



LONG ISLAND LIGHTING COMPANY

SHOREHAM NUCLEAR POWER STATION

P.O. BOX 818, NORTH COUNTRY ROAD • WADING RIVER, N.Y. 11792

July 17, 1981

SNRC-596

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

SHOREHAM NUCLEAR POWER STATION - Unit 1
Docket No. 50-322

Dear Mr. Denton:

Enclosed herewith are 60 copies of additional information regarding SER Open Item No. 59, Control of Heavy Loads, which was previously identified as requiring clarifying information to complete NRC review.

If you require additional information or clarification, please do not hesitate to contact this office.

Very truly yours,

B. R. McCaffrey
Manager, Project Engineering
Shoreham Nuclear Power Station

CC/mh

Enclosures

cc: J. Higgins

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1/60

Item # 59 - Control of Heavy Loads

NRC letters of December 22, 1980 and February 3, 1981 requested information concerning the handling of heavy loads at Shoreham. Specifically, the reference letters requested information from operating plants via Enclosure 2 and from applicants for operating licenses via Enclosure 3. This response is intended to address only paragraph 2.1 of Enclosure 3 as required. Information required by paragraphs 2.2 and 2.3 will be provided via a separate report submitted later.

The following is provided in accordance with paragraph 2.1:

1. A review of all cranes, monorails, and hoists for the Shoreham plant was performed in order to identify those capable of carrying a heavy load (ie., greater than a fuel assembly plus handling tool, 1000 lbs) and which could impact safety related equipment if dropped.

For purposes of this analysis, the load was assumed to pass through a single structural boundary (floor) and to impact equipment located at the next lower elevation.

Only certain areas of the plant contain both safe shutdown equipment (SSE) and overhead handling systems (OHS) capable of carrying heavy loads. These areas are the reactor building, screenwell, and control building (including diesel generator areas). Overhead handling systems in other buildings are separated by extensive distances and would not impact any safe shutdown equipment or structures following a load drop.

The cranes, monorails, and hoists located in buildings containing safe shutdown equipment are tabulated in Table 1 (attached) and are defined as follows:

- a. Overhead handling systems whose failure could impact safe shutdown equipment - Group 1
- b. Overhead handling systems whose failure could not impact safe shutdown equipment - Group 2

The list identifies overhead handling systems having potentially adverse load drop consequences irrespective of probability, safety features or single protective barriers/structures.

2. As outlined in response 1 above, only overhead handling systems located in buildings containing safe shutdown equipment are considered due to the large distance and/or multiple barriers between the OHS and the SSE. An example of these are the turbine building and radwaste building cranes which are far removed from SSE in the reactor building and the control building. A heavy load drop by either of these cranes would present no consequences to essential equipment. OHS located in buildings containing SSE but which would not impact that equipment are defined as Type 2 above and in Table 1. A separate listing of Type 2 OHS including the nearest (vectorial) distance to SSE and physical barriers, if any, is presented in Table 2.
- 3.a. Equipment essential to safe shutdown (SSD) and decay heat removal is located only in the reactor building, control building, and the screenwell. The majority of the SSE in the reactor building is located below el 175-0 and is shown on Figs. 1 through 7. The spent fuel pool and the area of most heavy load operations are located at el 175-0 and are the primary areas serviced by the reactor polar crane. Note that safe shutdown would still be possible without certain equipment where sufficient time exists for manual operation. For example, valve operators for long term cooling could be manually operated even though the Motor Control Center (MCC) might be lost. However, no credit would be taken for short term operations.

Concerning SSE in the reactor building, the safe load paths where Group 1 overhead handling systems are utilized are shown on Figs. 10 and 11. These drawings outline the monorail locations above safety equipment for these areas. The designated load handling path is defined by the monorails' location since deviations would not be possible. Group 1 heavy load handling operations within the containment are generally limited to valve operator or recirculation pump motor removal. Drawings defining the monorails' locations are shown on Figs. 10 through 12.

Heavy load handling operations on el 175-0 of the reactor building are outlined on Fig. 13. These loads are generally handled by the reactor polar crane over the operating floor in a manner which passes the loads as far as practical from the spent fuel pool. The spent fuel shipping cask is the major load carried near the pool which is inserted into one corner of the pool during the spent fuel shipping operation. In addition, the cask must eventually be raised from the entrance at el 40-0 up to the operating floor. This operation requires the cask and other possible loads to

pass over certain equipment located on el 8-0 (Fig. 1), which is protected by the reinforced concrete slab at el 40-0 (Fig. 2). Handling of the cask during this operation would utilize the hatchway connecting el 40-0 to 175-0 as shown on the respective figures. A safe load path concerning movement of heavy loads by the polar crane will be established following development of the specific operating procedures. In general, the crane will not be permitted to carry heavy loads over the spent fuel pool. However, the dual load path (redundant) design will greatly limit operating restraints on load movement over other areas.

SSE in buildings other than the reactor are limited to the path of the monorails and associated hatchways at these locations.

- 3.b. Safe load handling operations on el 175-0 utilizing the polar crane will be controlled by specific administrative procedures to be provided at a later date. Safe operations at other buildings will also utilize specific procedures and will generally be limited in that load moving operations will be limited to the specific load path established by the permanent monorails. Note that load handling operations within the containment would generally require an extended interval with the reactor at cold shutdown conditions. For both Group 1 and 2 cranes, (Table 1), the primary method of safe load handling operations will be in conformance to the specific maintenance or repair procedures to be provided.

- 3.c. A listing of the overhead handling systems used in areas with safe shutdown equipment, the OHS capacity, the designated lifting device, and the weight of the load to be carried is presented in Table 1.

Specific procedures in compliance with NUREG-0612 Section 5.1.1 (2) will be provided for all Group 1 cranes outlined in the table. These procedures will be developed prior to heavy load operations whenever safe shutdown equipment is required to be operable. A list of special lifting devices used for heavy loads is provided in Table 3.

- 3.d. The lifting devices utilized in 3.c. above are separated into those utilized solely for the reactor polar crane and those used for the miscellaneous cranes and hoists. The specific devices used for the polar crane are presented in Table 3 and meet the requirements of ANSI N14-6 - 1978 or ANSI B30.9 - 1971 as applicable or meet the conservative design criteria outlined in Table 9.1.4-2 of the FSAR.

The remaining OHS generally utilizes slings and integral load connection points. The lifting slings meet the requirements of ANSI B30.9 - 1971 as appropriate.

- 3.e. The only Group 1 crane for which ANSI B30.2 - 1976 is applicable is the reactor polar crane which does meet that standard. Other miscellaneous Group 1 cranes meet the applicable requirements of the purchase specification which generally relate to ANSI B30.16 and B30.11.
- 3.f. As stated in 3.e. above, the reactor polar crane is the only Group 1 OHS required to meet ANSI B30.2 - 1976. This crane does meet the standard as well as the guidelines of CMAA specification 70.
- 3.g. Specific procedures concerning operator training, qualification, and conduct have not yet been developed for the Shoreham plant. At this time there are no planned exceptions to the requirements of ANSI B30.2 - 1976.

TABLE 1

OVERHEAD HANDLING SYSTEMS CARRYING HEAVY LOADS IN SAFE SHUTDOWN AREAS

<u>Building</u>	<u>Crane Mark No.</u>	<u>Capacity (ton)</u>	<u>Load Carried/Equipment Served</u>	<u>Approximate Weight (lbs)</u>	<u>Group</u>	<u>Crane Type</u>
Reactor	1T31-CRN-002	125/30	Note 1 (Polar Crane)	Note 1	1	Polar
	1T31-CRN-019	1.5	Varies (RB receiving area crane)	Varies	1	Mounted Jib
	1T31-CRN-037	24	Recirc Pump Motor	42,400	1	Monorail
	1T31-CRN-044	1	CRD Leveling Tray	Note 2	2	Monorail
	1T31-CRN-045	24	Recirc Pump Motor Transfer	42,400	1	Monorail
	1T31-CRN-048	1.5	CRD Repair Area Jib	Note 2	2	Mounted Jib
	1T31-CRN-078	2	CRD Pump	Note 2	1	Monorail
	1T31-CRN-079A&B	6	Equipment Hatch	Note 2	2	Monorail
	1T31-CRN-080	10	Equipment Hatch	Note 2	2	Bridge/Mono
	1T31-CRN-081	4	Equipment Hatch	Note 2	2	Bridge/Mono
	1T31-CRN-082	2	SLC Pump	Note 2	1	Bridge/Mono
	1T31-CRN-083	1	RBCLCW Repair	Note 2	1	Bridge/Mono
	1T31-CRN-084	2	Personnel Hatch (inside containment)	Note 2	1	Bridge/Mono
	1T31-CRN-085	4	HPCI	Note 2	1	Bridge/Mono
	1T31-CRN-086	2	RCIC	Note 2	1	Bridge/Mono
	1T31-CRN-087	2	CRD Leveling Tray	Note 2	2	Pad Eye
	1T31-CRN-088	1	TIP Cask	Note 2	2	Pad Eye

TABLE 1 (CONT'D)

OVERHEAD HANDLING SYSTEMS CARRYING HEAVY LOADS IN SAFE SHUTDOWN AREAS

<u>Building</u>	<u>Crane Mark No.</u>	<u>Capacity (ton)</u>	<u>Load Carried/Equipment Served</u>	<u>Approximate Weight (lbs)</u>	<u>Group</u>	<u>Crane Type</u>
Reactor (cont'd)	1T31-CRN-089	1	RWCU Repair	Note 2	2	Mounted Jib
	1T31-CRN-090	2	MSIVs(Main Steam Tunnel	Note 2	1	Monorail
	1T31-CRN-091	2	MS SRV's	Note 2	1	Monorail
	1T31-CRN-092A&B	4	MS SRV's	Note 2	1	Pad Eye
	1T31-CRN-093	1	Varies(95'Equip Trolley)	Note 2	2	Monorail
	1T31-CRN-094A&D	2	MSIV's (inside containment)	Note 2	1	Monorail
	1T31-CRN-099	1	CRD FLT.	Note 2	1	Monorail
	1T31-CRN-100	6	RWCU Hx	4.5 (NRHx)	2	Monorail
MG Room	1X39-CRN-040	18	Motor Generator	Note 2	2	Monorail
	1X39-CRN-041A	18	Motor Generator	Note 2	2	Monorail
Control	1X31-CRN-104A-F	2	Diesel Generator	Note 2	1	Monorail
	1X31-CRN-105	15	Diesel Generator	Note 2	1	Monorail
Screenwell	1U31-CRN-116	7.5	Trash Cart & Misc.	Note 2	2	Bridge Crane
	1U31-CRN-120A&B	5	Screenwash Pump	Note 2	2	Monorail

NOTE 1: List of heavy loads for Polar Crane

<u>Item</u>	<u>Weight (tons)</u>
Shield Plug -- A	103
B	87
C	97
D	76

OVERHEAD HANDLING SYSTEMS CARRYING HEAVY LOADS IN SAFE SHUTDOWN AREAS

<u>Item</u>	<u>Crane Mark No.</u>	<u>Capacity (ton)</u>	<u>Load Carried/Equipment Served</u>	<u>Approximate Weight (lbs)</u>	<u>Group</u>	<u>Crane Type</u>
	E			85		
	F			100		
Drywell Head Lift Rig				6		
Drywell Head				43		
Dryer & Separator Plugs	J			50.6		
	K			55.1 (each)		
Refueling Canal Plugs	L			7		
	M			9 (each)		
	N			9		
Rx Pressure Vessel Insulation Frame				4		
Head Stud Rack				1.5		
Rx Head Strongback				5		
Rx Pressure Vessel Head				68		
Service Platform & Support Ring				5		
Dryer & Separator Sling				2		
Steam Dryer				29		
Steam Separator				51		
Stud Tensioner & Frame				6		
Flux Monitor Shipping Crate				2.5		
Shield Plug Lifting Rig (J,K,& A-F)				9		
Spent Fuel Cask				5.8		
Cask Restraint				7		
Portable Refueling Shield				(later)		
Portable Refueling Shield Lifting Rig				(later)		
Shield Plug Lifting Rig (L,M,N)				2		

NOTE 2: Equipment weight assumed equal to crane capacity.

TABLE 2GROUP 2 OVERHEAD HANDLING SYSTEMS

<u>Building</u>	<u>Crane Mark No.</u>	<u>Function</u>	<u>Approximate Distance to SSE</u>	<u>Remarks</u>
Reactor	1T31-CRN-089	RWCU Maintenance	90 ft	To fuel pool cooling, PPs
	1T31-CRN-048	CRD Area Jib	75 ft	To CRD HCU
	1T31-CRN-079A&B	Equipment Hatch	75 ft	To CRD HCU
	1T31-CRN-080	Equipment Hatch	75 ft	To HCU
	1T31-CRN-081	Equipment Hatch	50 ft	To HCU
	1T31-CRN-088	TIP Cask	25 ft	To CRD control station
	1T31-CRN-095	el 95-0 Equip. Trolley		
	1T31-CRN-100	RWCU Heat Exchanger	15 ft & wall	To MCC
Screenwell	1U31-CRN-116	Trashcart & Misc.	75 ft & outerwall	To service water pumps
	1U31-CRN-120A&B	Screenwash pumps	30 ft & outer wall	To service water pumps
Control Room	1X39-CRN-040	MG Set	75 ft	To diesel generator
	1X39-CRN-041A	MG Set	75 ft	To diesel generator
Containment	1T31-CRN-044	CRD leveling	75 ft	To Misc. or Redundant Pg
	1T31-CRN-087	CRD leveling	75 ft	To Misc. or Redundant Pg

TABLE 3

LIST OF SPECIAL LIFTING DEVICES TO BE USED WITH POLAR CRANES

<u>Mark No. of Lifting Device</u>	<u>Equipment</u>	<u>Capacity (ton)</u>
1F11-TO-054,055	Shield Plugs K, K ₃ , K ₄ , & A-F, J	104
1F11-TO-051	Drywell Head	50
1F11-TO-056	Shield Plugs L, M, & N and the Cask Restraint	9
1F15-SH-003	Portable Refueling Shield	(later)
F13-E009 (GE)	Reactor Head Strong Back	80
- - -	Dryer & Separator Sling	52 - 194.25 in. spacing 38 - 204.5 in. spacing

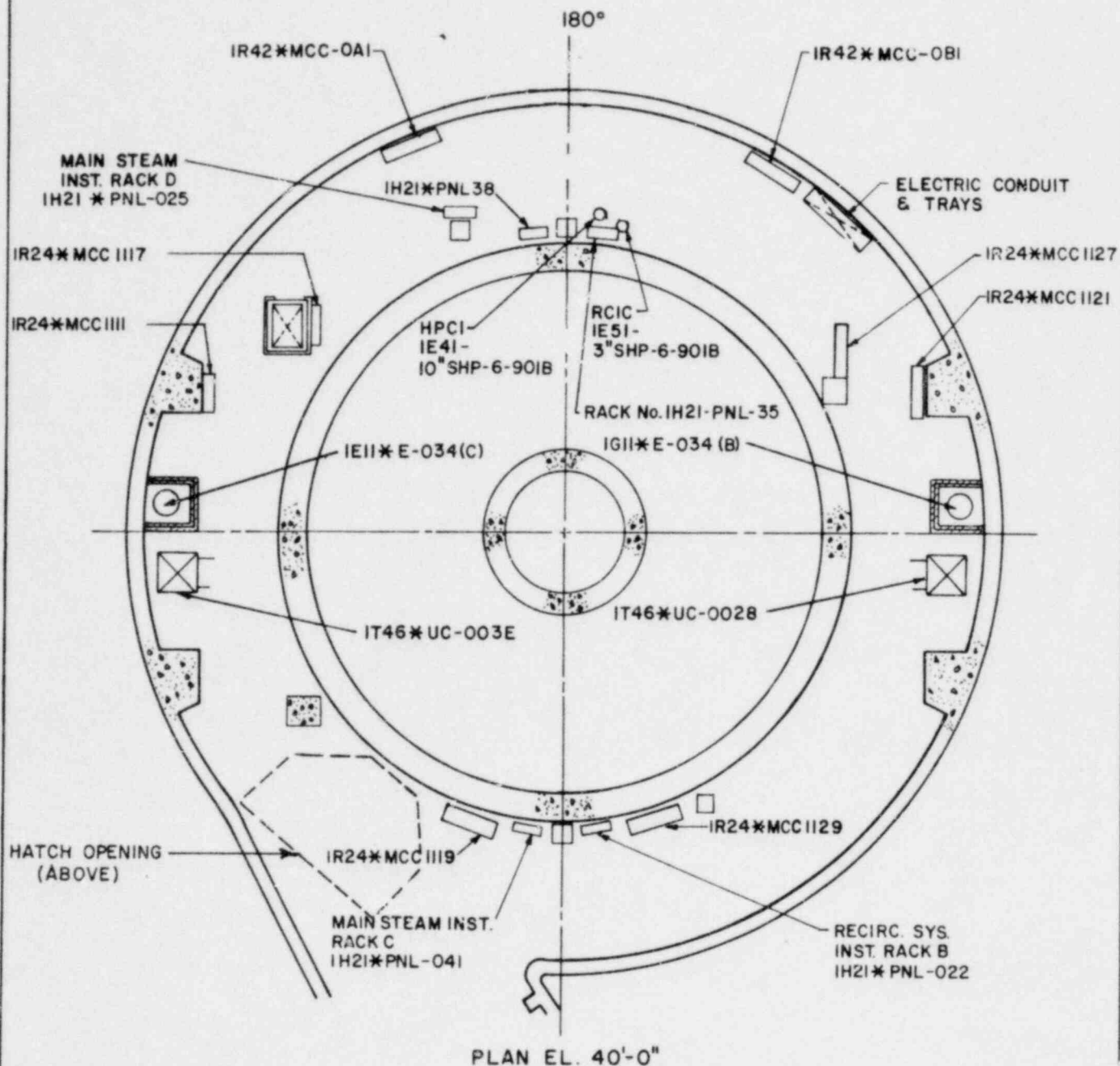


FIG. 2

PLAN VIEW-RELATIVE LOCATION
OF SAFE SHUTDOWN EQUIPMENT
EL. 40'-0"

SHOREHAM NUCLEAR POWER STATION-UNIT 1

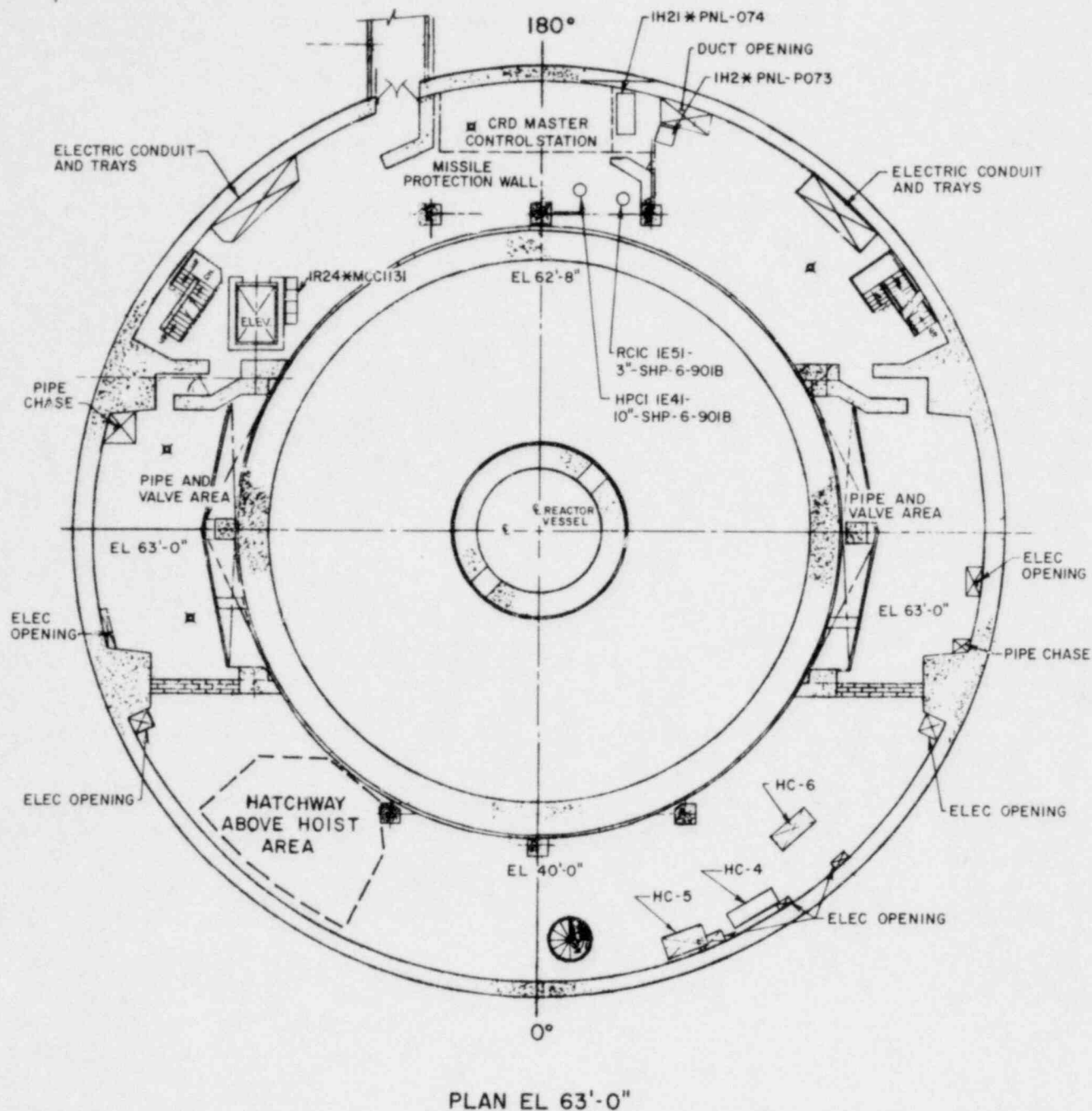
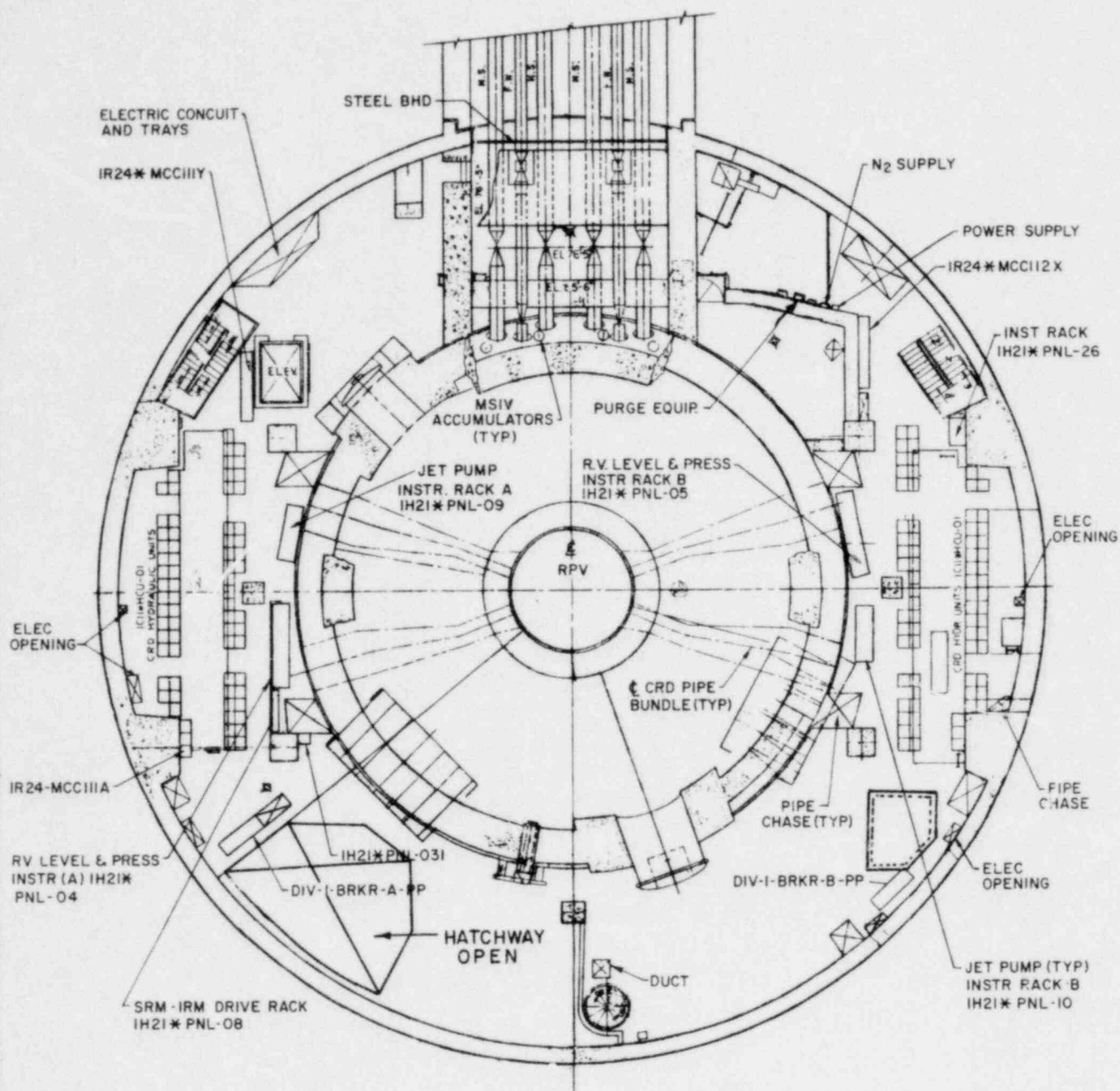


FIG. 3
 PLAN VIEW - RELATIVE LOCATION
 OF SAFE SHUTDOWN EQUIPMENT
 EL. 63'-0"
 SHOREHAM NUCLEAR POWER STATION-UNIT 1

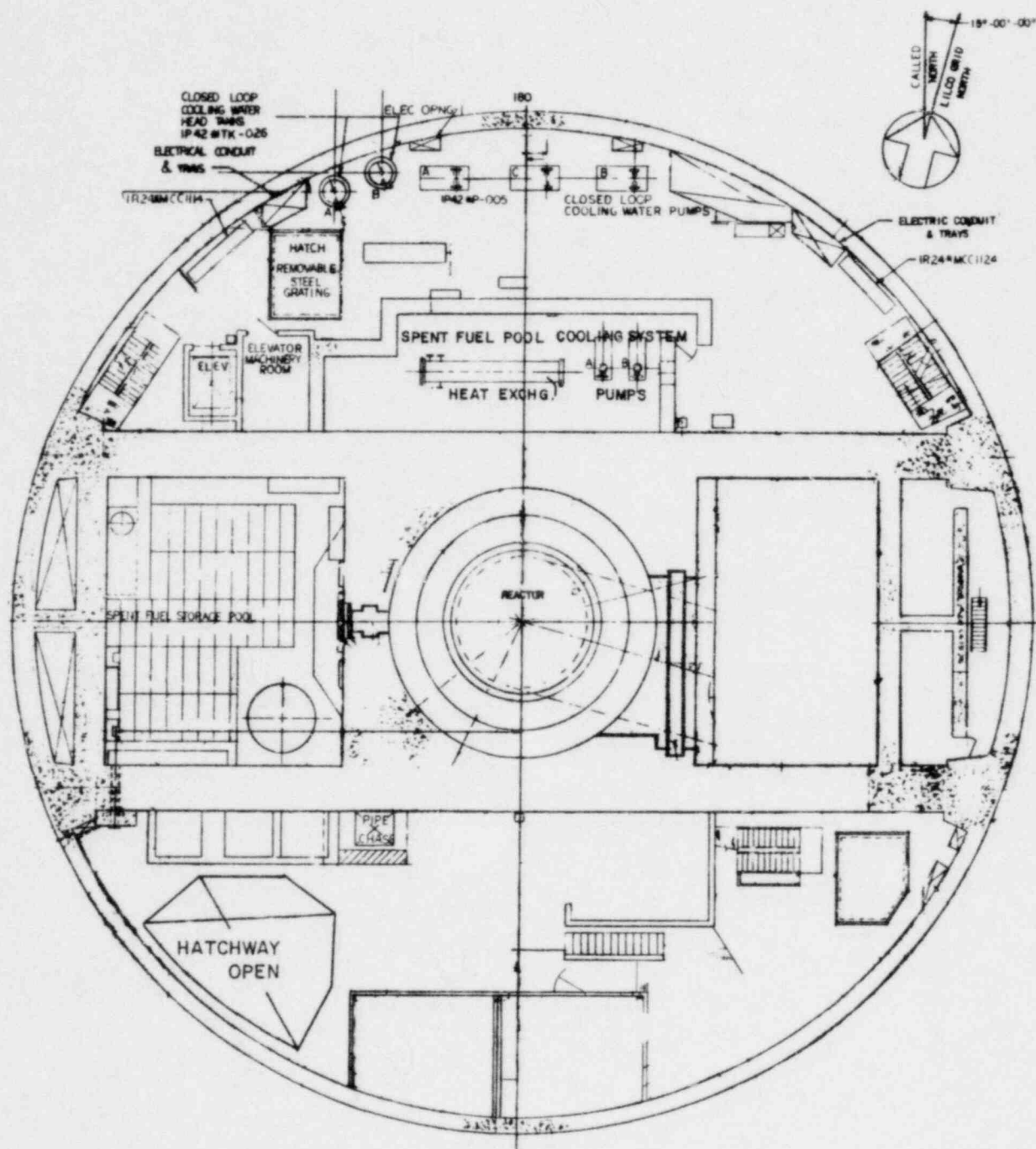


PLAN EL 78'-7"

FIG. 4
PLAN VIEW-RELATIVE LOCATION
OF SAFE SHUTDOWN EQUIPMENT
EL. 78'-7"
SHOREHAM NUCLEAR POWER STATION-UNIT 1



FIG. 5
PLAN VIEW-RELATIVE LOCATION
OF SAFE SHUTDOWN EQUIPMENT
EL. 112'-9"
SHOREHAM NUCLEAR POWER STATION-UNIT 1



PLAN EL 150'-9"

FIG. 6

PLAN VIEW-RELATIVE LOCATION
OF SAFE SHUTDOWN EQUIPMENT
EL. 150'-9"

SHOREHAM NUCLEAR POWER STATION-UNIT 1

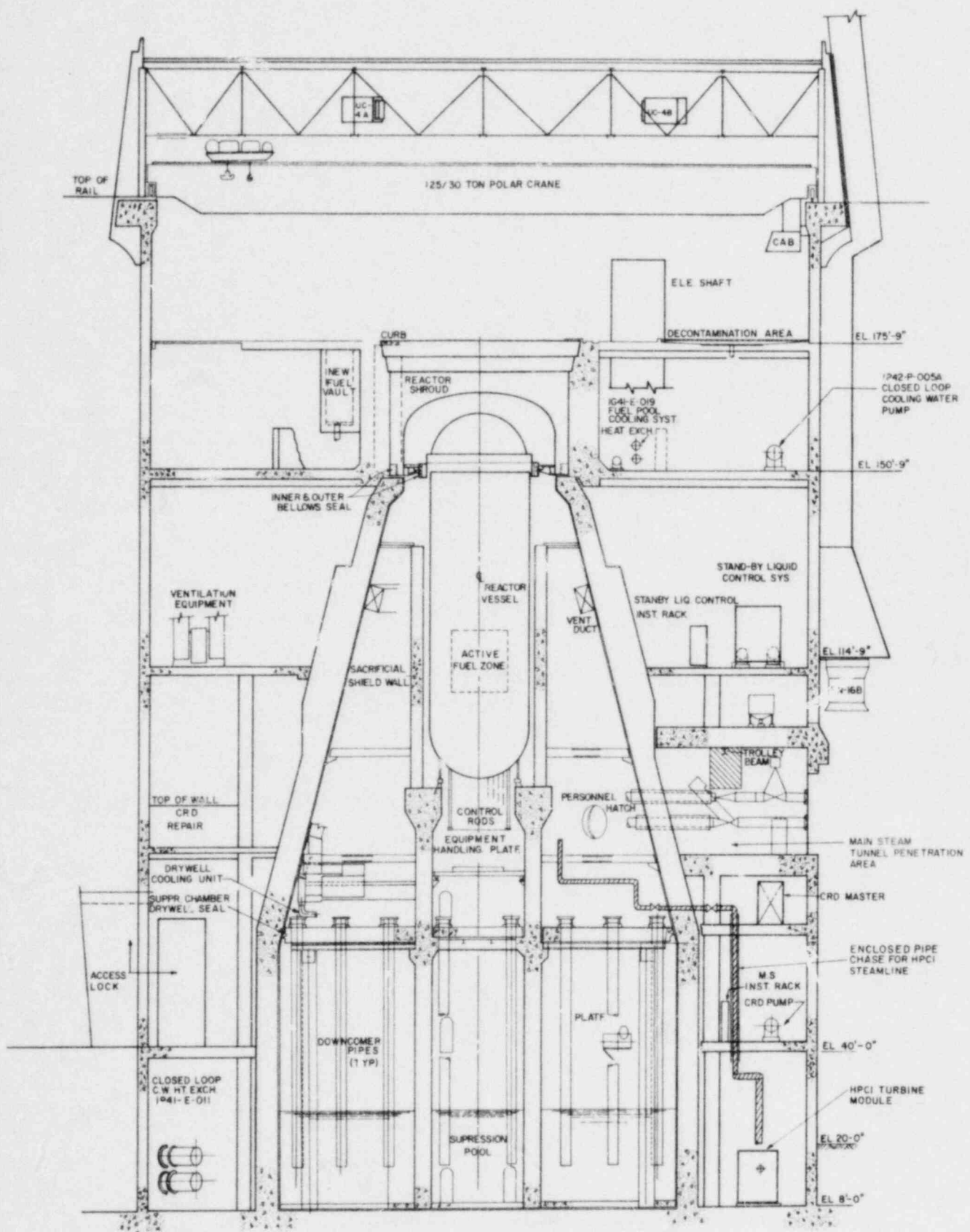
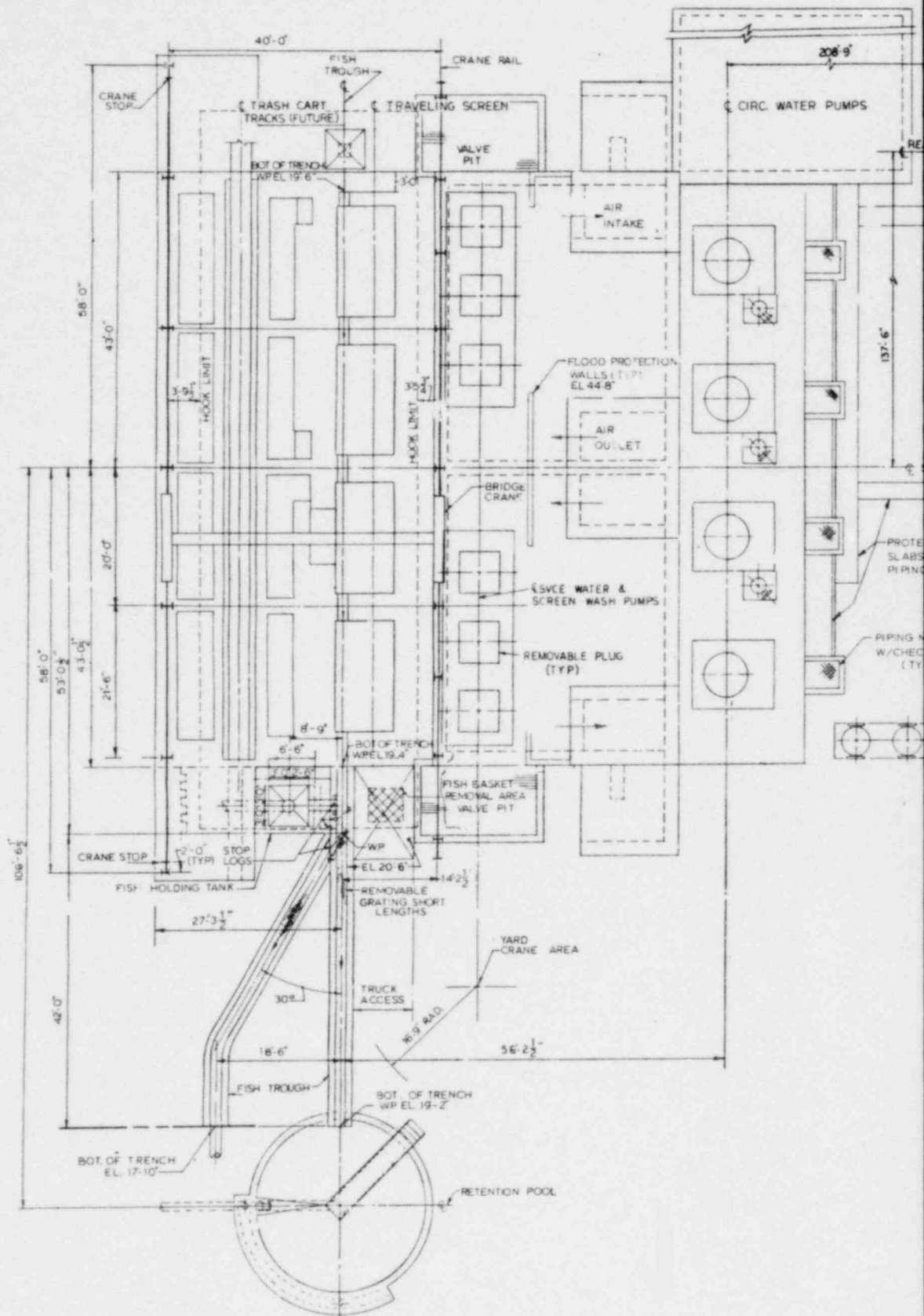
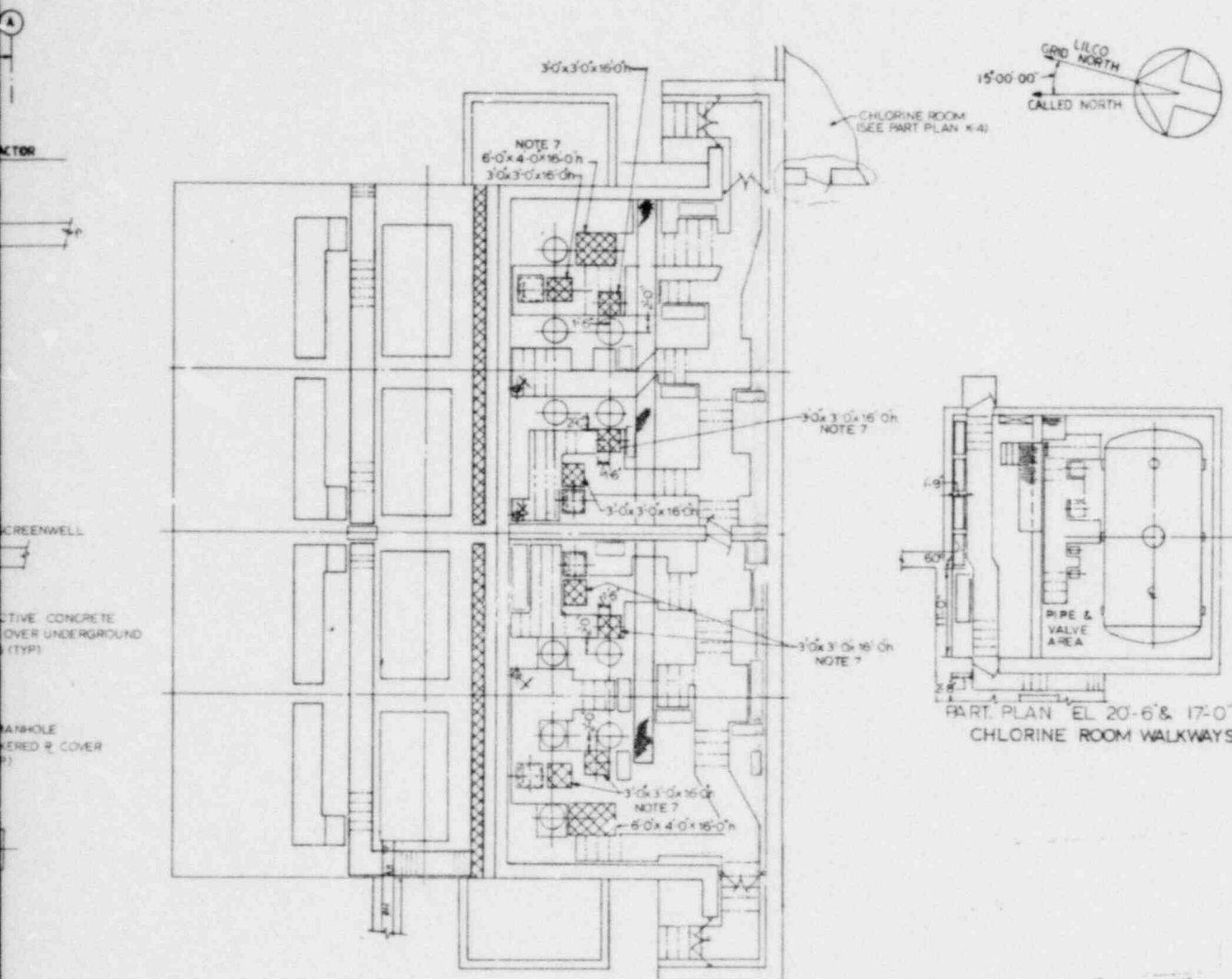


FIG. 7
ELEVATION - RELATIVE LOCATION
OF SAFE SHUTDOWN EQUIPMENT
SHOREHAM NUCLEAR POWER STATION-UNIT 1

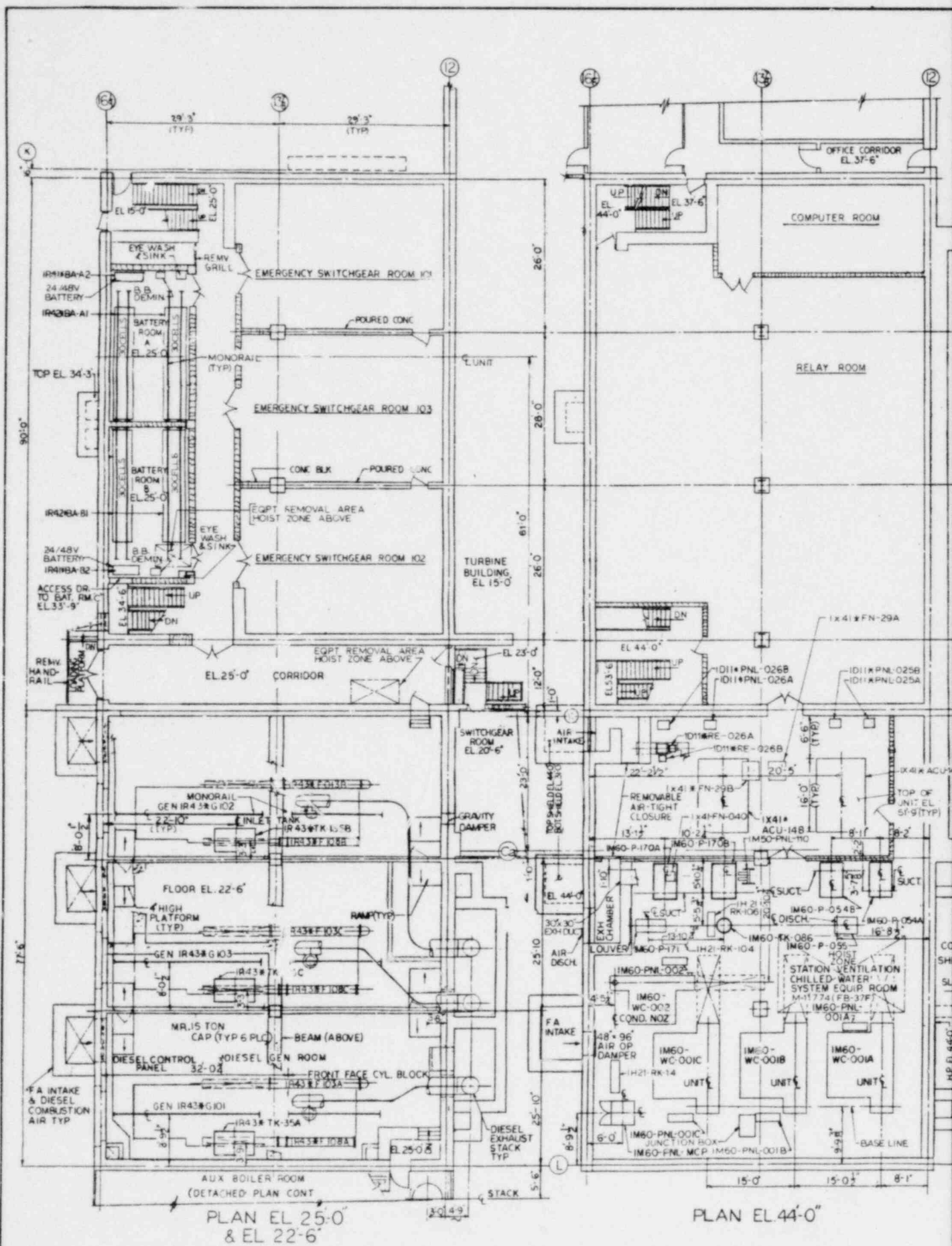




NOTES

- WALKWAY AND EOPT REMOVABLE (3'-0" WIDE BY 6'-8" HIGH UNLESS OTHERWISE NOTED)
- EOPT REMOVAL & LAYDOWN AREA DIMENSIONS INDICATE APPROX. SIZE OF SPACE ENVELOPE REQUIRED FOR EOPT REMOVAL AREA (BELOW LIFTING EYES OR MONORAIL SHOULD BE CLEAR FOR RIGGING WHICH IS NOT INCLUDED IN SPACE ENVELOPE)

FIG. 8
PLAN VIEW - SCREENWELL
SHOREHAM NUCLEAR POWER STATION-UNIT 1



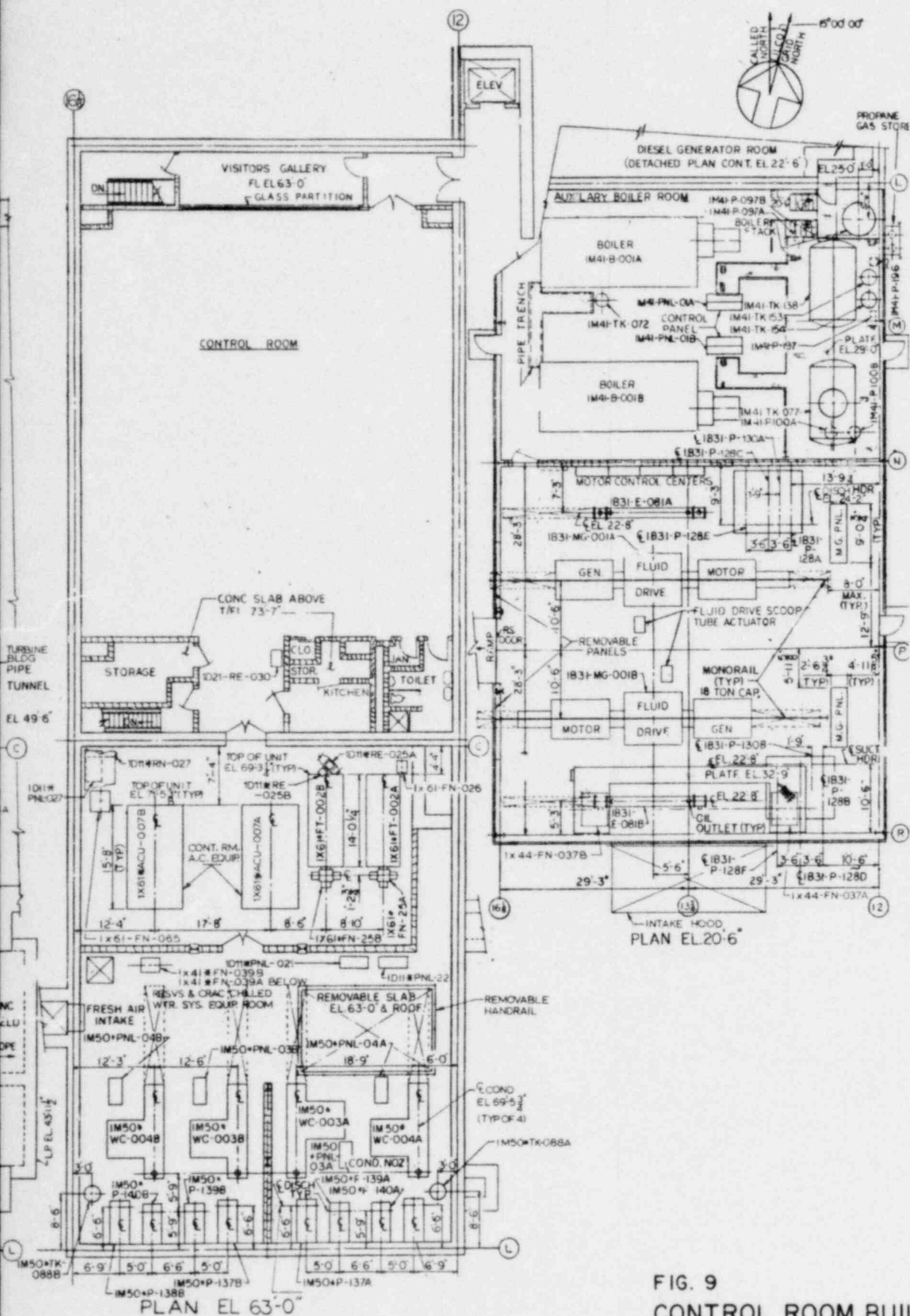
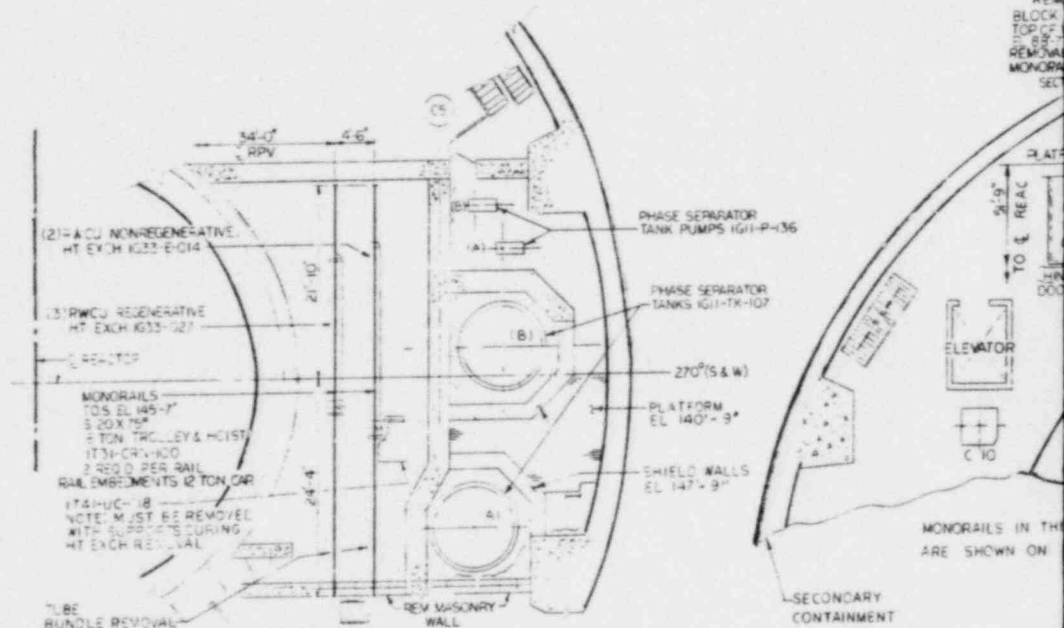
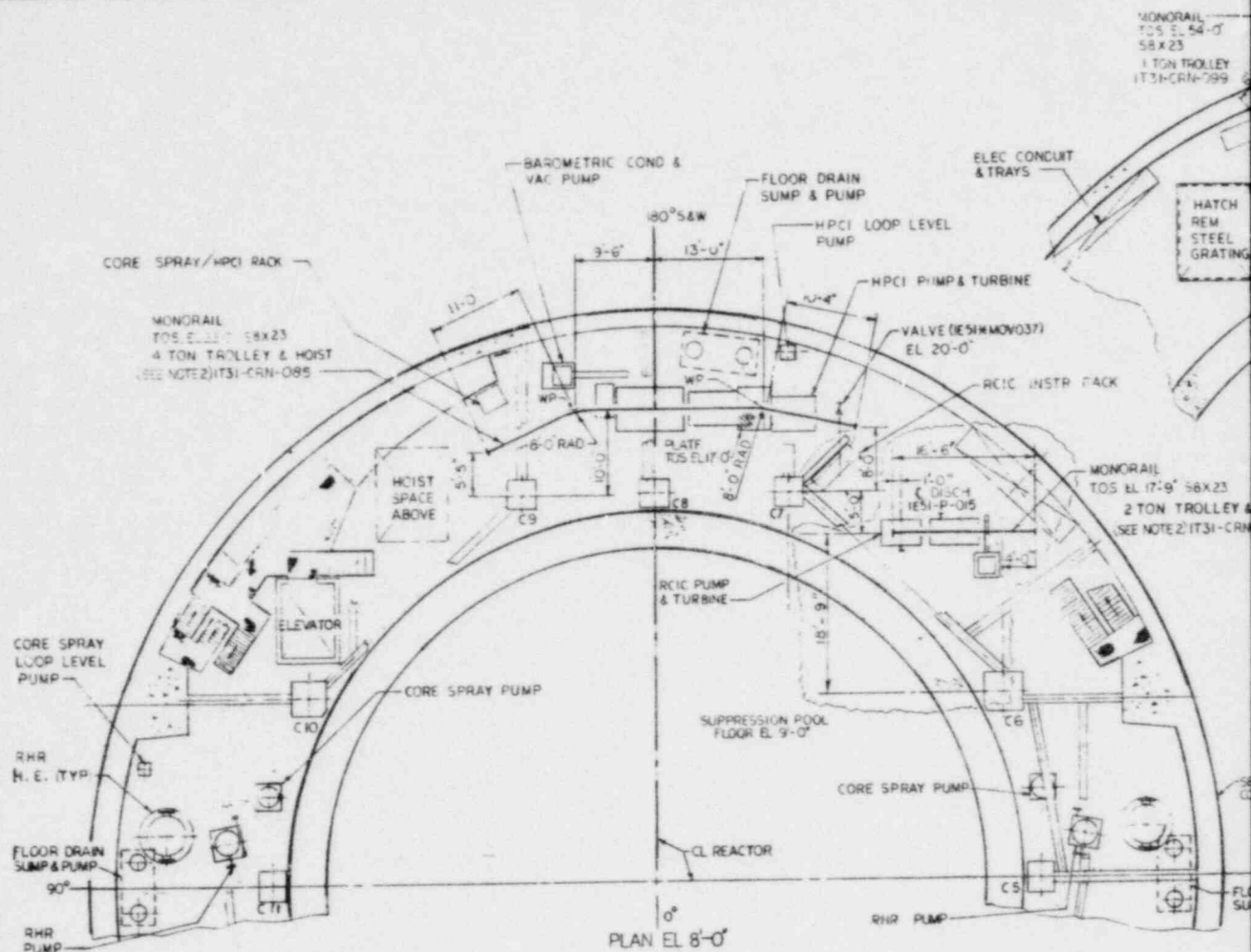
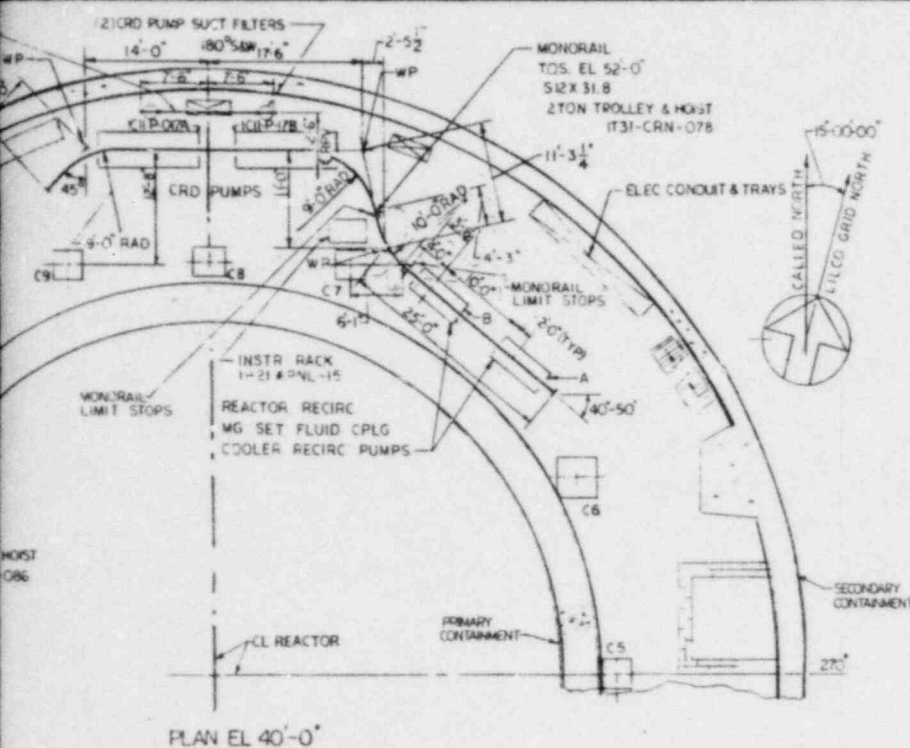


FIG. 9
CONTROL ROOM BUILDING
SHOREHAM NUCLEAR POWER STATION-UNIT 1





NOTES:

1. BEAM MUST BE WELDED IN PLACE (BOLTING WOULD NOT ALLOW CLEARANCE FOR TROLLEY)
2. MONORAILS TO BE INSTALLED PARALLEL TO C.L. OF MAIN STEAM VALVES. FIELD TO PLUMB & VERIFY POSITION
3. TWO TROLLEYS, HOISTS REQUIRED FOR EACH RAIL

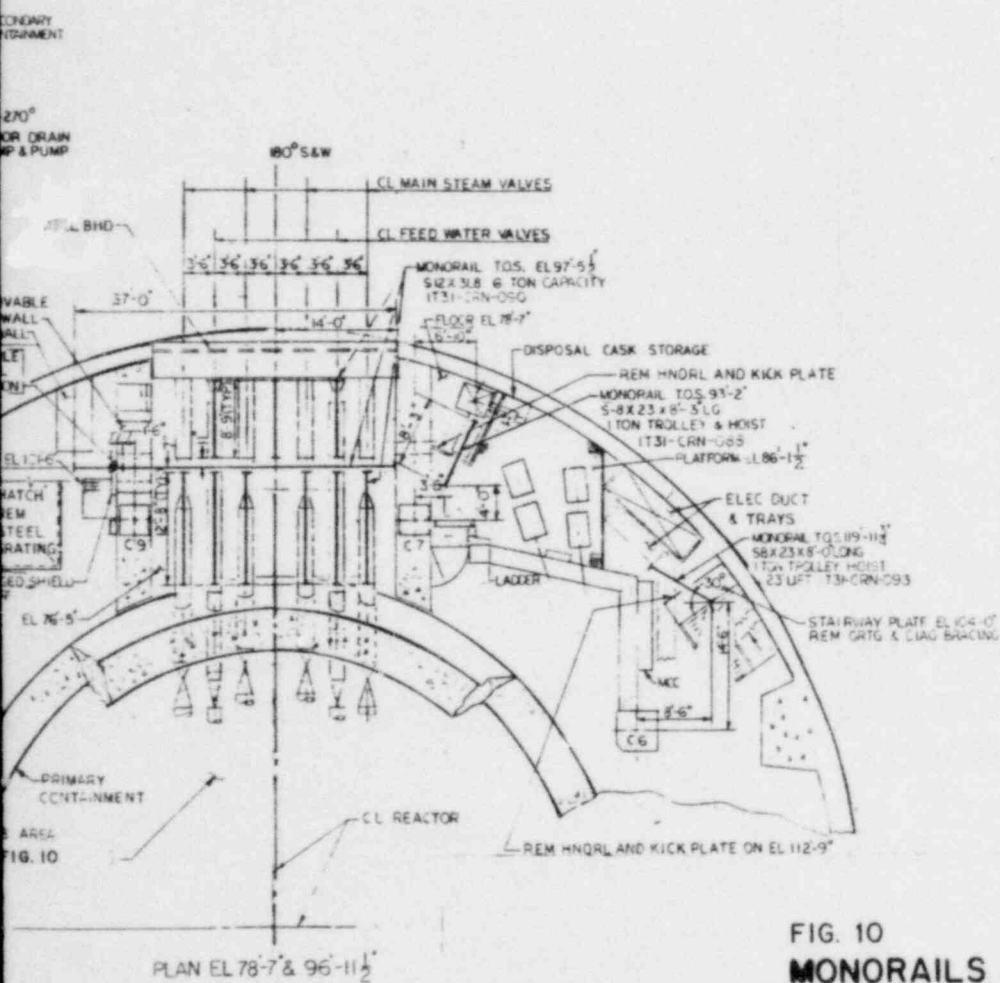
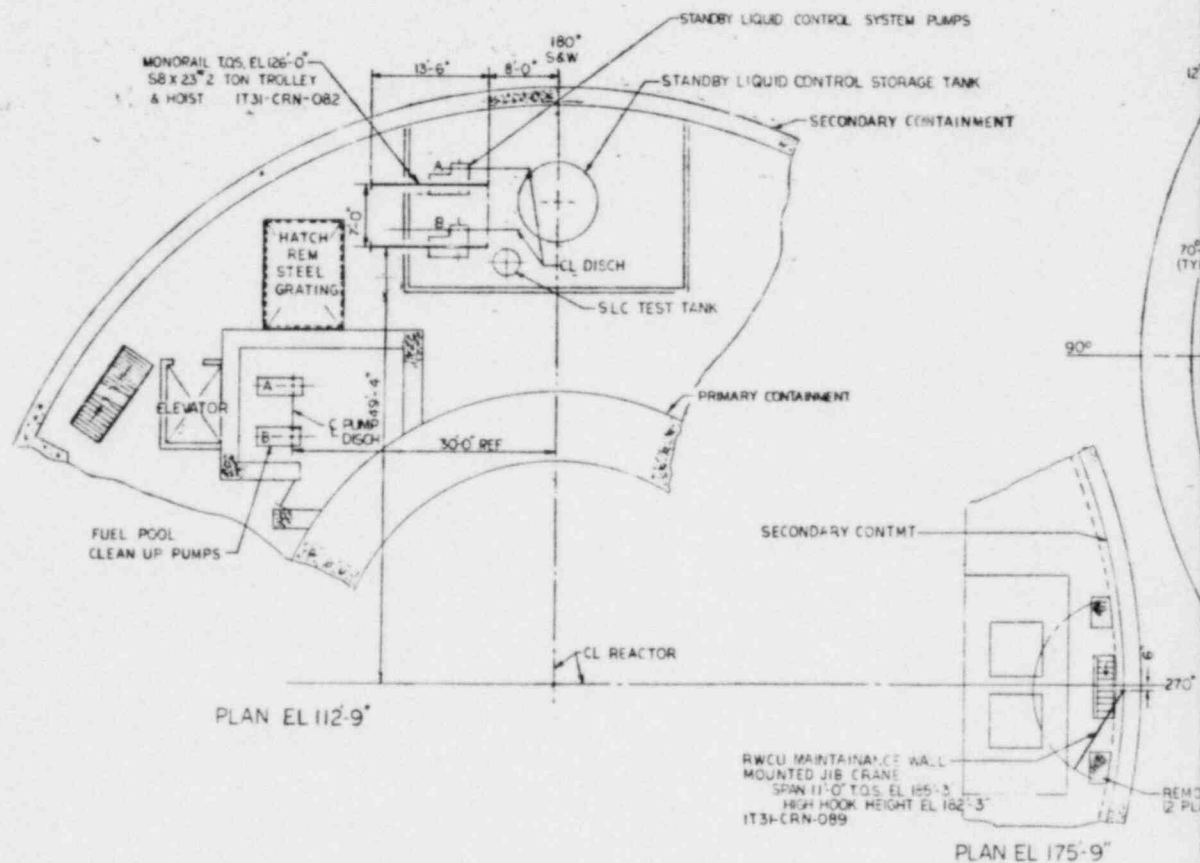
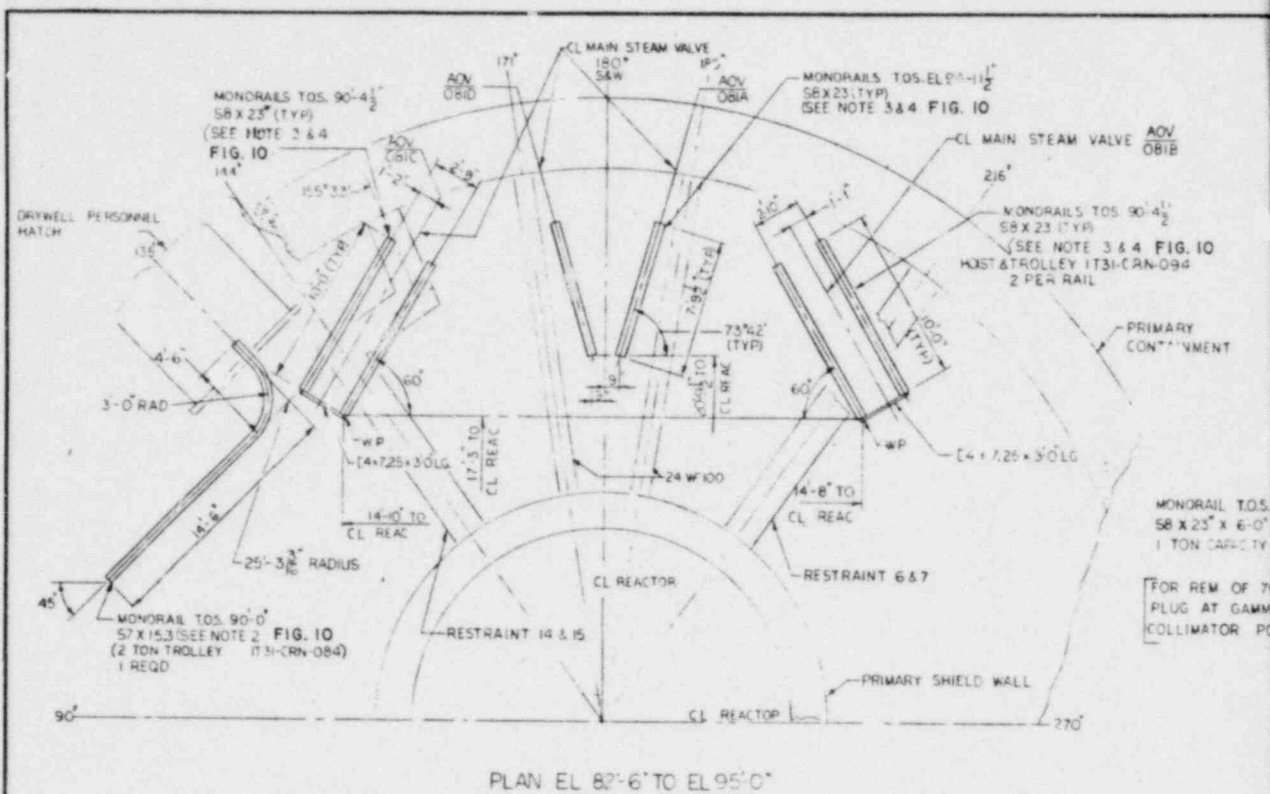
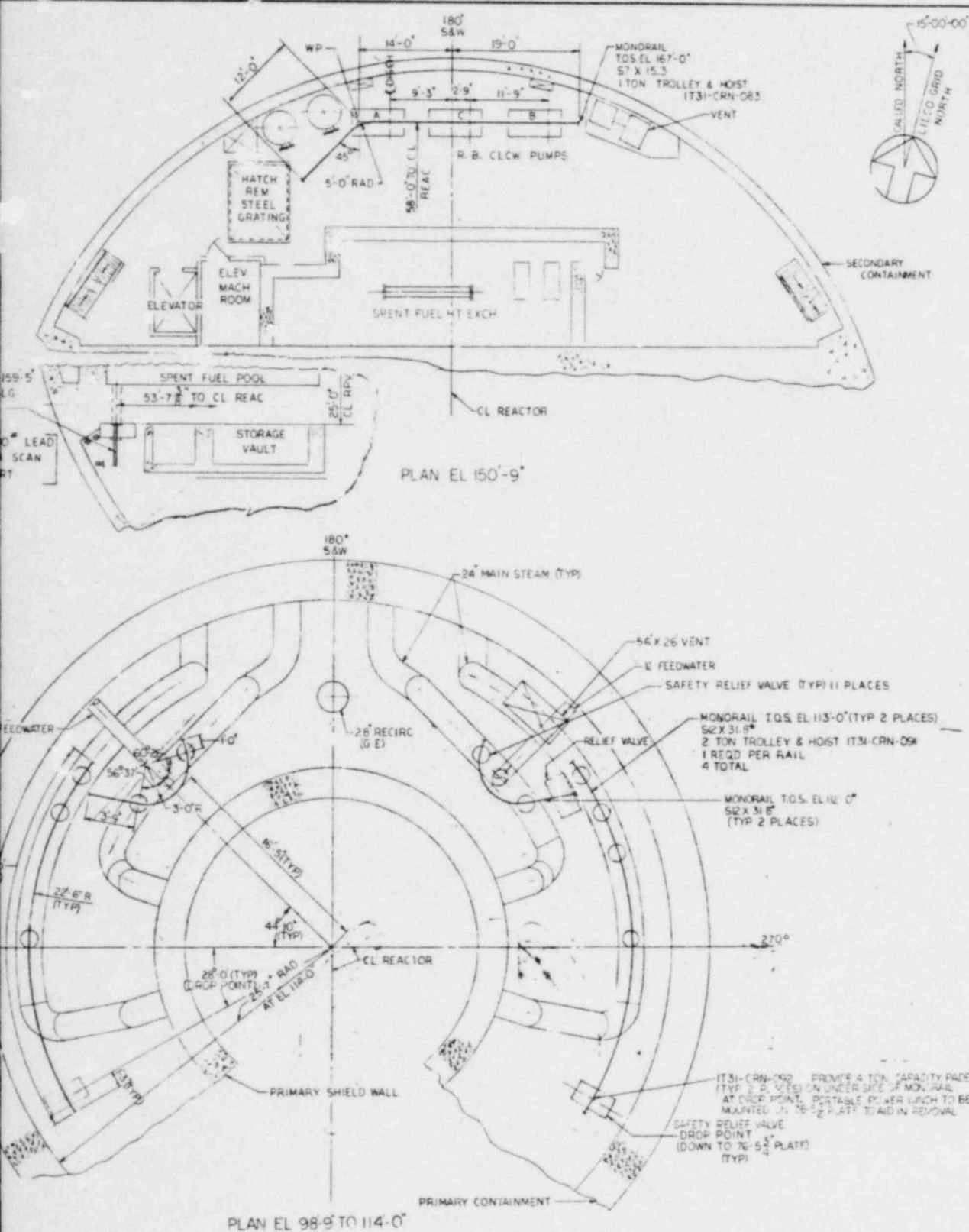


FIG. 10

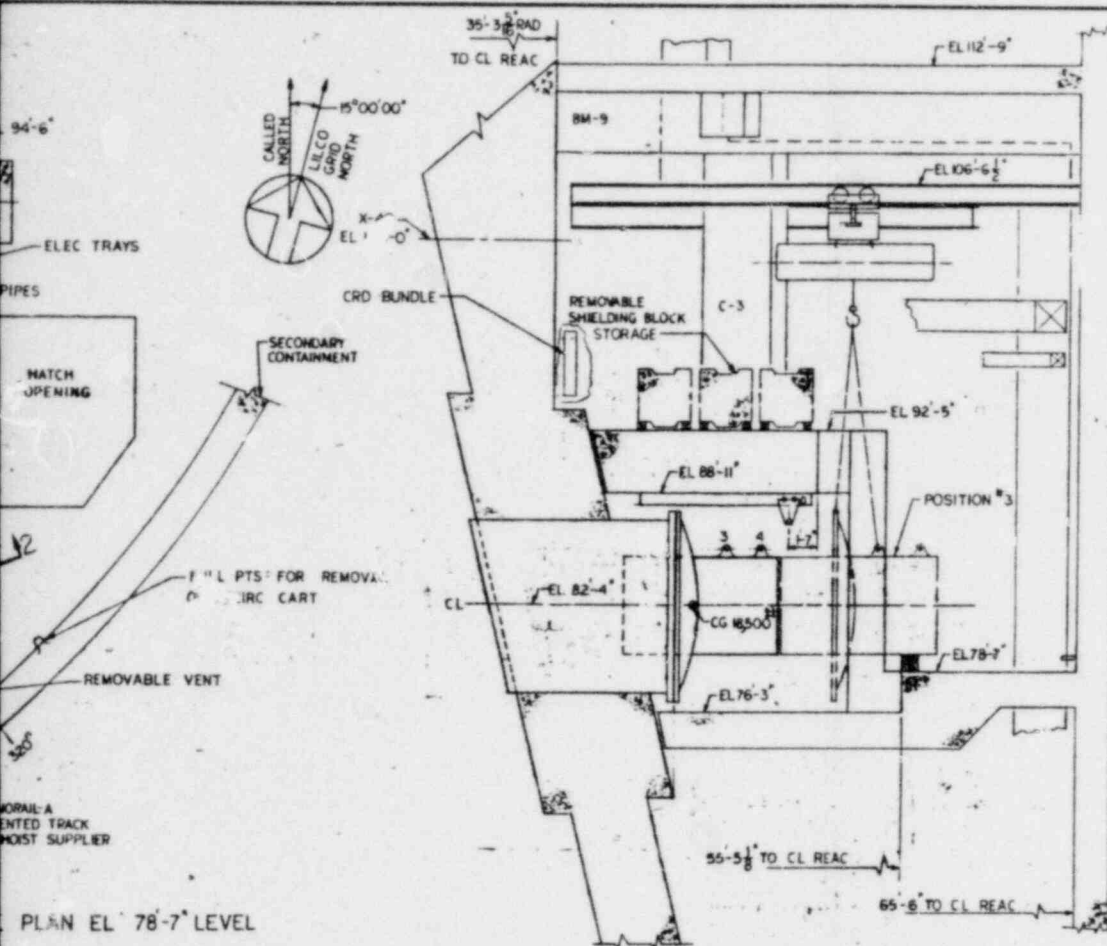
**MONORAILS ARRANGEMENT -
REACTOR BUILDING - SHEET 1
SHOREHAM NUCLEAR POWER STATION - UNIT 1**



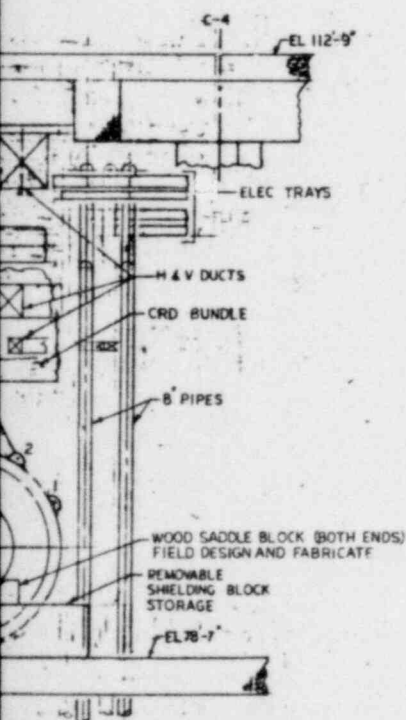


ABLE CHECKERED PLATE
(CES)

FIG. 11
MONORAILS ARRANGEMENT-
REACTOR BUILDING - SHEET 2
SHOREHAM NUCLEAR POWER STATION-UNIT 1

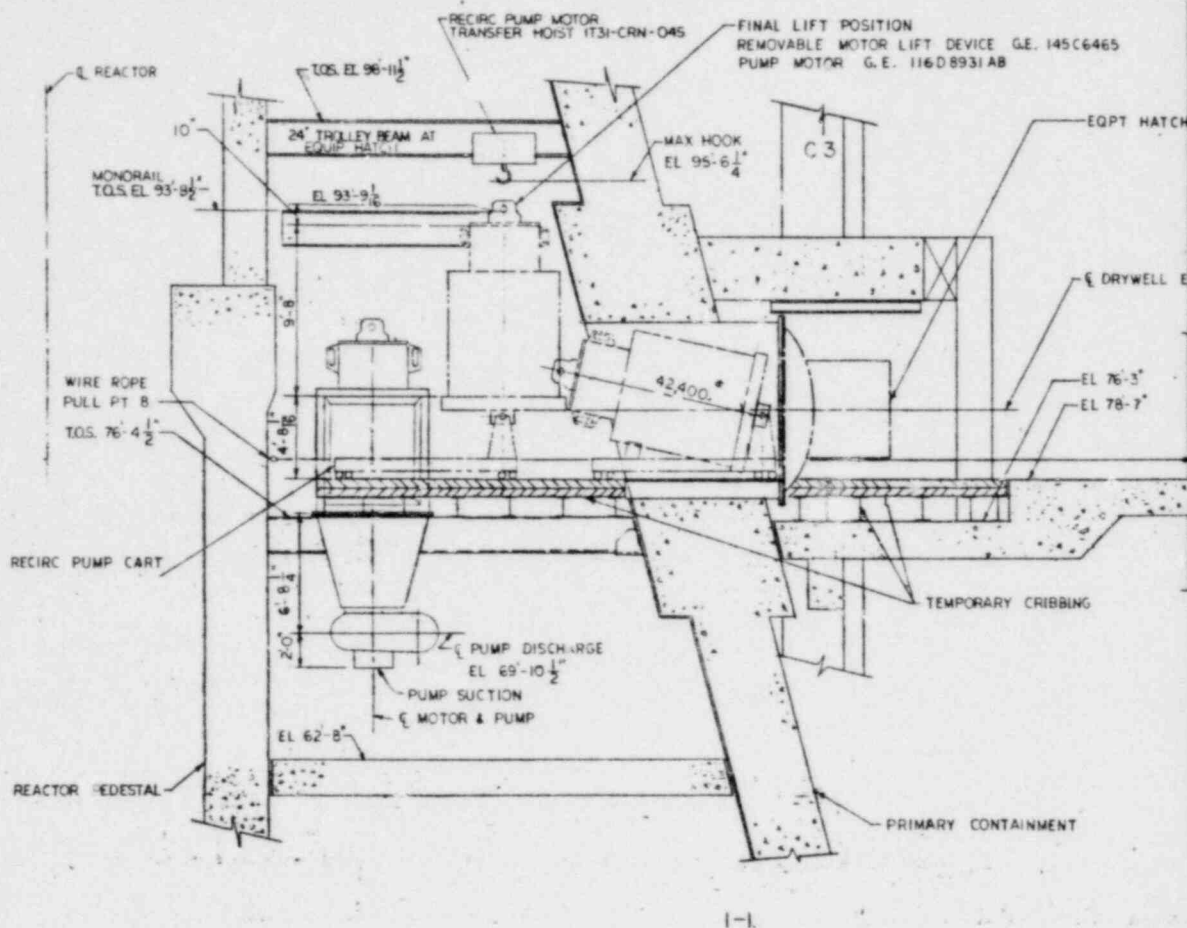


SECTION I-I
(POSITION 3 SHOWN)



- STEPS TO REMOVE EQUIPMENT HATCH
1. REMOVE 6 SHIELDING BLOCKS USING BRIDGE CRANE HOIST (CRN-080) STORE 3 BLOCKS ON ROOF AND 3 ON FLOOR AS SHOWN.
 2. CONNECT HOISTS ON CRN-079A, 8 TO LUGS #1. CONNECT TROLLEY OF CRN-081 TO LUG #3. TAKE A STRAIN ON BOTH HOISTS AND TROLLEY TO REMOVE LOAD FROM HATCH BOLTS. REMOVE HATCH BOLTS.
 3. MOVE HATCH OUTWARD UNTIL CRN-081 REACHES ITS OUTER LIMIT OF TRAVEL (POSITION #1). POSITION HOIST OF CRN-080 OVER AND CONNECT TO LUG #4. DISCONNECT CRN-081 FROM LUG #3.
 4. MOVE HATCH OUTWARD UNTIL CRN-079A, 8 REACH THEIR OUTER LIMIT OF TRAVEL (POSITION #2). PLACE SADDLE UNDER HATCH BARREL AS SHOWN AND DISCONNECT CRN-080 FROM LUG #4. MOVE CRN-080 INWARD UNTIL ITS HOIST IS OVER THE C.G. OF THE HATCH ASSEMBLY. CONNECT CRN-080 TO LUGS #2 AND LUG #3. DISCONNECT CRN-079A, 8 FROM LUGS #1.
 5. MOVE HATCH OUTWARD TO POSITION #3 AND LIFT TO CLEAR STEP AT EL 78'-7". CONTINUE TO MOVE HATCH OUTWARD UNTIL BRIDGE GIRDER OF CRN-080 LINES UP WITH MONORAIL "A". TRANSFER HOIST OF CRN-080 ONTO MONORAIL "A" AND MOVE HATCH TO SETDOWN POINT (POSITION #4). HATCH AND BARREL TO BE ROTATED MANUALLY WHERE NECESSARY.

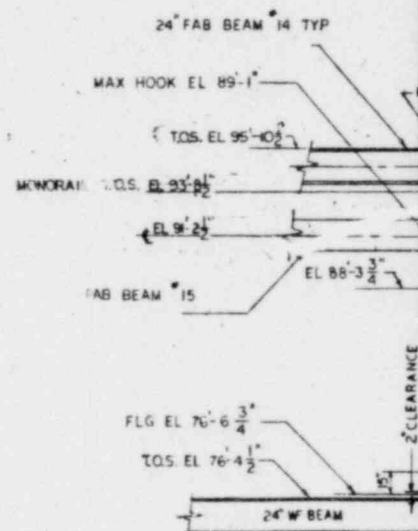
FIG. 12
DRYWELL EQUIPMENT HATCH
REMOVAL
SHOREHAM NUCLEAR POWER STATION-UNIT 1



THE FOLLOWING SEQUENCE OF OPERATIONS IS SUGGESTED FOR THE REMOVAL OF RECIRCULATING PUMP MOTORS:

NOTES:

1. DETACH PUMP, COOLING UNIT & CONDUIT BOX FROM MOTOR.
2. ATTACH LIFTING DEVICE (G.E. 14506465) AND LIFT RECIRCULATING PUMP MOTOR WITH 25 TON MONORAIL HOIST.
3. MOVE INTO POSITION AT 341\" (S.W.) AND RAISE MOTOR.
4. LOCATE 15\" HIGH TEMPORARY SUPPORTS UNDER MOTOR.
5. LOWER MOTOR, DISCONNECT MONORAIL HOIST FROM MOTOR AND MOVE HOIST AWAY FROM 341\" (S.W.).
- 6.
7. RAISE MOTOR WITH TROLLEY BEAM HOIST, REMOVE TEMPORARY MOTOR SUPPORTS AND INSTALL TEMPORARY CRIBBING.
8. MOVE VEHICLE INTO POSITION USING PULL POINT (B) AND SECURE MOTOR TO VEHICLE. (SEE W-10163)
9. REMOVE VEHICLE AND MOTOR FROM PRIMARY CONTAINMENT USING PULL POINT (S).
10. ALIGN CASTERS TO PATH (C) AND MOVE VEHICLE ALONG PATH (C) USING PULL POINT (3).
11. REALIGN CASTERS TO PATH (B) AND MOVE VEHICLE ALONG PATH (B) USING PULL POINT (2).
12. REALIGN CASTERS TO PATH (A) AND MOVE VEHICLE ALONG PATH (A) USING PULL POINT (1).
13. PICK-UP MOTOR AT POINT (R) WITH POLAR CRANE AND MANEUVER UP THRU HATCHES.



REMOVAL

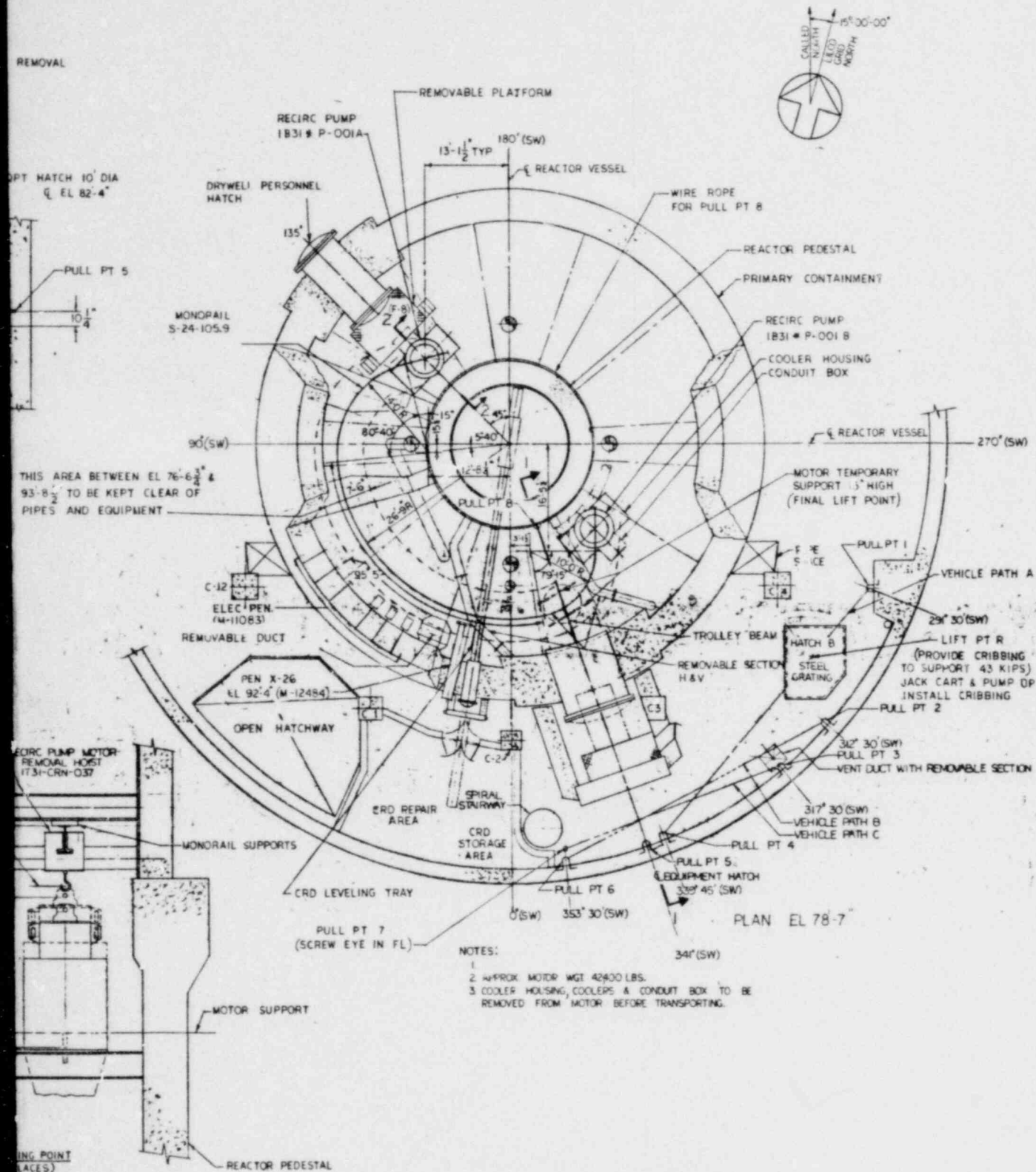


FIG. 13
RECIRCULATING PUMP MOTOR
REMOVAL
SHOREHAM NUCLEAR POWER STATION-UNIT 1

