failure. Therefore, integrity of the CVCS piping, valves and the remaining filters located below this level is not expected to be compromised. The system will continue to perform its safety functions.

CVCS HEAT EXCHANGER SERVICE MONORAIL HOIST (CS-CR-13)

The letdown, letdown reheat, letdown chiller, moderating and seal water heat exchangers in the chemical and volume control system are all installed in separate cubicles below 25'-0" floor level. As in the case of filters, only one heat exchanger cubicle will be opened at any one time for inspection, or to have access to the particular heat exchanger. Thus any potential damage would be limited to only that heat exchanger which has been removed from service. Also, the adequacy of the reinforced concrete slab and other structures is being checked to ensure that following a load drop safe shutdown and decay heat removal capabilities are retained.

RESPONSE TO 2.4-2-d (Cont'd)

In addition, with the exception of the removable floor plugs, the safety factors for other loads such as tube bundles are much greater than 10 which will enhance the reliability of the load handling system. The concrete plugs are not expected to be lifted more than 12 inches from the floor.

COMPONENT COOLING WATER PUMP SERVICE MONORAIL HOISTS (CC-CR-15A & 15B)

The monorail CC-CR-15A services primary component cooling water pumps CC-P-11A and 11B, and monorail CC-CR-15B is used during maintenance of pumps 11C and 11D. An interchangeable chainfall hoist of 3 ton capacity is provided for the two monorails. The pumps in the two independant loops are separated by a 6 foot high metal partition (provided for fire protection purposes) which runs across the two parallel monorails.

The metal partition as well as the safe load paths will restrict the movement of a heavy load over a pump in the redundant loop. However, in the unlikely event of a load being carried over the partition and coincident failure of the handling system, one pump in the redundant loop could be rendered inoperable. Since for normal full power operation only one pump is required in each loop, the remaining pump will continue to supply cooling water to the various users. If the affected loop must be shut down following a load drop, and it cannot be restored to OPERABLE status within 72 hours, cooldown will be initiated with one loop to bring the plant to HOT STANDBY within 6 hours and to COLD SHUTDOWN within the following 30 hours.

In addition, a structural analysis is being performed to demonstrate that a load drop in this area will not damage any safety related equipment or damage to such equipment will be limited so as not to result in loss of the required

RESPONSE TO 2.4-2-d (Cont'd)

safe shutdown or decay heat removal functions.

The above three monorails are not designed to retain a load in the event of seismic accelerations equivalent to an SSE. An outline of the 'method of analysis' used to demonstrate the adequacy of the structures following a load drop is given in Appendix II.

TABLE 4-1

SEABROOK STATION — UNITS 1 & 2

TABULATION OF HEAVY LOADS

CRANE/MONORAIL - HOIST	LOAD IDENTIFICATION	WEIGHT (lbs)	LIFTING DEVICE	LOAD PATH DRAWING	LOAD HANDLING PROCEDURE SPECIFIC/GENERAL	REFERENCE DRAWING
CONTAINMENT						
Polar Gantry Crane MM-CR-3 420 Ton Main 50 Ton Auxiliary Whiting Corporation	Neutron Shield Panel (8)	10,000 each	Main/Aux. Hook & Slings	805276	General (See Note 2)	815542
	Reactor Cavity Seal Ring	18,625	Main/Aux. Hook & Slings	805273	Specific (See Note 1)	805556
	Reactor Missile Shield and Support (plus CRDM cooling fans)	40,000 (with spreader assembly)	Main Hook and Spreader Assembly	805273	Specific	101933
	CRDM Cooling Air Duct and Supports Heaviest Section	See Note 4	Auxiliary Hook and Slings	805276	General	609605 609608 609609
	Reactor Vessel Head and Attachments	320,000 (with lifting rig)	Main Hook, RV Head Lifting Rig, Load Cell, and Linkage Assembly	805275	Specific	F.P. #50234 F.P. #50246
	Internals Lifting Rig	18,350	Main Hook, Load Cell and Linkage Assembly	805275	Specific	F.P. #53998

TABLE 4-1

SEABROOK STATION — UNITS 1 & 2

TABULATION OF HEAVY LOADS

CRANE/MONORAIL - HOIST	LOAD IDENTIFICATION	WEIGHT (lbs)	LIFTING DEVICE	LOAD PATH DRAWING	LOAD HANDLING PROCEDURE SPECIFIC/GENERAL	REFERENCE DRAWING
	Upper Internals	152,000 (with lifting rig)	Main Hook, Internals Lifting Rig, Load Cell and Linkage Assembly	805272	Specific	F.P. #50209
	Lower Internals	340,000 (with lifting rig)	Main Hook, Internals Lifting Rig, Load Cell and Linkage Assembly	Not Required	Specific/General	
	Jib Crane (including hoist and trolley)	3,000	Auxiliary Hook and Slings	805272	General	F.P. #54824
	Stud Tensioners	2,500	Aux. Hook & Slings	805274	General	F.P. #50215
	R.V. Head Stud, Nut and Washer Assembly	700	Aux. Hook & Slings	805274	General	
	RC Pump Motor	100,260	Main Hook &Motor Lifting Slings	805277	Specific	F.P. #50218
	RC Pump Motor Support	9,300	Main /Aux. Hook & Slings	805277	General	F.P. #50218
	RC Pump Internals	44,900	Main Hook & Slings	805277	Specific	F.P. #50218
	RC Pump Assembly (including casing)	94,400	Main Hook & Slings	805277	Specific	F.P. #50218
	RC Pump Removable Concrete Plugs (2 sections)	37,000 (Heaviest)	Main Hook & Slings	805277	Specific/General	101445

TABLE 4-1

SEABROOK STATION — UNITS 1 & 2

TABULATION OF HEAVY LOADS

CRANE/MONORAIL - HOIST	LOAD IDENTIFICATION	WEIGHT	LIFTING DEVICE	LOAD PATH DRAWING	LOAD HANDLING PROCEDURE SPECIFIC/GENERAL	REFERENCE DRAWING
	RC Pump Handling Frame	10,000	Aux. Hook & Slings	805277	General	1168 E 98
	Plug for In-Core Detector Drive	10,000	Aux. Hook & Slings	Not Required	General	101445
	420 Ton Hoist Load Block	30,000	N/A	N/A	-	F.P. #52461
	50 Ton Hoist Load Block	2,000	N/A	N/A	-	F.P. #52462
	In-Service Inspection Tool	(See Note 3)				
	Miscellaneous Equipment in Containment Annulus Area		Auxiliary Hook and Slings	805275	General	-
	Pressurizer Missile Shield	5,000	Aux. Hook & Slings	Not req'd See Note 5	General/Specific	101939
	Equipment Hatch Cover (including airlock)	85,150	Aux./Main Hook and Slings	805273	Specific/General	F.P. #10552 F.P. #10556

TABLE 4-1

SEABROOK STATION —— UNITS 1 & 2

TABULATION OF HEAVY LOADS

CRANE/MONORAIL - HOIST	LOAD IDENTIFICATION	WEIGHT (lbs)	LIFTING DEVICE	LOAD PATH DRAWING	LOAD HANDLING PROCEDURE SPECIFIC /GENERAL	REFERENCE DRAWING
FUEL STORAGE BUILDING						
Spent Fuel Cask Handling Crane	Spent Fuel Cask	(Cask design not yet finalized)		805279	Specific	
FH-RE-1 125 Ton Main 5 Ton Aux. (2) Whiting Corporation	New Fuel Shipping Container	6,700	Main/Aux. Hook #2 and Four-Leg Sling Assembly	805279	Specific/General	
	New Fuel Assembly	1,700 (with handling tool)	Auxiliary Hook #1 and New Fuel Assembly Handling Tool	805279	Specific/General	FIG. 4.2-2 (FSAR)
	Crane Load Block (125 Ton)	5,900	N/A	N/A	—	F.P. #55593
	Irradiated Specimen Cask	(See Note 3)				
	Failed Fuel Container	(See Note 3)				
PRIMARY AUXILIARY BUILDING						
Filter Cask Monorail Hoist CS-CR-5 4.5 Ton Capacity	Filter Cask (CVCS system)	7,000	Filter Cask Lifting Device	805280	General	F.P. #
	Concrete Floor Plug	3,000	Slings	805280	General	805869
Boric Acid Batching Monorail Hoist CS-CR-6 4.5 Ton Capacity	Hatch Cover (2 sections)	1,300 each	Slings	805281	General	101598
	Pallets of Boric Acid	8,910/10 pallets	Slings	805281	General	—

TABLE 4-1

SEABROOK STATION — UNITS 1 & 2

TABULATION OF HEAVY LOADS

CRANE/MONORAIL-HOIST	LOAD IDENTIFICATION	WEIGHT (lbs)	LIFTING DEVICE	LOAD PATH DRAWING	LOAD HANDLING PROCEDURE SPECIFIC/GENERAL	REFERENCE DRAWING
CVCS Heat Exchanger Service Monorail Hoist CS-CR-13 3.5 Ton Capacity (Unit #1 only)	Removable Concrete Floor Plug (2 sections)	6,600 each	Slings	805280	General	101528
	Heat Exchanger Tube Bundle	2,150 (Heaviest)	Slings	805280	General	F.P. #50163
Component Cooling Water Pump Service Monorail Hoist CC-CR-15A & 15B 3 Ton Capacity each	Primary Component Cooling Water Pump	3,600	Slings	805280	General	F.P. #50626
	PCCW Pump Motor	5,270	Slings	805280	General	F.P. #50626 F.P. #51153
EMERGENCY FEEDWATER PUMP BUILDING						
Emergency Feed Pump Monorail Hoist FW-CR-27 4 Ton Capacity	Emergency Feedwater Pump	5,700	Slings	805278	General	F.P. #22432 F.P. #22433
	Emergency Feedwater Pump Motor	4,800	Slings	805278	General	F.P. #22435
	Emergency Feedwater Pump Turbine	3,900	Slings	805278	General	F.P. #22431
	6'-0" x 4'-6" Removable Concrete Floor Plug	4,000	Slings	805278	General	101660 101664

TABLE 4-1

SEABROOK STATION — UNITS 1 & 2

TABULATION OF HEAVY LOADS

NOTES:

1. Specific Procedure: A specific procedure governs critical load handling operations requiring unique procedures, and provides detailed instructions for the movement and handling of such loads, or performance of complex tasks requiring greater detail to ensure safe handling of loads.

2. General Procedure: A general procedure governs all crane and load handling operations not requiring a specific procedure, and serves as a reference document for specific procedures. The 'Crane Safety Mannal' may be used as a general procedure.

3. Load path and attachment method is to be determined prior to use, and approved by the Plant Operating Review Committee. Details are not available at this time.

4. The design of the ductwork/supports for the CRDM has not been finalized. The weights of these components will be added at a later date.

5. The pressurizer missile shield will be stored on top of the pressurizer compartment itself.

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: FILTER CASK MONORAIL HOIST (CS-CR-5)

LOCATION	BUILDING: PRIMARY AUXILIARY BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 3-5, Column Line A-B, Elev. 25'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
Filter Cask (7000 lbs) Removable Floor Plugs (3000 lbs each)	Floor Elev. 25'-0" (Monorail Elev. 40'-6")	Seal Water Heat Exchanger, seal Water injection Filter, Seal Water return Filter, Reactor Coolant Filter Demineralizer Prefilter, all located in individual compartments below 3' thick reinforced concrete slab. CVCS piping and valves below 25' elevation. (Valve operators i.e. extensions for some drain valves and isolating valves for the above equipmert are above 25' elev.)	C and E

*Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: BORIC ACID BATCHING MONORAIL HOIST (CS-CR-6)

LOCATION	BUILDING: PRIMARY AUXILIARY BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 5-6, Column Line B-D, Elev. 53'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
Hatch Cover in 2 sections (1000 lbs each) Pallets of boric acid (1000 lbs approximately in one lift)	Floor Elev. 53'-0" (Monorail elev. 67'-0")	Boric acid tank CS-TK-4B located at floor elev. 25'-0", below boric acid batching tank.	B, D & E

* Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: CVCS HEAT EXCHANGER SERVICE MONORAIL HOIST (CS-CR-13)

LOCATION	BUILDING: PRIMARY AUXILIARY BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 2-4, Column Line A-B		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
Concrete Floor Plug in 2 sections (6600 lbs. each)	Floor Elev. 25'-0" (Monorail Elev. 45'-6")	Letdown Heat Exchanger, Letdown Reheat HX, Letdown Chiller HX, Moderating HX and Seal Water HX, all located in individual compartments below 3' thick reinforced concrete slab. CVCS Piping and Valves located below 25' elev (Valve operators i.e., extensions for isolating valves for above equipment are located above 25'-0" elevation)	C,E
Heat Exchanger Tube Bundle (2150 lbs. - Heaviest Tube Bundle)	same as above	same as above	C, D & E

* See Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: CHARGING PUMP SERVICE MONORAIL HOISTS, (CS-CR-14A, 14B, & 14C)

LOCATION	BUILDING: PRIMARY AUXILIARY BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 3-5, Column Line C-D, Elev. 7'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
Charging Pump Components	Floor Elev. 7'-0" (Rail Elev. 18'-7")	Charging Pump, Associated CVCS Piping	B

* Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: COMPONENT COOLING WATER PUMP SERVICE MONORAIL HOISTS (CC-CR-15A & 15B)

LOCATION	BUILDING: PRIMARY AUXILIARY BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 2-4, Column Line A-C, Elev. 25'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category*
Primary Component Cooling Water Pump (3600 lbs) PCCW Pump Motor (5270 lbs)	Floor El.25'-0" (Monorail El. 35'-0")	PCCW pumps and PCCW System piping. CVCS Piping and valves below 2 to 4' thick reinforced concrete slab (El. 25'-0"). Valve operators i.e., extensions, located above 25'-0" elev., for isolating valves for: - Letdown Reheat HX - Letdown Chiller HX - Letdown Flow Control Valve PCV 131 - Seal Water Return Filter - Regenerative Demineralizer - Seal Water Injection Filters (drain valves) - Cation Bed Demineralizers - 3" line from Moderating HX to RC Filter - 3" line from RC Filter to RHR Pump	B & E

*See Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: RADIOACTIVE PIPE TUNNEL SERVICE MONORAIL HOISTS (CBS-CR-18A & 18B)

LOCATION	BUILDING: RADIOACTIVE PIPE TUNNEL		
IMPACT AREA / LOADS	Zone: Piping Zone 28A Pipe Tunnel Elev. (-) 34'-6"		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
Encapsulation Vessel Head (1000 lbs)	EL.(-) 34'-6"	Valves 16" CBS-V8, V14 & Piping	B
Encapsulation Vessel Skirt (1200 lbs)	EL.(-) 34'-6"	Valves 16" CBS-V8, V14 and Piping	B
Sump Isolation Valve Topworks (Less than 2500 lbs)	EL.(-) 34'-6"	Valves 16" CBS-V8, V14 & Piping	B

* See Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: MAIN STEAM AND FEEDWATER PIPE CHASE CRANES (MS-CR-25A & 25B)

LOCATION	BUILDING: MS AND FW PIPE CHASE		
IMPACT AREA / LOADS	Zone: East Chase Floor Elev. 3'-0" West Chase Floor Elev. 3'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category *
MS Isolation Valve Operator	EL. 20'-0"	Safety Valve and main steam and feedwater piping	C
MS Isolation Valve Topworks	EL. 20'-0"	Safety Valve and main steam and feedwater piping	C
FW Isolation Valve Operator	EL. 20'-0"	Safety Valve and main steam and feedwater piping	C
FW Isolation Valve Topworks	EL. 20'-0"	Safety Valve and main steam and feedwater piping	C

* See Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: EMERGENCY FEED PUMP MONORAIL HOIST (FW-CR-27)

LOCATION	BUILDING: EMERGENCY FEEDWATER PUMP BUILDING		
IMPACT AREA / LOADS	Zone: Area around monorail in entire building Elev. 27'-0"		
	Elevation	Safety Related Equipment	Hazard Elimination Category*
Emergency Feedwater Pump (5700 lbs)	Floor El.27'-0"	Emergency FW turbine, pump, motor, and feedwater piping.	C
Emergency FW Pump Motor (4800 lbs)	Floor El.27'-0"	Emergency FW turbine, pump, and feedwater piping.	C,D
Emergency FW Pump Turbine (3900 lbs)	Floor El.27'-0"	Emergency FW pump, motor, and feedwater piping.	C,D
Concrete Floor Plug (4000 lbs)	Floor El.27'-0"	Emergency FW pump, motor, turbine, and feedwater piping.	C,D

* See Sheet 10 of 10

CONTROL OF HEAVY LOADS NUREG 0612

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

CRANE: DIESEL GENERATOR SERVICE CRANES, (DG-CR-28A & 28B)

LOCATION	BUILDING: DIESEL GENERATOR BUILDING		
IMPACT AREA / LOADS	Zone: Column Line 5-9, Column Line A-E Elev. 21'-6"		
	Elevation	Safety Related Equipment	Hazard Elimination Category*
Diesel Generator Components	EL.21'-6"	Diesel Generator, Diesel Auxiliary Systems	B

* See Sheet 10 of 10

LOAD/IMPACT AREA MATRIX

SEABROOK STATION UNITS 1 & 2

TABLE 7-1

Hazard Elimination Categories

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.

APPENDIX I

ANALYSIS OF RV HEAD LIFTING RIG AND INTERNALS LIFTING RIG (SPECIAL LIFTING DEVICES)

(Later)

APPENDIX II

METHOD OF ANALYSIS OF PLANT STRUCTURES

(Later)

APPENDIX III

ANALYSIS OF FILTER CASK LIFTING DEVICE

(Later)

ATTACHMENT A

NUREG 612:CONDUIT & CABLE TRAY REVIEW

ITEM No.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
1.	MM-CR-3	Polar Gantry Crane	CTMT	805052 805053 805055 805056	Not Examined Excluded by Design
2.	FH-RE-24	Radial Arm Stud Tensioner Hoists	CTMT	805054	Not Examined Excluded by Design
3.	FH-RE-1	Spent Fuel Cask Handling Crane	Fuel Storage Bldg.	805058 805059 805084	See Note 1
4.	CS-CR-5	Filter Cask Mono-rail Hoist	PAB	805215 805062	See Note 1
5.	CS-CR-13	CVCS HX Service Monorail Hoist	PAB	805062	See Note 1
6.	CS-CR-6	Boric Acid Batch-ing Monorail Hoist	PAB	805062 805066	See Note 1
7.	CS-CR-14A -14B -14C	Charging Pump Service Monorail Hoist	PAB	805061 805065	See Note 1
8.	CC-CR-15A -15B	Component Cooling Water Pump Service Monorail Hoist	PAB	805062 805064 805066	See Note 1
9.	CBS-CR-18A -18B	Radioactive Pipe Tunnel Service Monorail Hoist	Radioactive Pipe Tunnel (EL-34'-0")	805540	See Note 1
10.	MS-CR-25A -25B	Main Steam & FW Pipe Chase Crane	MS & FW Pipe Chase	202063 202064	See Note 2

ATTACHMENT A (CONT'D)

NUREG 612: CONDUIT & CABLE TRAY REVIEW

ITEM No.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
11.	FW-CR-27	Emergency Feed Pump Monorail Hoist	Emergency FW Pump Bldg.	310453	See Note 3
12.	DG-CR-28A -28B	Diesel Generator Service Crane	Diesel Gen. Bldg.	202068 202069 202070	See Note 1

NOTE 1: Safety-related cable trays and/or conduits do not exist below this crane.

NOTE 2: These cranes are excluded from detailed evaluation because of site specific considerations.

NOTE 3: The cable trays located below in the electrical tunnel are not expected to be affected by a load drop. A confirmatory structural analysis of the intervening floor is being performed.

ATTACHMENT B

NUREG 612 : PIPING REVIEW

ITEM NO.	EQUIPMENT NO.	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
1	MM-CR-3	Polar Gantry Crane	CTMT	805051 805052 805053	Not Examined - excluded by design
2	FH-RE-24	Radial Arm Stud Tensioner Hoists	CTMT	805055	Not Examined - excluded by design
3	FH-RE-1	Spent Fuel Cask Handling Crane	Fuel Storage Bldg.	805058 805059 805084 805088	No piping below this crane
4	CS-CR-5	Filter Cask Monorail Hoist	PAB	805215	No piping below this crane
5	CS-CR-13	CVCS HX Service Monorail Hoist	PAB	805215 805235 805236	No piping below this crane
6	CS-CR-6	Boric Acid Batching Monorail Hoist	PAB	805066 805062 805063	No other system piping in this area
7	CS-CR-14A -14B -14C	Charging Pump Service Monorail Hoist	PAB	805213 805214	No piping below this crane except suction and discharge piping for the individual pump served.
8	CC-CR-15A -15B	Component Cooling Water Pump Service Monorail Hoist	PAB	805215 805216 805213	No piping below this monorail except CC Water pump connections and check valves in the discharge lines.

ATTACHMENT B (CONT'D)

NUREG 612: PIPING REVIEW

ITEM NO.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
9	CBS-CR-18A 18B	Radioactive Pipe Tunnel Service Monorail Hoist	Radioactive Pipe Tunnel (El.-34'-0")	805540	No other system piping below this crane
10	MS-CR-25A -25B	Main Steam & FW Pipe Chase crane	MS & FW Pipe chase	202063 202064	See Note 1
11	FW-CR-27	Emergency Feed Pump Monorail Hoist	Emergency FW Pump Bldg.	202296	FW-4613-01-1506-8" FW-4610-04-02-3"
12	DG-CR-28A 28B	Diesel Generator Service Crane	Diesel Generator Bldg.	202070 202068	No piping below this crane

NOTE 1: These cranes are excluded from detailed evaluation because of site specific considerations.

ATTACHMENT C

NUREG 612:SAFETY-RELATED EQUIPMENT REVIEW

ITEM No.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
1.	MM-CR-3	Polar Gantry Crane	CTMT	805054 805051 805052 805053 805055 805056	Steam Generators, Reactor Coolant Pumps, pressurizer
2.	FH-RE-24	Radial Arm Stud Tensioner Hoists	CTMT		Not examined - excluded by design
3.	FH-RE-1	Spent Fuel Cask Handling Crane	Fuel Storage Bldg.	805058 805059	No safety-related equipment in this area
4.	CS-CR-5	Filter Cask Mono-rail Hoist	PAB	805064 805062	CS-E-5 Seal Water HX Valve Operators, CC-P-11C CC Pumps and piping.
5.	CS-CR-13	CVCS HX Service Monorail Hoist	PAB	805062 805011	CS-E-5 HX CC-P-11A, Valve Operators, CS-E-3 HX CS-E-4 HX CS-E-7 HX CS-E-8 HX and piping
6.	CS-CR-6	Boric Acid Batching Monorail Hoist	PAB	805062 805066	CS-TK-4B, Boric Acid Tanks
7.	CS-CR-14A -14B -14C	Charging Pump Ser-vice Monorail Hoist	PAB	805061 805065	See Note 1
8.	CC-CR-15A -15B	Component Cooling Water Pump Service Monorail Hoist	PAB	805062	Valve Operators, CS-E-5 Seal Water HX

ATTACHMENT C (CONT'D)

NUREG 612:SAFETY-RELATED EQUIPMENT REVIEW

ITEM No.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
9.	CBS-CR-18A -18B	Radioactive Pipe Tunnel Service Monorail Hoist	Radioactive Pipe Tunnel (Elev. - 34'-0")	805540	Motor operated valves 16" CBS-V14, V8
10.	MS-CR-25A -25B	Main Steam & FW Pipe Chase Crane	MS & FW Pipe Chase	202063 202064	See Note 2
11.	FW-CR-27	Emergency Feed Pump Monorail Hoist	Emergency FW Pump Bldg.	202296	FW-V67, V68 Valves, IR-50 Instrumentation Rack
12.	DG-CR-28A -28B	Diesel Generator Service Crane	Diesel Generator Bldg.	202070 202068	Fuel Oil Storage Tank 26A & 26B, valves Air Compressor.

NOTE 1: These monorails are not evaluated in detail because of separation and redundancy of the safety related equipment.

NOTE 2: These cranes are excluded from detailed evaluation because of the site specific considerations.

ATTACHMENT D

NUREG 612:HVAC REVIEW

ITEM NO.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
1	MM-CR-3	Polar Gantry Crane	CTMT	604128 604129 604130 604131	Not examined-- Excluded by design
2	FH-RE-24	Radial Arm Stud Tensioner Hoists	CTMT		Not examined - excluded by design
3	FH-RE-1	Spent Fuel Cask Handling Crane	Fuel Storage Building	604136 604137 604143	See Note 1
4	CS-CR-5	Filter Cask Monorail Hoist	PAB	604110 604111	See Note 1
5	CS-CR-6	Boric Acid Batching Monorail Hoist	PAB	604109	See Note 1
6	CS-CR-13	CVCS Heat Exchanger Service Monorail Hoist	PAB	604110 604111 604113	See Note 1
7	CS-CR-14A -14B -14C	Charging Pump Service Monorail Hoist	PAB	604111	See Note 1
8	CC-CR-15A -15B	Component Cooling Water Pump Service Monorail Hoist	PAB	604110 604111 604114 604115	See Note 1

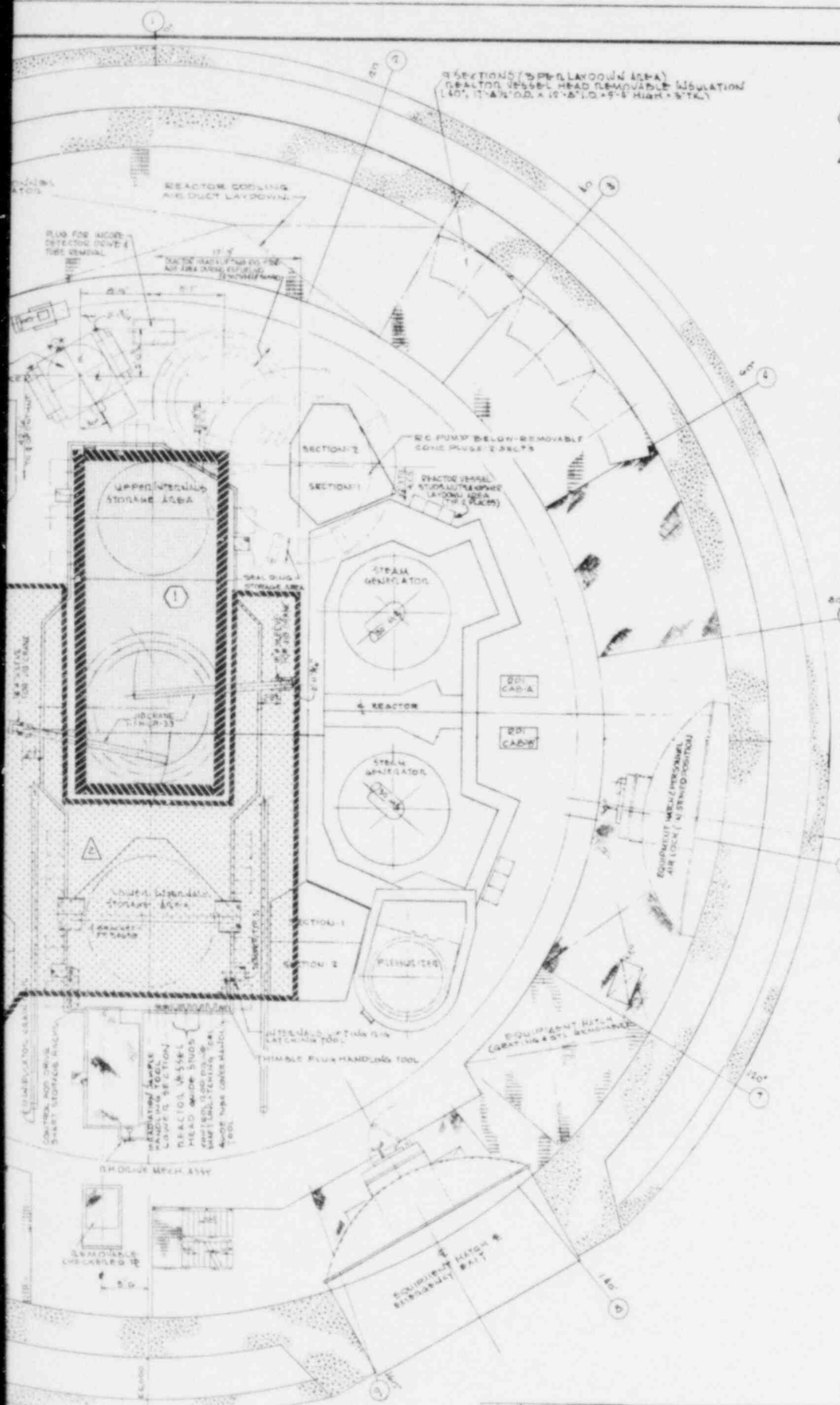
ATTACHMENT D (CONT'D)

ITEM NO.	EQUIPMENT NUMBER	EQUIPMENT NAME	AREA CONSIDERED	REFERENCE DRAWINGS	REMARKS
9	CBS-CR-18A -18B	Radioactive Pipe Tunnel Service Monorail Hoist	Radioactive Pipe Tunnel		See Note 1
10	MS-CR-25A -25B	Main Steam & Feedwater Pipe Chase Crane	MS & FW Pipe Chase	604165 604168 604171	See Note 1
11	FW-CR-27	Emergency FW Pump Monorail Hoist	Emergency FW Pump Bldg.	604141 604142	See Note 1
12	DG-CR-28A -28B	Diesel Generator Service Crane	Diesel Generator Bldg.	604097 604098 604123	See Note 1

Note 1: No safety-related HVAC equipment or ducts below this crane.

9763-F-805272

4 | 3



SAFE LOAD PATHS :

1. UPPER INTERNALS INTERNALS LIFTING RIG
2. JIB CRANE

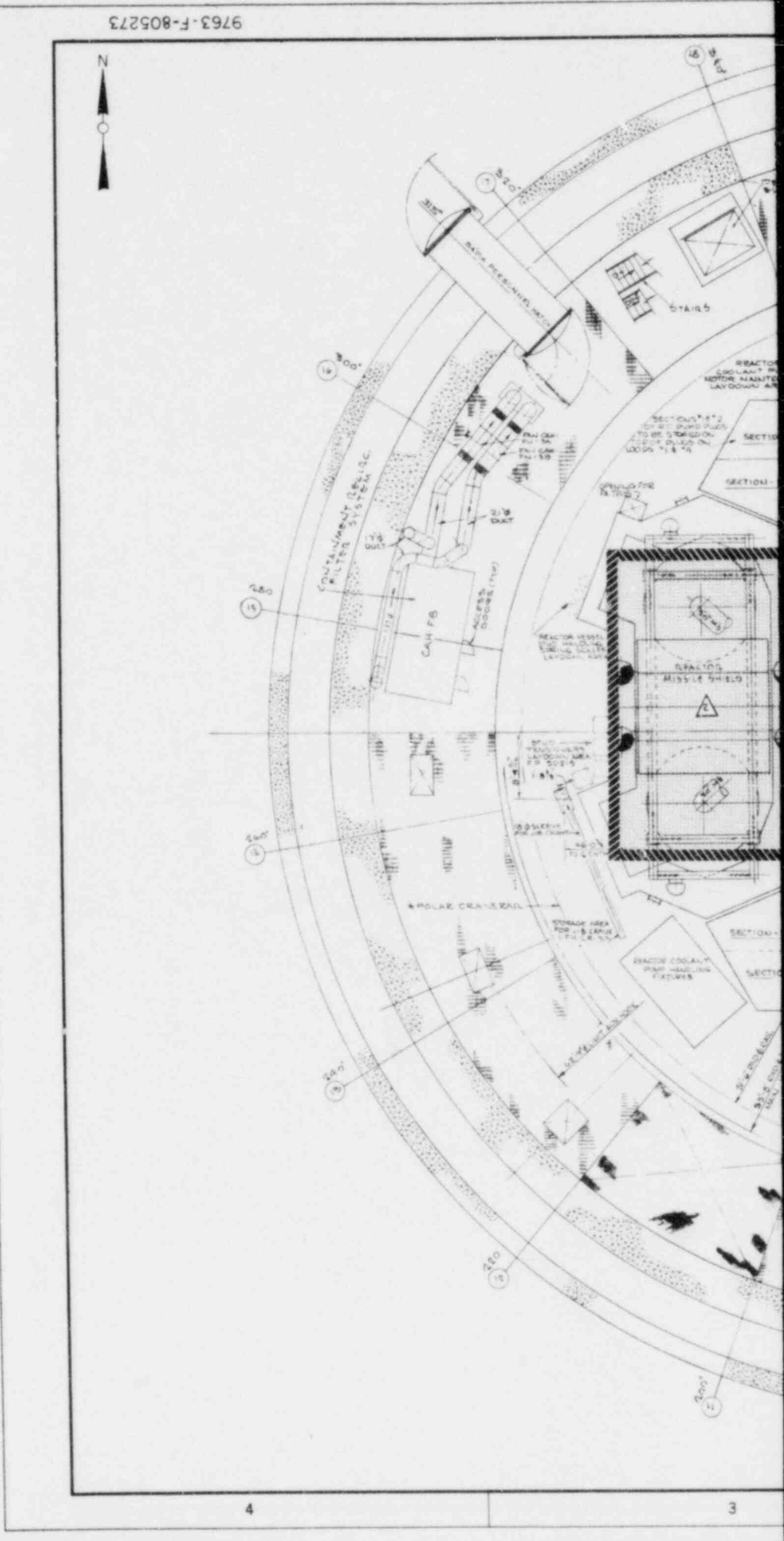
GENERAL NOTES :

1. LOADS SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. NO HEAVY LOAD EXCEPT EQUIPMENT ASSOCIATED WITH REFUELING IS TO BE CARRIED OVER OPEN REACTOR VESSEL UNLESS MISSILE SHIELD IS IN PLACE.

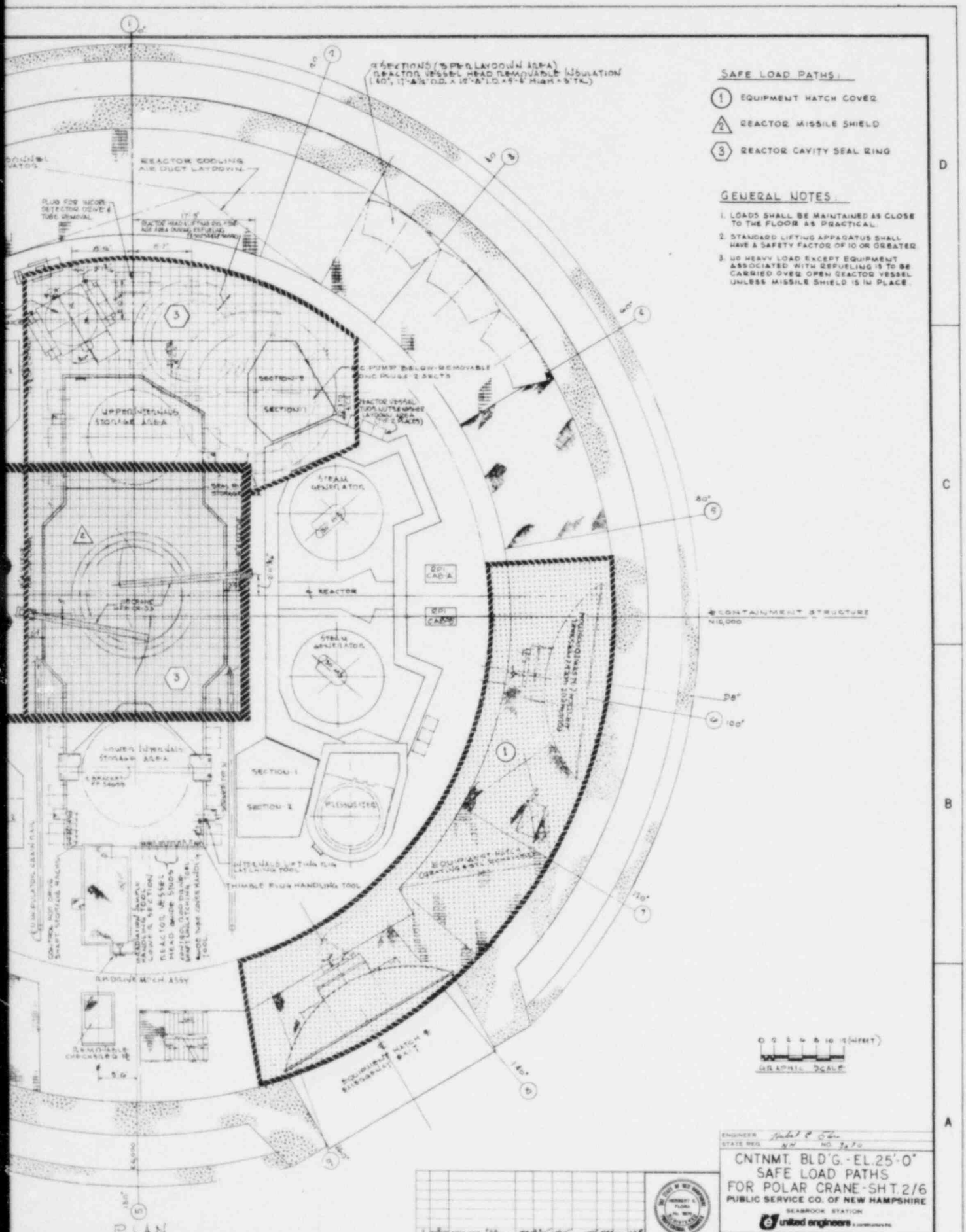
ENGINEER
STATE REG. NO.

CNTNMT. BLD'G. - EL. 25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE - SH'T. 1/6
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805272



9763-F-805273
N
STAIRS
CONTAINMENT COOLING FILTER SYSTEM
CAH-F8
ACCESS DOORS
REACTOR MISSILE SHIELD
POLAR CRANE RAIL
REACTOR COOLANT PUMP HANDLING FIXTURES
4
3



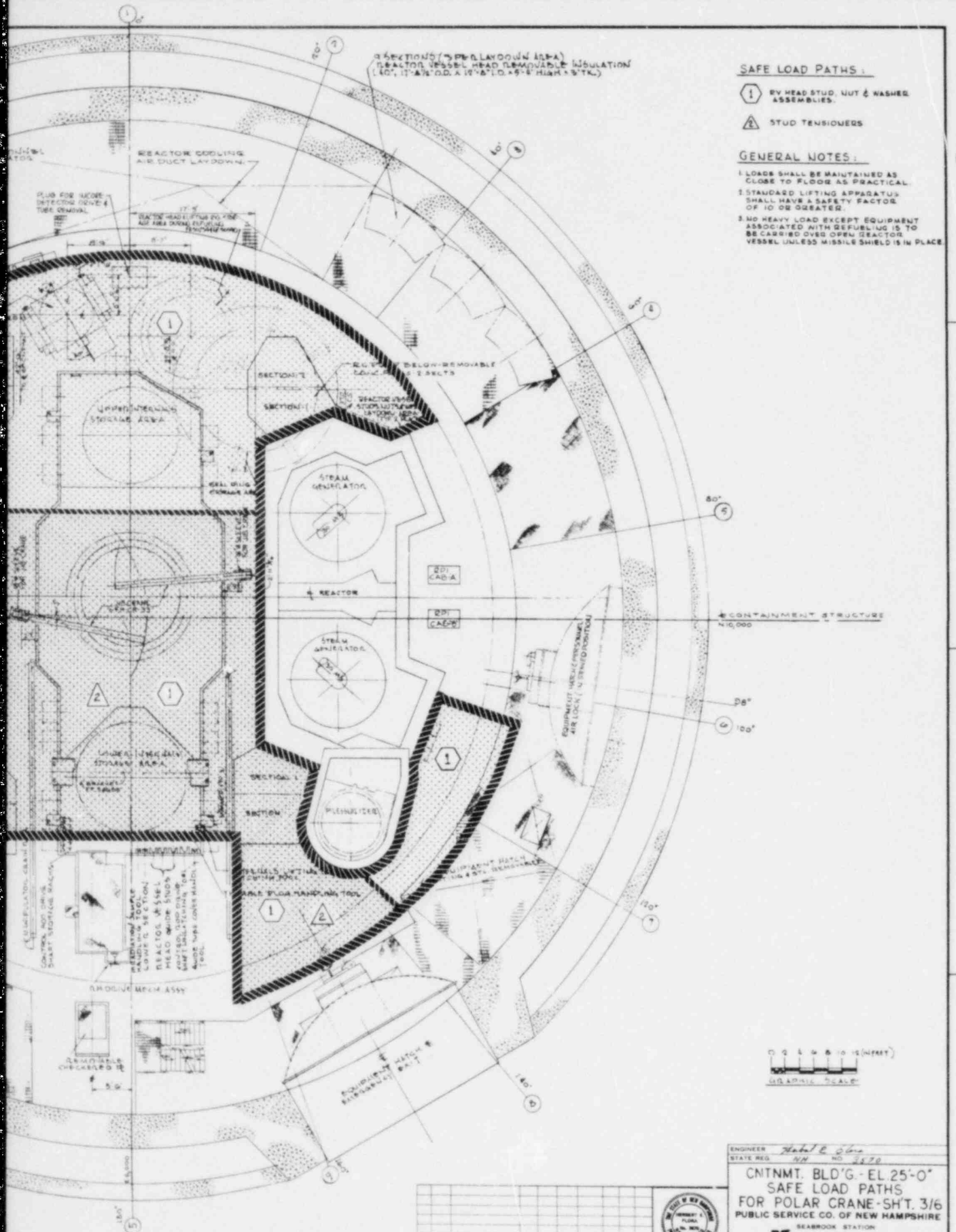
ENGINEER Herbert P. Stein
STATE REG. NH NO. 3170

CNTNMT. BLD'G. - EL. 25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE - SH. T. 2/6
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805273

9763-F-805274

4 | 3



PLAN

(SECTIONS) (3 PLACES) LAYDOWN AREA)
REACTOR VESSEL HEAD REMOVABLE INSULATION
(40°, 17'-4½" O.D. x 15'-6" I.D. x 9'-6" High + STK.)

SAFE LOAD PATHS:

(1) RV HEAD STUD, NUT & WASHER ASSEMBLIES.

(2) STUD TENSIONERS

GENERAL NOTES:

1. LOADS SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. NO HEAVY LOAD EXCEPT EQUIPMENT ASSOCIATED WITH REFUELING IS TO BE CARRIED OVER OPEN REACTOR VESSEL UNLESS MISSILE SHIELD IS IN PLACE.

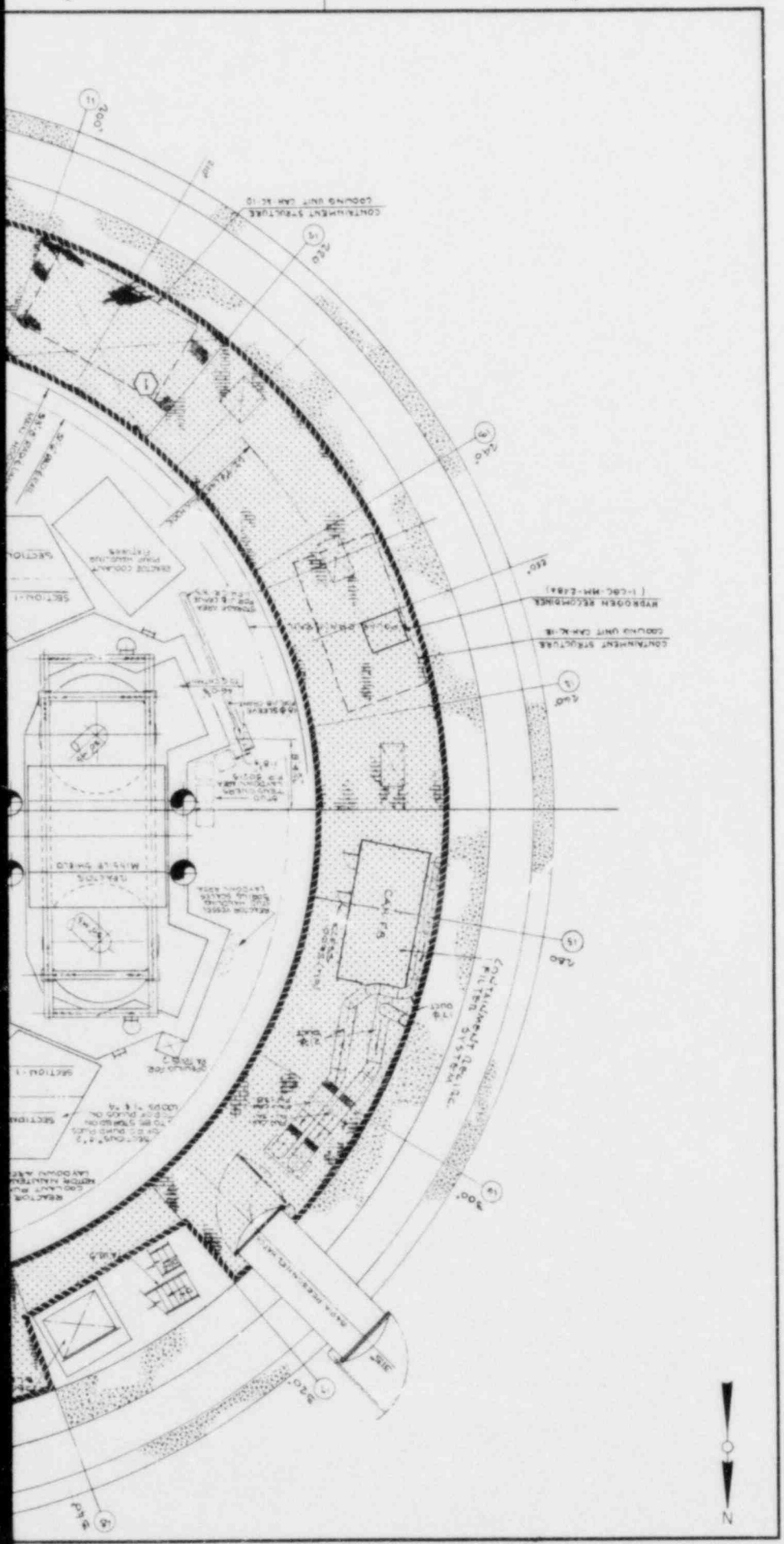
ENGINEER Herbert E. Glass
STATE REG. NH NO. 5570

CNTNMT. BLD'G. - EL 25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE - SH'T. 3/6

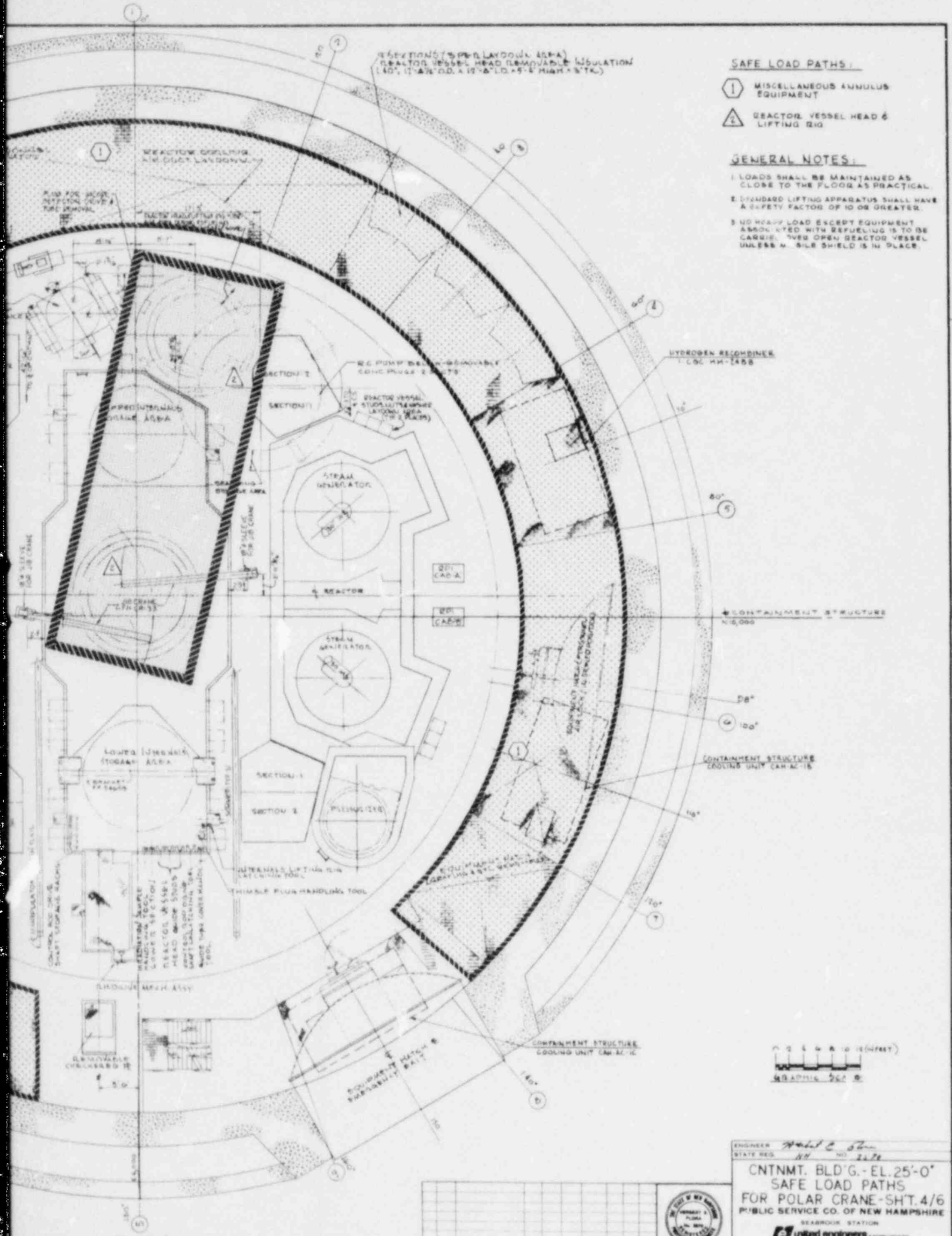
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805274

DISCIPLINE	INIT. BY	DATE	DISCIPLINE	INIT. BY	DATE
CIVIL	NA		MET & ELEC	AA	
MECH.	NA		ELEC.	AA	
NUCLEAR	AA		MECH. EQUIP.	AA	



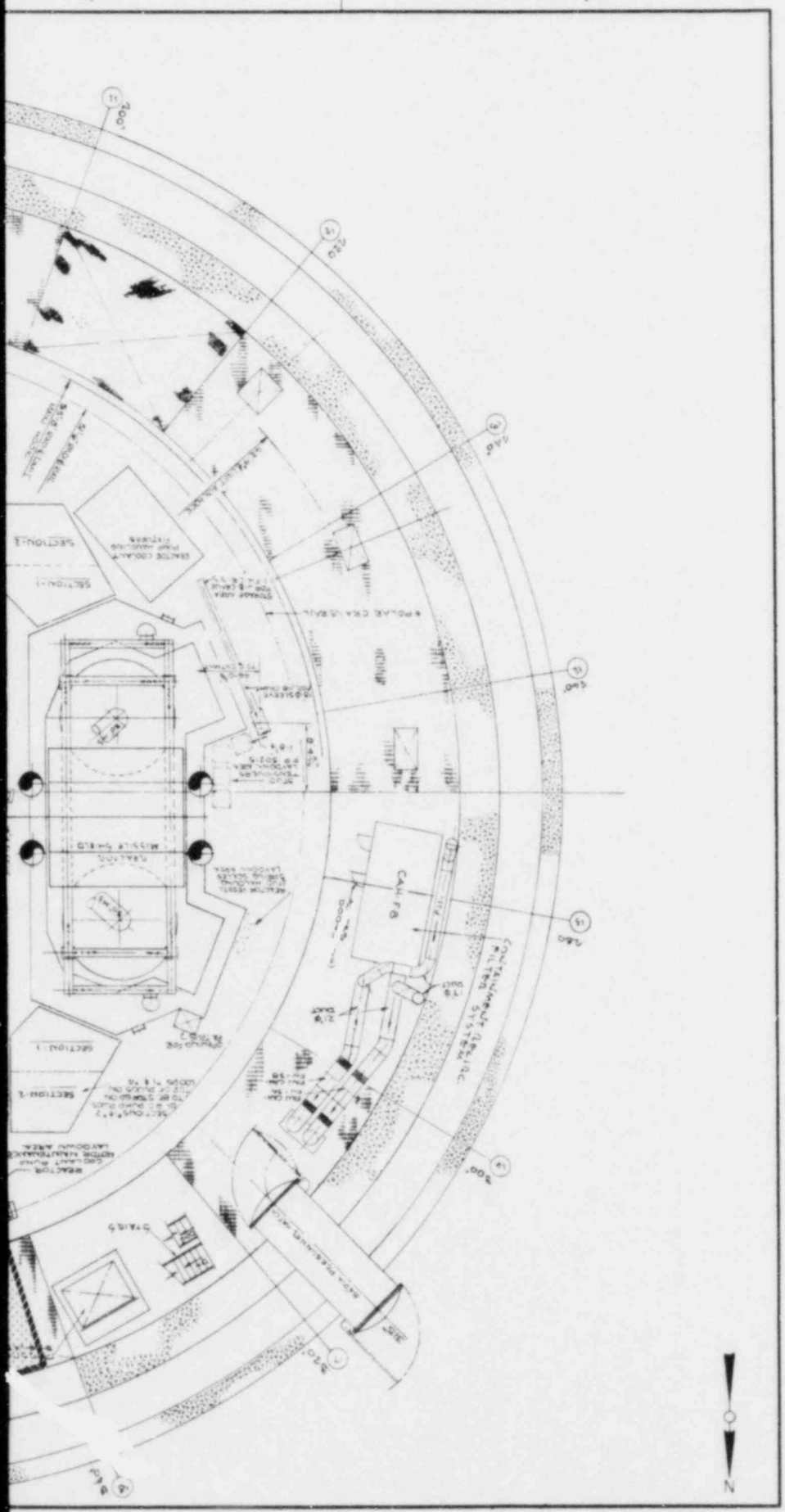
9763-F-805275



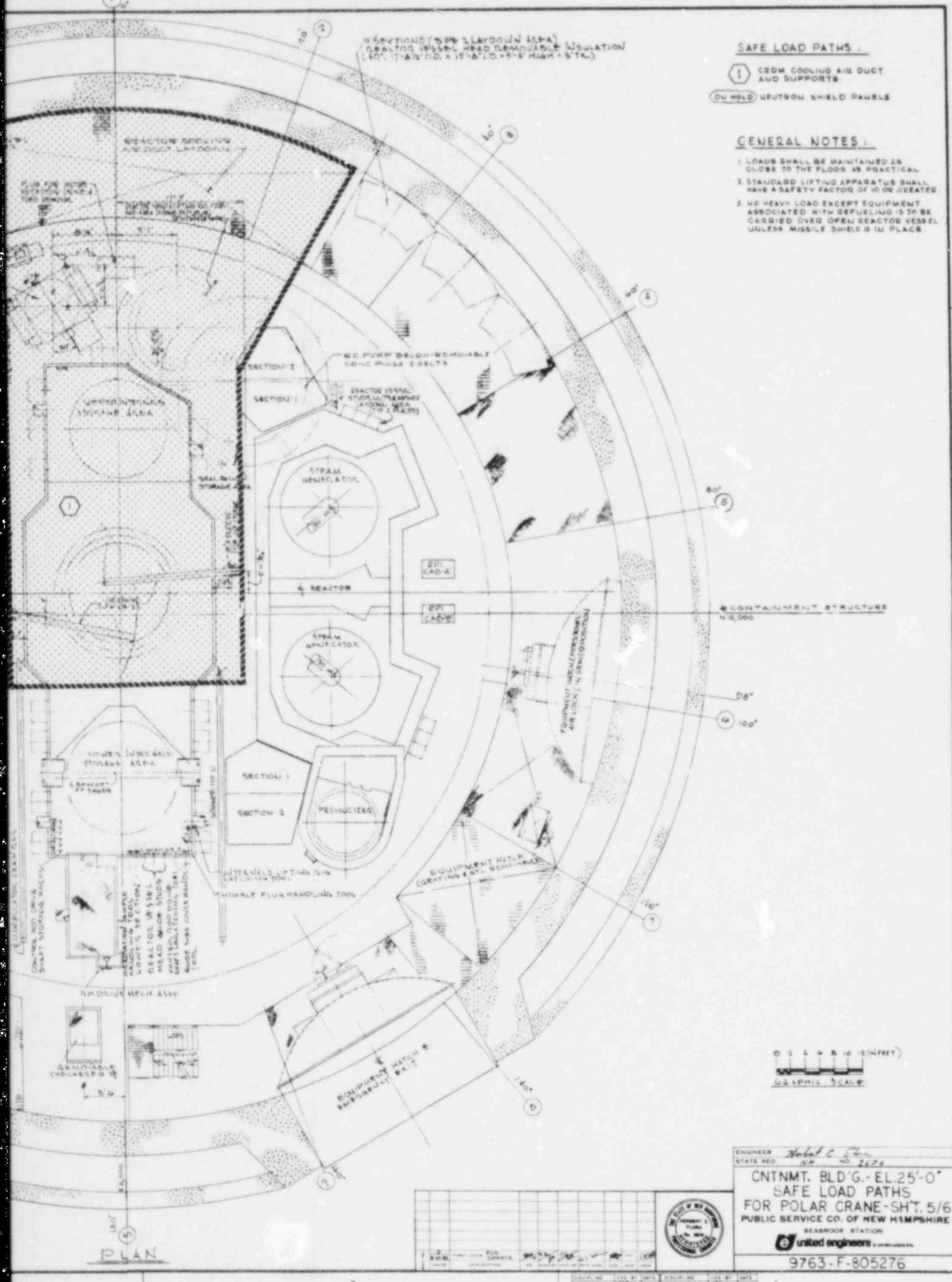
ENGINEER	
STATE REG.	NO.

CNTNMT. BLD'G. - EL. 25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE - SH'T. 4/6
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805275

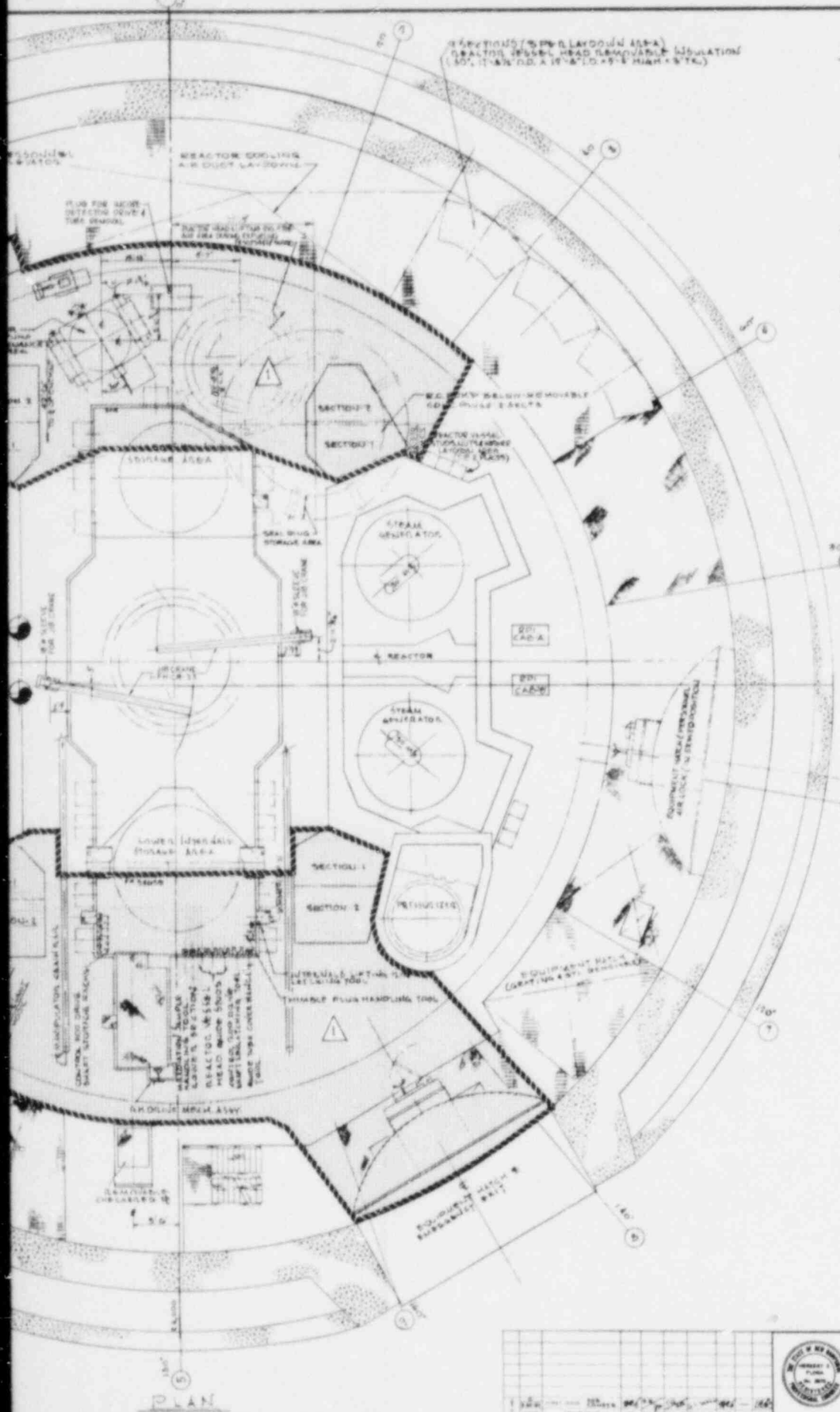


9763-F-805276


SAFE LOAD PATHS :
1 CRDM COOLING AIR DUCT AND SUPPORTS
DU MOLD NEUTRON SHIELD PANELS
GENERAL NOTES :
1. LOADS SHALL BE MAINTAINED AS CLOSE TO THE FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. NO HEAVY LOAD EXCEPT EQUIPMENT ASSOCIATED WITH REFUELING IS TO BE CARRIED OVER OPEN REACTOR VESSEL UNLESS MISSILE SHIELD IS IN PLACE.
REACTOR COOLING AIR DUCT LAYDOWN AREA
SECTION 2
SECTION 1
STEAM GENERATOR
℄ REACTOR
℄ CONTAINMENT STRUCTURE
PRESSURIZER
EQUIPMENT HATCH
PLAN
GRAPHIC SCALE
ENGINEER
STATE REG.
CNTNMT. BLD'G. - EL. 25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE - SH'T. 5/6
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers
9763-F-805276

9763-F-805277

4 | 3



SAFE LOAD PATHS :

⚠1 RC PUMPS.
RC PUMP MOTORS.
REMOVABLE CONCRETE PLUGS FOR RC PUMPS.
PUMP HANDLING FRAME

GENERAL NOTES :

1. LOAD SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. NO HEAVY LOAD EXCEPT EQUIPMENT ASSOCIATED WITH REFUELING IS TO BE CARRIED OVER OPEN REACTOR VESSEL UNLESS MISSILE SHIELD IS IN PLACE.
4. DURING NORMAL OPERATION RC PUMP HANDLING FRAME WILL BE STORED OUTSIDE THE CONTAINMENT.
5. SECTIONS 1 & 3 OF RC PUMP CONCRETE PLUGS ARE TO BE STORED ON TOP OF OTHER PLUGS FOR LOOPS 1 & 4 AND SIMILARLY ON LOOPS 2 & 3.

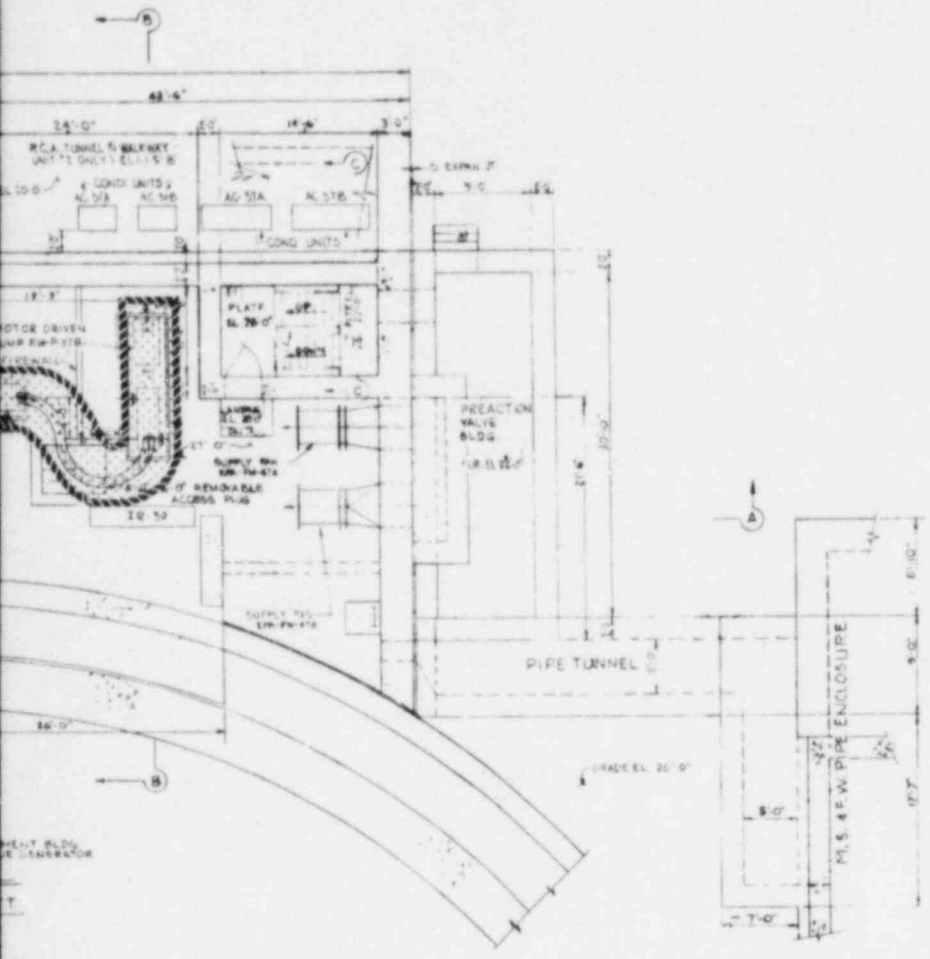
GRAPHIC SCALE

ENGINEER
STATE REG. NO.

CNTNMT. BLD'G.-EL.25'-0"
SAFE LOAD PATHS
FOR POLAR CRANE-SHT. 6/6
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805277

9763-F-805278



SAFE LOAD PATHS

(1) EMERGENCY FEED PUMP MONORAIL HOIST FW-CR-27

GENERAL NOTES:

1. LOADS SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. THE 1 REMOVABLE ACCESS PLUG (4'-0" x 9'-0") SHALL BE IN PLACE PRIOR TO HANDLING OF ANY LOADS.

ENGINEER [illegible] STATE REG. NH NO. 3478

FMER. FW. PUMP BLD'G. - EL. 27'-0"
SAFE LOAD PATHS
FOR MONORAILS
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

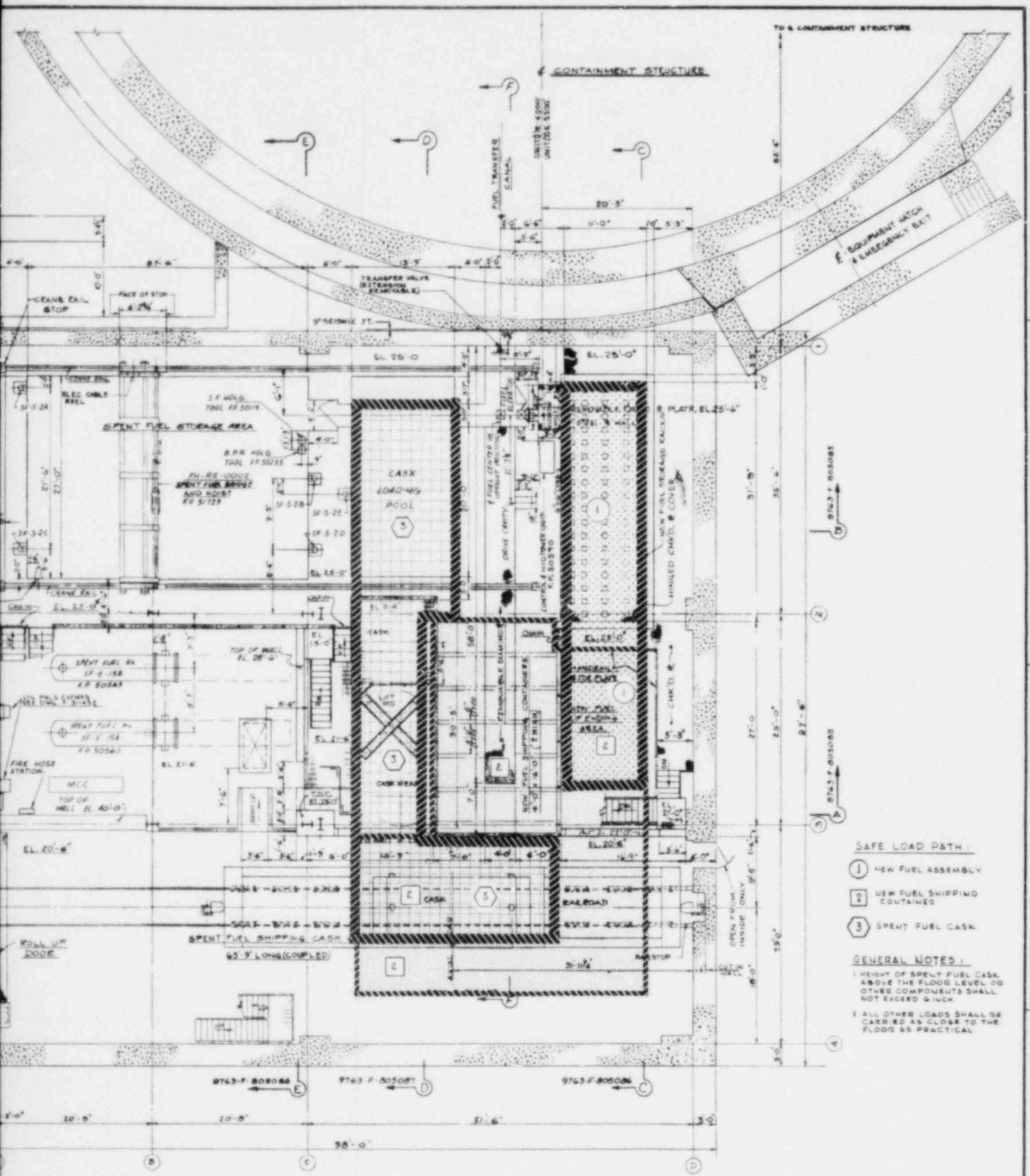
9763-F-805278

D C B A

2 1

9763-F-805279

4 | 3



PLAN @ EL. 21'-6" & 25'-0"

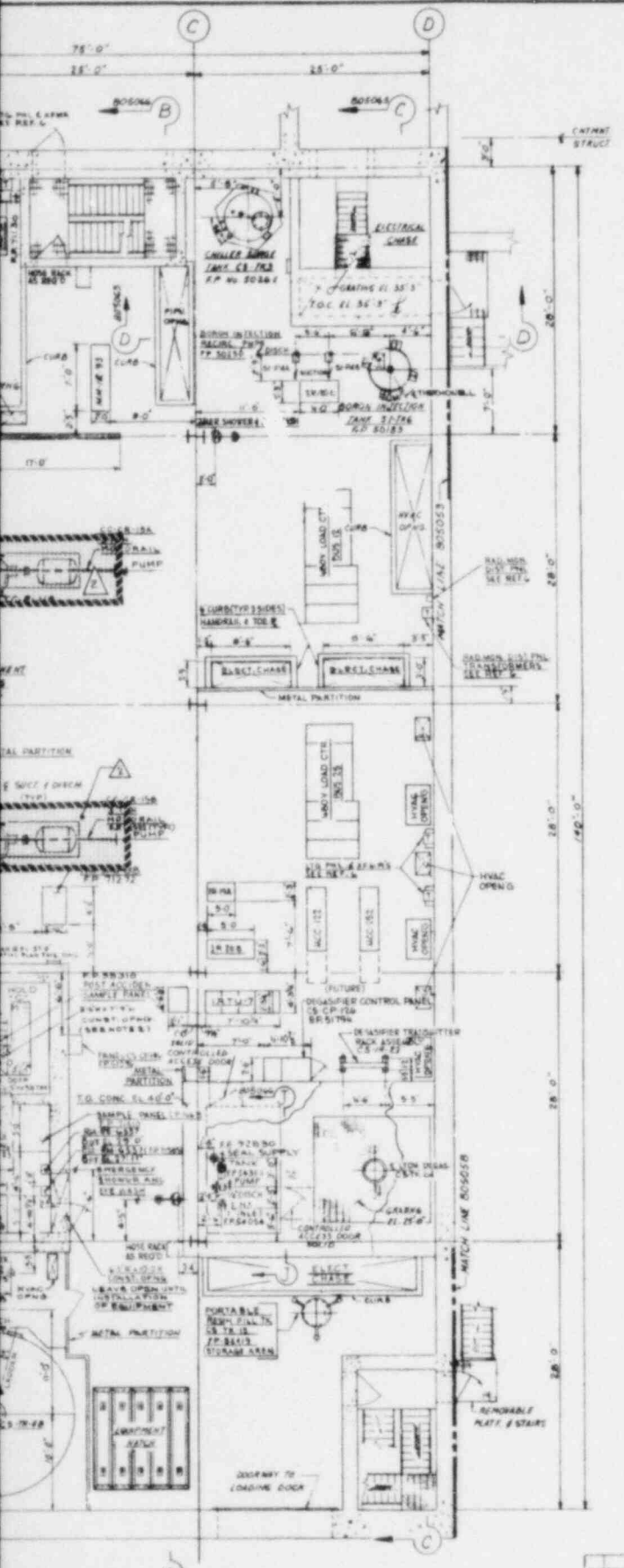
ENGINEER Robert E. Sze
STATE REG. NH NO. 3570

F.S.B. - EL. 25'-0"
SAFE LOAD PATHS
FOR CASK HAND'G. CRANE
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805279

2 1

9763-F-805280



SAFE LOAD PATHS

- (2) PRIMARY COMPONENT COOLING WATER PUMP MONORAIL HOIST CC-CR-15A & 15B
- (3) FILTER CASK MONORAIL HOIST CS-CR-5 (UNIT #1)
- (4) CVCS HEAT EXCHANGER SERVICE MONORAIL HOIST CS-CR-15 (UNIT #1 ONLY)
- (1) FILTER CASK MONORAIL HOIST CS-CR-5 (UNIT #2)

GENERAL NOTES:

1. LOADS SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.
3. ONLY ONE HEAT EXCHANGER OR FILTER CUBICLE SHALL BE OPENED AT ANY ONE TIME.

GRAPHIC SCALE (IN FEET)

ENGINEER
STATE REG. NO.

P.A.B. - EL. 25'-0"
SAFE LOAD PATHS FOR MONORAILS

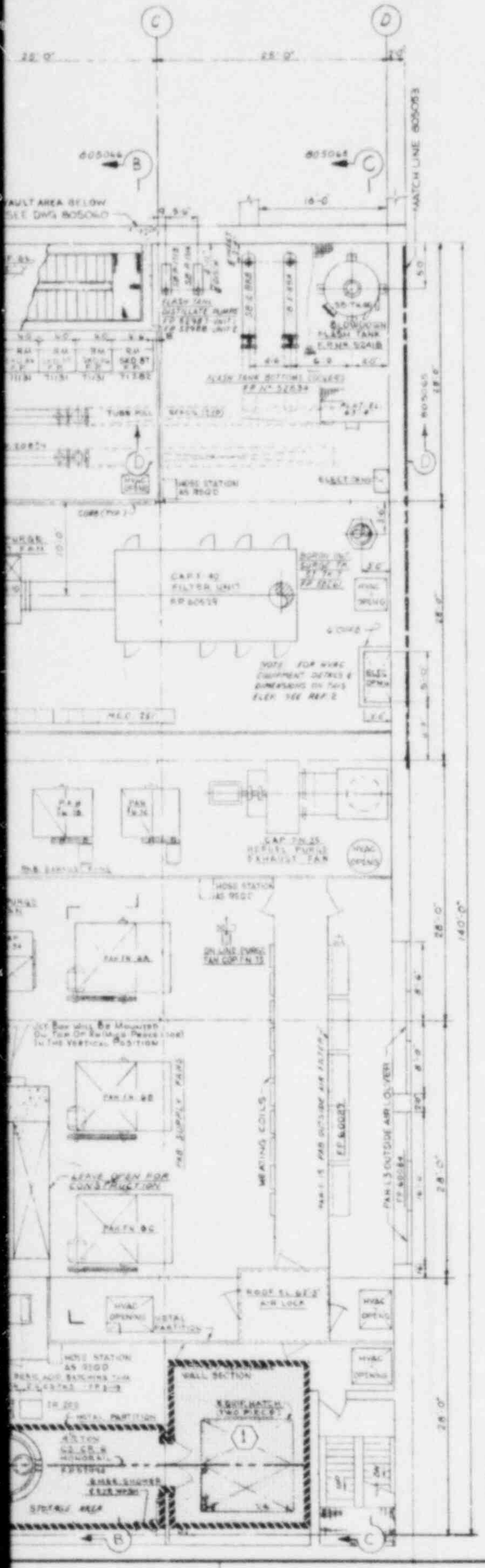
PUBLIC SERVICE CO. OF NEW HAMPSHIRE
SEABROOK STATION
united engineers

9763-F-805280

DISCIPLINE	NO. OF SHTS.	DISCIPLINE	NO. OF SHTS.
ARCH.	NA	MECH. & SHTM.	NA
STRUCT.	NA	ELECT.	NA
MECH.	NA	MECH. PIPG.	NA
NUCLEAR	NA		

9763-F-80528

N
F
A
B
COL. F
N.P. BLDG.
(UNIT 1 ONLY)
12'-0"
25'-0"
805049
805048
FOR RHR
1
2
3
4
5
6
PROPOSED STRUCTURE
PROPOSED STEEL DECK
DG-A/B JACKET
WATER COOLER
COMPONENT COOLING
HEAD TANKS
EL. 83'-0"
HOSE STATION
W/ REELS
REMOVABLE
WALL SECTION
HVAC FLOOR
OPENING W/RG
GRATING
Metal Partition
ROOF
EL. 85'-0"
HVAC FLR.
OPNG. W/GRATE
ROOF EL. 80'-1"
VALVE
AISLE
AREA
EL. 64'-0"
LADDER
ACCESS DOOR
PAB HEAT EQUIPMENT
AREA
(PUMPS & HEAT EXCHANGERS)
SEE REF. 2



PLAN AT EL. 53'-0"

SAFE LOAD PATHS:

(1) BORIC ACID BATCHING MONORAIL - HOIST CS-CR-6

GENERAL NOTES:

1. LOADS SHALL BE MAINTAINED AS CLOSE TO FLOOR AS PRACTICAL.
2. STANDARD LIFTING APPARATUS SHALL HAVE A SAFETY FACTOR OF 10 OR GREATER.

GRAPHIC SCALE (IN FEET)

ENGINEER
STATE REG. NH NO.

P.A.B. - EL. 53'-0" SAFE LOAD PATHS FOR MONORAILS

PUBLIC SERVICE CO. OF NEW HAMPSHIRE

SEABROOK STATION

united engineers

9763-F-805281