CONTROL OF HEAVY LOADS

RESPONSE TO NRC GENERIC LETTER 81-07
FOR THE
SOUTH TEXAS PROJECT
UNITS 1 & 2

CONTROL OF HEAVY LOADS

RESPONSE TO NRC GENERIC LETTER 81-07

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UNITS 1 AND 2

REVISION 1

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FOR

SOUTH TEXAS PROJECT

UNITS 1 AND 2

REVISION 1

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Summary of Revision 1
to the
Control of Heavy Loads Report
for
South Texas Project
Units 1 & 2

On July 2, 1984 NRC transmitted copies of the Technical Evaluation Reports prepared by EG&G Idaho, Inc. for the South Texas Project Control of Heavy Loads Report (ST-AE-HL-90421). As requested by the NRC, a conference call was conducted on August 13, 1984 to discuss the comments in the Technical Evaluation Reports. The agreements reached in the conference call are reflected in Revision 1 to the Control of Heavy Loads Report for the South Texas Project. A summary of the revisions follows.

1. Comment

Confirm that the information shown on Figures 1 through 38 of the Control of Heavy Loads Report is also on plant equipment layout drawings.

Resolution

Safe Load Paths are shown on Figures 1 through 38 of the Control of Heavy Loads Report in lieu of including the Safe Load Paths on plant equipment layout drawings.

2. Comment

The method(s) of physically marking or indicating the safe load paths in the load handling area should be specified. The paths include loads handled by single failure-proof cranes.

Resolution

It is not practical to permanently mark the safe load paths in the load handling areas. Administrative controls will be used to ensure safe load paths are followed. The administrative controls will include items such as temporary markings (ropes, cones, etc.), a signalman to lead the load along the safe load path, etc.

The responses to items 2.1.3.b and 2.1.3.c have been revised to reflect this resolution.

3. Comment

The weight recognized as a heavy load at STP should be specified.

Resolution

A heavy load is defined as a load weighing more than the sum of the weights of a fuel element, a control rod, and its handling tool. Based on this criteria, a heavy load for STP is defined as 2300 lbs.

The introduction to the report has been revised to reflect this resolution.

4. Comment

The interface lift points for five heavy loads handled by the FHB overhead crane should be upgraded to meet NUREG 0612 - Article 5.1.6.

Resolution

It is Houston Lighting & Power's position that the combination of a single failure proof crane and the use of safe load paths provides adequate assurance in lieu of upgrading the interface lift points for the loads in question. These loads are not carried near the spent fuel pool or safety related equipment. If any of the loads were dropped during movement along the safe load path, no damage to safety related equipment would occur.

Item 5 of Attachment D to this report has been revised to reflect this position.

5. Comment

Information for proper evaluation of the auxiliary hook of the FHB crane is needed.

Resolution

No heavy loads have been identified for which the auxiliary hook would be used.

The response to item 2.1.3.a has been revised to reflect this resolution.

6. Comment

Mechanical stops or electrical interlocks are needed to supplement administrative control for heavy loads handled over the in-containment fuel holding pool when it contains fuel.

Resolution

The RCB Polar Crane Main Hoist will be used to move the Containment Fuel Pool Gate and Reactor Vessel Internals Lift Rig when they are moved over the in-containment fuel storage pool while fuel is stored in the pool. The Safety Factor for the RCB Main Hoist and the interfacing lift points for these loads exceeds 10/1 and is considered acceptable.

The response to items 2.2.1, 2.2.4 and 2.4.2.b has been revised to reflect this resolution.

7. Comment

Information for proper evaluation of the Containment Building Polar Crane Auxiliary Hook is needed.

Resolution

The RCB Polar Crane Auxiliary Hook meets the same design requirements as the Main Hook except with a lower capacity. It is used depending on the size of the load and other circumstances discussed in the report.

The reference to usage of the RCB Polar Crane Auxiliary Hook has been revised.

8. Comment

Complete tabular information on heavy loads subject to NUREG 0612 criteria is not provided. Either complete the tabular entries, or justify their omission.

Resolution

A note has been added to Table 1 to better explain the entries in the Table and the format of Table 1 has been revised. All the information requested is included in the Table.

CONTROL OF HEAVY LOADS

RESPONSE TO NRC GENERIC LETTER 81-07

FOR

SOUTH TEXAS PROJECT

UNITS 1 AND 2

REVISION 1

INTRODUCTION

NRC Generic Letter (GL) 81-07 requested a review of the methods of handling heavy loads at the South Texas Project (STP), the implementation of certain recommendations regarding these methods, and information to demonstrate that these recommendations have been implemented. This report provides the required information specified by Enclosure 3 of GL 81-07. Item numbers correspond to those in GL 81-07. Tables are provided which identify cranes of concern (which are defined as being capable of carrying heavy loads) their loads, lifting devices, potential targets, and locations. A heavy load is defined as a load weighing more than the sum of the weights of a fuel assembly, control rod, and a handling tool. Based on this criteria, a heavy load for STP is defined as 2300 lbs.

GENERAL REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS, SECTION 2.1 OF GENERIC LETTER 81-07

NRC STATEMENT

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 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.

ITEM NO. 2.1.1

Report the results of your review of plant arrangements to identify all overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal (taking no credit for any interlocks, technical specifications, operating procedures, or detailed structural analysis).

STP Response

HL&P has conducted a detailed review of plant arrangement to identify all overhead handling systems from which a load drop may result in damage to any system required for plant shutdown or decay heat removal. A list of the overhead handling systems identified is provided in Table 1.

Plant general arrangement drawings and the plant model were reviewed to determine if any handling system capable of carrying heavy loads could carry loads over components in systems required for safe shutdown or decay heat removal. The location of components of interest with respect to the handling systems was determined by review of general arrangement drawings, the STP Q-list (Design Criteria NQ1000) and area surveys. A brief description of the cranes identified in Table 1 is provided below.

1) Reactor Containment Building (RCB) Polar Crane: Each polar crane consists of two crane girders and a trolley. The Unit 1 main hoist has a capacity of 417 tons; the Unit 2 main hoist has a capacity of 500 tons. Both cranes have a 15-ton auxiliary hoist. Circular rails supported from the containment walls at elevation 141' support the crane girders and provide for 360° rotation. The polar cranes were manufactured by Whiting Corporation.

2) Fuel Handling Building (FHB) Overhead Crane: The fuel handling building overhead crane is located at elevation 101'. The crane trolley has a 15-ton main hoist with redundant reeving system and a 2-ton auxiliary hoist. The main hoist meets the intent of NRC Regulatory Guide 1.104. The 15/2 ton cranes were manufactured by Kranco, Inc.

3) Essential Cooling Water (ECW) Intake Structure Gantry Crane: The ECW gantry crane is located on the top deck of the ECW intake structure and travels on rails. The crane has a 20-ton capacity and is manufactured by Kranco, Inc.

4) Diesel Generator Building (DGB) Overhead Cranes: The three DGB overhead cranes each have a capacity of 3 tons and each is located over a diesel generator train. The cranes are manufactured by Crane Hoist Corp.

5) Monorails: Monorails are used throughout the plant and have hoist capacities from 0.5 tons to 7.5 tons.

ITEM NO. 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.

STP Response

Table 2 identifies overhead handling systems capable of carrying heavy loads which have been excluded from the item 2.1.1 and the justification for their exclusion. These exclusions were developed during the review described in the previous section.

ITEM NO. 2.1.3

NRC STATEMENT

With respect to the design and operation of heavy-load-handling systems in the containment and the spent-fuel-pool area and those load-handling systems identified in 2.1.1, above, provide your evaluation concerning compliance with the guidelines of NUREG 0612, Section 5.1.1. The following specific information should be included in your reply.

Item 2.1.3.a

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

STP Response

Table 1 identifies cranes that operate in the containment or the spent fuel pool area or that travel over equipment required for safe shutdown or decay heat removal. The fuel handling machine and refueling machines located in the FHB and RCB, respectively, have been excluded from this study because their heaviest load, a single spent fuel element, control rod and handling tool, is by definition not a heavy load.

The location of safe load paths, spent fuel and safety-related equipment of concern for these cranes are identified on Figures 1 through 38. Safe load paths are described in Attachment A.

The safe load paths follow, where practical, structural floor members, beams etc.; such that, if the load is dropped, the structure is more likely to withstand the impact.

The FHB overhead crane's 15-ton main hoist has been designed to meet the intent of Regulatory Guide 1.104, Rev. 0, i.e., single-failure-proof cranes. No heavy loads have been identified for which the Auxiliary Hoist would be used; therefore, this hoist is not addressed in this report. Although the designation of safe load paths is not necessary for this crane since its single-failure-proof design provides adequate assurance that a load drop will not occur, Attachment A also includes descriptions of the load paths for this crane.

Should changes to the safe load paths become necessary through design evaluation or operating constraints, revised safe load paths will be established and incorporated into plant procedures in accordance with the guidelines used to establish the initial safe load paths.

Item 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.

STP Response

Procedures will be prepared to cover requirements to move heavy loads over safe load paths. Load paths will be explicitly defined in the procedures. Additionally, procedures will require the use of techniques to ensure that safe load paths are followed, for example, marking the path with cones or ropes or having a signalman lead the load. Deviations from established load paths will require written alternatives which have been approved by the plant safety review committee.

Item 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).

STP Response

Table 1 provides a tabulation of heavy loads to be handled by each crane including load identification, load weight, and designated lifting device.

A procedure is being developed to cover handling of these heavy loads. This procedure will include:

1. Identification of required equipment,

2. Inspection and acceptance criteria required prior to load movement,

3. The steps and proper sequence to be followed in handling the load,

4. The safe load path,

5. Administrative controls to ensure the safe load path is followed, and

6. Other special precautions.

Item 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 B30.9-1971 as appropriate. For lifting devices where these standards, as supplemented by NUREG 0612, Section 5.1.1(4) or 5.1.1(5), are not met, describe any proposed alternatives and demonstrate their equivalency in terms of load-handling reliability.

STP Response

Description

The special lifting devices are identified in Table 1 and are described below.

1. Reactor Vessel Head Lift Rig Assembly

The individual items that comprise the lifting assembly used to handle the reactor vessel head are an integral part of the integrated head package (IHP). The IHP is a system that combines the head lifting rig, control rod drive mechanism (CRDM) seismic supports, lift rods, reactor vessel missile shield, CRDM cooling system, and the power and instrumentation cabling (Figures B-1 and B-2) into an efficient one-package reactor vessel head design. The IHP is permanently mounted on the reactor vessel head and helps to minimize the time, manpower, and radiation dosage associated with head removal and replacement during refueling.

The lift rods, missile shield, and seismic tie rods comprise the CRDM seismic support system. The cooling shroud combined with the lift rods, missile shield, and cooling fans comprise the CRDM cooling system. The lift assembly consists of the lift rig, missile shield, lift rods, and the intermediate attachments. The upper internals lift rods are used in the rapid refueling mode to lift the upper internals along with the Reactor Vessel Head. The evaluation in this report only concerns the items of the IHP and upper internals lift rods that are utilized during the lifting and lowering of the reactor vessel head and upper internals. The major components that are used for lifting are:

a. Lift Rig

The reactor vessel head lift rig is a four-legged carbon steel structure approximately 7 feet high weighing about 8,800 pounds permanently attached to clevises on the missile shield. During lift of the IHP, a load cell linkage connects the rig to the polar crane.

b. Missile Shield

The missile shield is a 5-inch thick circular carbon steel plate about 12-1/2 feet in diameter weighing about 30,000 pounds. It is attached to four lift rods that extend down to the reactor vessel head and has four welded lugs which attach to the lift rig.

The missile shield prevents any missiles that may be ejected from atop the reactor vessel head from penetrating other reactor coolant system pressure boundaries and/or the containment structure.

The missile shield provides seismic support for the CRDM's. Extensions on the CRDM rod travel housings protrude through holes in the missile shield plate, limiting the displacement of the housings during a seismic occurrence. The missile shield is in turn attached to the seismic tie rods, which are attached to clevices on the refueling cavity walls.

The missile shield serves as a spreader for the head lift rig, and transfers the reactor vessel head load to the lift rig during lift of the head. Only the latter function is considered in this report.

c. Lift Rods

Four carbon steel solid, 5-1/2 inch diameter lift rods 25 feet long, weighing about 2000 pounds each, extend from the head up to the missile shield. The rods are threaded into bosses on the reactor vessel head and are bolted to the missile shield. These rods support the missile shield and serve as a seismic support. They also transfer the head load during a head lift from the head to the missile shield. Only the latter function is considered in this report.

d. Upper Internals Lift Rod Assembly

The upper internals lift rod assembly consists of three 3-3/4 inch diameter stainless steel rods, 14 feet long, extending from the upper internals flange through a penetration on the reactor vessel head. The rods are permanently bolted to the upper internals flange and bolted with a removable nut to the vessel head penetration. When the plant is not in a "rapid refueling" mode, these rods are disconnected from the head.

2. Reactor Vessel Internals Lift Rig

The internals lift rig (Figure B-3) is a three-legged carbon and stainless steel structure, approximately 30 feet high and 14 feet in diameter weighing approximately 21,000 pounds. It is used to handle the upper and lower reactor vessel internals packages. It is attached to the main crane hook for all lifting, lowering, and traversing operations. A load cell linkage is connected between the main crane hook and the rig to monitor loads during all operations.

The internals lift rig is attached to the internals package by means of three rotolock studs which engage three rotolock inserts located in the internals flange. These rotolock studs are manually operated from the internals lift rig platform using a handling tool which is an integral part of the rig. The studs are normally spring retracted upward and are depressed to engage the inserts. Rotating the mechanism locks it in both positions.

3. Load Cell And Load Cell Linkage

The load cell is used to monitor the load during lifting and lowering to ensure no excessive loadings occur. The unit is a load sensing clevis type, rated at 700,000 pounds.

This load cell is a part of the load cell linkage which is an assembly of pins, plates, and bolts that connect the polar crane main hook to the lifting blocks of both the reactor vessel head and the internal lift rigs.

4. Reactor Coolant Pump Lifting Device

A special lifting device for the reactor coolant pump motor is being purchased from Westinghouse. It will consist of a spreader assembly to provide equal lift at four points. The specific design for STP is still pending.

Summary of Results

The reactor vessel head lift rig assembly, internals lift rig, load cell and load cell linkage generally meet the intent of the ANSI N14.6-1978 requirements for design and manufacture. The assembly and detailed manufacturing drawings and purchase order documents contain requirements equivalent to design specifications. The multi-functional items of the head lift rig assembly (a Class 1 support) have a design specification. Some exceptions are taken to the ANSI N14.6 requirements for acceptance testing, maintenance, and verification of continuing compliance.

The reactor coolant pump special lift device will be built to ANSI N14.6 requirements.

A stress report has been prepared for these devices, excluding the RCP lifting device, and a summary of the applicable results is included in Attachment B. The ANSI N14.6 criteria for stress limits associated with certain stress design factors for tensile and shear stresses are satisfied.

These devices were manufactured under Westinghouse (and in some instances, ASME Code) surveillance with identified hold points, procedure review, and personnel qualification which meet the related ANSI requirements. A 125 percent load test was performed on the head lift rig assembly, the upper internals lift rods, the internals lift rig, load cell and load cell linkage. The load test was performed at a fabricators shop and was followed by the appropriate non-destructive testing.

Exceptions to ANSI N14.6 and the justification of present design acceptability are presented in Table 3.

Slings may be used throughout the plant to lift equipment. All slings will be procured to the requirements of ANSI B30.9-1971 as modified by NUREG 0612. The rating identified on the sling will be in terms of the "static load" which produces the maximum static and dynamic loads. Where this restricts sling use to certain cranes, the slings will be clearly marked as to the cranes with which they may be used.

Item 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 the proposed alternative.

STP Response

A procedure has been approved which covers the inspection and testing of all plant cranes. This procedure is based on the requirements of ANSI B30.2-1976, Chapter 2-2, ANSI N45.2.2-1972, OSHA 2206 (29CFR1910), and the Manufacturers Instruction Manuals.

All preventative and corrective maintenance will be performed using procedures which invoke ANSI B30.2-1976, Chapter 2-2.

Item 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.

STP Response

The design of the Polar Cranes, the FHB 15/2 overhead cranes and the ECW gantry cranes comply with the guidelines of CMAA-70 and Chapter 2.1 of ANSI B30.2-1976.

The criteria in CMAA-70 is not directly applicable to the DGB crane because it is a top running single girder overhead crane. The design of this system was compared to the guidelines of CMAA-74 "Specification for Top Running and Under Running Single Grider Electric Overhead Traveling Cranes." The crane meets the requirements of CMAA-74 and Chapter 2.1 of ANSI B30.2-1976.

Because the criteria in CMAA-70 and ANSI B30.2 are not directly applicable to monorails and their hoists, the design of these handling systems was compared to the guidelines of ANSI B30.11-1973 "Monorail Systems and Underhung Cranes" and ANSI B30.16-1973 "Overhead Hoists". All of the monorails identified in Table 1 were designed to meet these guidelines.

Item 2.1.3.g

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

STP Response

HL&P takes no exceptions to ANSI B30.2-1976, Chapter 2-3, "Qualifications for Operators."

SPECIFIC REQUIREMENTS FOR OVERHEAD HANDLING SYSTEMS
OPERATING IN THE VICINITY OF FUEL STORAGE POOLS,
SECTION 2.2 OF GENERIC LETTER 81-07

NRC STATEMENT

NUREG 0612, Section 5.1.2, provides guidelines concerning the design and operation of load-handling systems in the vicinity of stored spent fuel. Per the guidelines, information provided in response to this section should 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 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.

ITEM NO. 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.

STP Response

The Fuel Handling Building Overhead Crane and the Containment Polar Crane are the only cranes capable (ignoring interlocks, movable mechanical stops, or operating procedures) of carrying heavy loads which could, if dropped, land or fall into a spent fuel pool. The type, capacity, and equipment designator are identified in Table 1.

The Polar Crane is considered in this section because the STP design includes an in-containment fuel pool for temporary fuel holding capability during refueling.

ITEM NO. 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.

STP Response

The Cask Handling Crane and the New Fuel Area Bridge Crane were excluded from the response to Item 2.2.1 because they are incapable of carrying heavy loads within 15 feet of the FHB pool boundary. The new fuel area crane is located at a level below the spent fuel pool. The rail for the Cask Handling Crane stops at the edge of the cask loading pool, more than 25 feet from the pool boundary. The fuel handling machine and refueling machine were excluded because they do not carry heavy loads. There are several monorails located in the FHB and in the Containment. However, these monorails are located at levels below the spent fuel pools and are not considered in Item 2.2.1.

ITEM NO. 2.2.3

Identify any cranes listed in 2.2.1, 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 of GL 81-07.

STP Response

The FHB overhead crane design makes the likelihood of a load drop extremely small for all loads based on the fact that it is designed to meet the intent of RG 1.104. The information requested in Attachment 1 of the generic letter is provided in Attachment D of this report.

During refueling it may be necessary to move the containment fuel pool gate and/or the Reactor Vessel Internals Lift Rig over the in-containment fuel pool while it contains fuel. If this need arises, the polar crane main hoist will be used (capacity 417 tons for Unit 1, 500 tons for Unit 2). As the two loads in question are 8,520 lbs. and 21,000 lbs., greater than a 10/1 safety factor is maintained. Additionally, the interfacing lift points on these two loads exceed the 10/1 safety factor criteria.

ITEM NO. 2.2.4

For cranes identified in 2.2.1, 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 GL 81-07. 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.

STP Response

For Polar Crane loads not categorized in 2.2.3 administrative controls will prevent movement while spent fuel is stored in the containment fuel pool with the following exception.

At inservice inspection intervals requiring removal of the lower internals from the vessel (once every 10 years), the internals are moved to the adjacent lower internals storage stand. It is not reasonable to postulate the movement of this load over the fuel pool.

SPECIFIC REQUIREMENTS OF OVERHEAD HANDLING SYSTEMS OPERATING IN THE CONTAINMENT, SECTION 2.3 of GENERIC LETTER 81-07

NRC STATEMENT

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 evalution criteria of NUREG 0612, Section 5.1, Criteria I through III.

ITEM NO. 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.

STP Response

The Polar Crane is the only crane physically capable (i.e, taking no credit for any interlocks or operating procedures) of carrying heavy loads over the reactor vessel. Its type, capacity and designator are identified in Table 1.

ITEM NO. 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.

STP Response

There are no cranes physically capable of passing over the vessel area which were excluded from Section 2.3.1.

ITEM NO. 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 1 of GL 81-07.

STP Response

There are no single-failure-proof cranes in the Reactor Containment Building.

ITEM NO. 2.3.4

NRC STATEMENT

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 demonstrated in your response to Section 2.4 of GL 81-07. 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.

ITEM NO. 2.3.4.a

Where reliance is placed on the installation and use of electrical interlocks or mechanical stops, indicate 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.

STP Response

To prevent loads from being carried over the reactor vessel, the polar crane will be equipped with an interlock to prevent the trolley from moving within a given radius of the reactor vessel (the zone of the interlock is shown in figure 38). Heavy loads that are required to pass within the interlock zone (with or without the head in place on the vessel) are the upper and lower internals, the in-service inspection rig, the integrated head package, the stud carrier rack containing twelve studs, nuts, and washers, the stud tensioners, and the Internals Lift Rig.

The polar crane is used only during shutdown and refueling. Once the integrated head package is removed, the only loads required to be carried through the interlock while fuel is in the vessel are the internals lift rig which is required to change the O-rings and the upper internals if they are removed separately from the IHP.

The interlocks are active at all times unless bypassed by key. The bypass will be in effect as long as the key is inserted. The key cannot be removed without reactivating the interlock.

An integrated head package (IHP) drop analysis which is applicable to STP was performed by Westinghouse and submitted to the NRC by Westinghouse letter NS-CE-1101 dated June 11, 1976 on the RESSAR-41 docket. This analysis determined that dropping the head would not result in an unacceptable degree of core damage. It received NRC approval on November 30, 1976.

The internals lift rig is shown on figure B-3. It is 14 feet in diameter and 30 feet high. Because of its size and shape it is impossible for it to hit the fuel. The effects of a drop of this rig onto the vessel are enveloped by the Westinghouse Head Drop Analysis since the rig is much lighter than the IHP.

The effects of a drop of the upper internals are also enveloped by the Westinghouse Head Drop Analysis.

The lower internals and inservice inspection rig are moved only when all the fuel has been removed from the vessel.

The key to the vessel interlock will be under the control of the refueling director. The interlock will be bypassed to remove the IHP. Once the IHP is removed from the vessel and clears the area above the vessel, the interlock will be restored. During rapid refueling, bypass will only be permitted for replacement of the O-rings. During nonrapid refueling bypass will be permitted to remove the internals as well. The interlock will be bypassed to replace the IHP.

Administrative & Testing Requirements

The key for bypassing the vessel interlock of the polar crane will be controlled by the refueling director and released only upon proper authorization. Procedures will also control the use and bypass of the interlock; additional technical specifications are not warranted.

The interlock boundaries will be tested before the interlocks are bypassed and following replacement of the IHP. The tests will be run without load on the crane hook.

<u>ITEM NO. 2.3.4.b</u>

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.

<u>STP Response</u>

For the Polar Crane, reliance is placed on other site specific considerations only for the movement of the lower internals and the inservice inspection rig. Movement of these loads is performed once every 10 years and will only occur after all the fuel has been removed from the vessel. Consequently bypassing the interlock at this time poses no hazard to the fuel.

Movement of loads over the in-containment fuel pool is discussed in response to item 2.2.4.

Since the lower internals are never removed and the inservice inspection rig is never used while fuel is in the vessel, no additional administrative, physical controls, or technical specifications over those described in section 2.3.4.a are required for these items.

ITEM NO. 2.3.4.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 of GL 81-07, as appropriate, for each analysis performed.

STP Response

The Polar Crane meets Criteria I to III. The Westinghouse head drop analysis covers compliance for all large loads less than 636,000 lbs.

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,
SECTION 2.4 OF GENERIC LETTER 81-07.

NRC STATEMENT

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.

ITEM NO. 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 of GL 81-07.

STP Response

There are no single-failure-proof cranes capable of passing over equipment required for safe shutdown, core decay heat removal or spent fuel pool cooling.

ITEM NO. 2.4.2

NRC Statement

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.

ITEM NO. 2.4.2.a

The presentation in a matrix format of all heavy loads and potential impact areas where damage might occur to safety-related equipment. Heavy load 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.

STP Response

Table 1 presents the crane, crane type, crane capacity in tons, loads, load weight, lifting device, potential targets and target locations.

Note that the targets identified are specific to a crane or monorail and are not specific to a particular load.

ITEM NO. 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 vided, present details showing the areas where crane travel . .l 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.

STP Response

Table 1 includes categories for elimination as follows:

SR - separation and redundancy
IL - interlocks
SS - site specific
AN - analysis
SF - single-failure proof crane
NA - not required for safe shutdown, decay heat removal, or spent fuel cooling

STP has been designed to ensure that redundant safety-related trains are provided with adequate separation and protection to ensure their continued function following a wide variety of events and conditions. This report also considered the consequences of floor failures where there is an intervening floor(s) between the load and the target.

Justification for the elimination of load/target combinations are provided below.

A. Containment Building

Containment will not be entered to perform heavy maintenance or for refueling operations until safe shutdown is achieved. The following targets will not be needed for core decay heat removal.

Main Steam Piping
Reactor Coolant Pumps
Steam Generators
HVAC Ducting
Cable Tray
Pressurizer
Hydrogen Recombiner

The RHR system is the only operating system directly required for the maintenance of cold shutdown.

1. Polar Crane Loads/RHR System

Three trains of RHR are provided, only one of which is required for decay heat removal. If a load must be moved over an RHR train when both redundant trains are not available (i.e., other train(s) are inoperable, or a load drop could impact all operable trains), the polar crane main hoist will be used in conjunction with adequate interfacing lift points to ensure that greater than a 10/1 safety factor is provided.

Administrative procedures will provide operational restraints to prevent movement of, or potential for damage to, components in another plant area (CCW pumps, ECW pumps, SI Piping in Containment El. - 2') associated with the operating RHR system(s); no additional technical specifications are warranted.

2. RCFC Fan/SI Piping (to RHR System Train A Heat Exchanger)

Administrative procedures will state that in the event the RHR system associated with this piping is the only operating RHR system, a move over this component will not be permitted; no additional technical specifications are warranted.

3. RHR Pumps, Pump Motors/RHR Piping, Pumps and Heat Exchangers

These combinations (monorail lifts) can be eliminated because of redundancy, separation and operational restrictions as stated above.

B. Mechanical Electrical Auxiliary Building

1. CCW Pumps, Pump Motors, Supplementary Coolers/CCW Piping and Pumps

These load/target combinations can be eliminated because of redundancy and separation. Three trains are provided (each uses a separate monorail and is in a separate room). Two are needed for achieving shutdown and only one for decay heat removal. Administrative procedures will address operational restrictions as described in 2.4.2.b - A-1; no additional technical specifications are warranted.

2. Charging Pump Components, Supplementary Coolers/Charging Pump Piping and Pumps

These interactions can be eliminated by redundancy and separation. Two pumps, in separate rooms using separate monorails, are provided. Only one is required.

3. Hatch Covers/Letdown Filters, Seal Water Injection Filter, Seal Water Return Filters, Reactor Coolant Filters

These targets are not essential for safe shutdown or decay heat removal.

4. Hatch Covers/Boric Acid Tanks

Two Boric Acid tanks are provided. Safe shutdown can be achieved with one. The tanks are separated such that no load drop could impact both tanks.

5. Hatch Covers/CVC Cation Bed Demineralizers and CVC Mixed Bed Demineralizers

These targets are not essential for safe shutdown or decay heat removal.

C. Fuel Handling Building

Safety Injection (SI) System Components, Containment Spray System Components/Safety Injection Pumps, Containment Spray Pumps

These combinations are eliminated because of redundancy and separation. Each set of pumps (1 High Head SI, 1 Low Head SI, 1 Containment Spray) uses a separate monorail and is sufficiently separated from the other sets. Additionally, administrative procedures will state that a set will be isolated before a lift of any of its components is attempted during operation.

The administrative controls identified will be implemented by plant procedure; no additional technical specifications are warranted.

D. Diesel Generator Building

The load/target combinations in the Diesel Generator Building are eliminated because of separation and redundancy. Each of the three separate rooms has its own crane and a load drop on one generator cannot impact the others.

E. Essential Cooling Water Intake

The load/target combinations at the ECW Intake are eliminated because of separation and redundancy. Additionally, administrative procedures will state operational restrictions as described in 2.4.2.b-A-1; no additional technical specifications are warranted.

ITEM 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 of GL 81-07.

STP Response

All interactions have been discussed in 2.4.2.b.

ITEM NO. 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.

STP Response

All interactions have been discussed in 2.4.2.b.

REFERENCES

1. George, H., Control of Heavy Loads of Nuclear Power Plants Resolution of Generic Technical Activity A-36, NUREG 0612, July, 1980.

2. WCAP - 10215 "Evaluation of the Acceptability of the Reactor Vessel Head Lift Rig Assembly, Reactor Vessel Internals Lift Rig, Load Cell and Load Cell Linkage to the Requirements of NUREG 0612 for Houston Lighting and Power Company, South Texas Project Electric Generating Station".

3. NS-CE-1101 dated June 11, 1976, "Consequences of Dropping the Upper Package During A Refueling."

TABLE 1
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
Reactor Containment Building (RCB) Polar Crane Unit 1 7C101NCP101A (417/15)	Reactor Vessel Internals Lift Rig	21,000	Load Cell Linkage	Mainsteam Piping	68/ Figure 16, 18, 19	NA
	Lower Internals	131,000	Internals Lift Rig	RC Pump	52/ Figure 16	SS, NA
RCB Polar Crane Unit 2 7C102NCP201A (500/15)	Load Cell Linkage	3,000	None	Vessel	68/ Figures 16, 18	SS, IL
	Containment Fuel Pool Gate	8,520	None	Steam Generators	102/ Figures 16, 18, 19	NA
	Reactor Coolant Pump Flywheel	16,500	RCP Lift Device	HVAC Ducting	120/ Figures 16, 18, 19	NA
	Reactor Coolant Pump Motor	97,600	RCP Lift Device	Cable Trays	68/ Figure 16	NA
	Reactor Coolant Pump Rotor	36,800	RCP Lift Device	Pressurizer	101/ Figures 16, 19	NA
	Inservice Inspection Rig	3,600	None	Hydrogen Recombiner	68/ Figure 16	NA
	RHR Pump	6,900	None	RHR Piping, Conduit	-2/ Figure 17	SR, SS

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
RCB Polar Cranes (Continued)	RHR Pump Motor	5,700	None			
	RHR Heat Exchanger	29,000	None			
	RHR Heat Exchanger Tube Bundle	14,000	None			
	Integrated Head Package (includes the following items to be lifted together during rapid refueling)	612,000	Head Lift Rig			
	a. Head Lift Rig	8,800				
	b. Missile Shield	30,000				
	c. Cooling Shroud	30,000				
	d. Cables on Shroud	5,000				
	e. Cooling Fans and	2,400				
	f. Vessel Head Plus Water	230,000				
	g. Cable Tray	7,500				

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
RCB Polar Cranes (Continued)	h. Cables on Tray	15,000				
	i. Stud Tensioners	6,000				
	j. Upper Internals	137,400	Internals Lift Rig (Non-rapid refueling)			
	Studs, Nuts. Washers (12 in carrier)	30,000	None			
	Hatches (HE) (3)	21,700	None			
	Hatch (Pump motors)	15,850	None			
	Hatch	13,400	None			
RCB Monorail 9C101NCM102A 9C102NCM202A (3)	RCFC Fan	4,414	None	Safety Injection Piping	-2/ Figure 17	SR
RCB Monorail 9C101NCM104A 9C102NCM204A (4)	RHR Pump	6,500	None	RHR Piping	-2/ Figure 17	SR
	RHR Pump Motor	5,700	None	RHR Pump	-2/ Figure 17	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
RCB Monorail 9C101NCM107A 9C102NCM207A (4)	RHR Pump	6,500	None	RHR Piping	-2/ Figures 17, 19	SR
	RHR Pump Motor	5,700	None	RHR Pump	-2/ Figures 17, 19	SR
RCB Monorail 9C101NCM107D 9C102NCM207D (4)	RHR Pump	6,500	None	RHR Piping	-2/ Figure 17	SR
	RHR Pump Motor	5,700	None	RHR Pump	-2/ Figures 17, 19	SR
IVC Monorail 9I101NCM101A 9I102NCM201A (4)	AFW Pump	4,100	None	AFW Pump Motor	10/ Figure 8a	SR
	AFW Pump Motor	4,300	None	AFW Piping	10/ Figure 8a	SR
IVC Monorail 9I101NCM102A 9I102NCM202A (4)	AFW Pump	4,100	None	AFW Pump Motor	10/ Figure 8a	SR
	AFW Pump Motor	4,300	None	AFW Piping	10/ Figure 8a	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
IVC Monorail 9I101NCM103A 9I102NCM203A (4)	AFW Pump	4,100	None	AFW Pump Motor	10/ Figure 8a	SR
	AFW Pump Motor	4,300	None	AFW Piping	10/ Figure 8a	SR
IVC Monorail 9I101NCM104A 9I102NCM204A (4)	AFW Pump	4,100	None	AFW Turbine	10/ Figure 8a	SR
	AFW Turbine	6,300	None	AFW Piping	10/ Figure 8a	SR
IVC Monorail 9I101NCM105A 9I102NCM205A (4)	MSIV Components	7,106 (largest)	None	AFW Pump	10/ Figure 8a	SR
				AFW Pump Motor	10/ Figure 8a	SR
				AFW Piping	10/ Figure 8a	SR
				MS Safety Valves	58/ Figure 8b	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
IVC Monorail 9I101NCM106A 9I102NCM206A (4)	MSIV Components	7,106 (largest)	None	AFW Pump	10/ Figure 8a	SR
				AFW Pump Motor	10/ Figure 8a	SR
				AFW Piping	10/ Figure 8a	SR
				MS Safety Valves	58/ Figure 8b	SR
IVC Monorail 9I101NCM107A 9I102NCM207A (4)	MSIV Components	7,106 (largest)	None	AFW Pump	10/ Figure 8a	SR
				AFW Pump Motor	10/ Figure 8a	SR
				AFW Piping	10/ Figure 8a	SR
				MS Safety Valves	58/ Figure 8b	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
IVC Monorail 9I101NCM108A 9I102NCM208A (4)	MSIV Components	7,106 (largest)	None	AFW Turbine	10/ Figure 8a	SR
				AFW Piping	10/ Figure 8a	SR
				AFW Pump	10/ Figure 8a	SR
				MS Safety Valves	58/ Figure 8b	SR
IVC Monorail 9I101NCM110A 9I102NCM210A (4)	MSIV Components	7,106 (largest)	None	AFW Turbine	10/ Figure 8a	SR
				AFW Piping	10/ Figure 8a	SR
	FWIV Valve	6,336	None	AFW Pumps	10/ Figure 8a	SR
	FWIV Actuator	3,115	None	AFW Pump Motors	10/ Figure 8a	SR
				MS Safety Valves	58/ Figure 8a	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
Mechanical Electrical Auxiliary Building (MEAB) Monorail 9M101NCM103A 9M102NCM203A (7.5)	CCW Pump	10,200	None	CCW Piping	10/ Figures 20, 24, 26	SR
	CCW Pump Motor	2,500	None	CCW Pump	10/ Figures 20, 24, 26	SR
	Supplementary Cooler	5,502	None			
MEAB Monorail 9M101NCM104A 9M102NCM204A (7.5)	CCW Pump	10,200	None	CCW Piping	10/ Figures 20 24, 26	SR
	CCW Pump Motor	2,500	None	CCW Pump	10/ Figures 20 24, 26	SR
	Supplementary Cooler	5,502	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
MEAB Monorail 9M101NCM105A 9M102NCM205A (7.5)	CCW Pump	10,200	None	CCW Piping	10/ Figures 20, 24, 26	SR
	CCW Pump Motor	2,500	None	CCW Pump	10/ Figures 20, 24, 26	SR
	Supplementary Cooler	5,502	None			
MEAB Monorail 9M101NCM106A 9M102NCM206A (3)	Charging Pump	2,400	None	Charging Pump Piping	10/ Figures 20, 27	SR
	Charging Pump Motor	4,400	None	Charging Pump	10/ Figures 20, 27	SR
	Charging Pump Gear	2,700	None			
	Charging Pump Base	5,100	None			
	Supplementary Cooler	2,938	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
MEAB Monorail 9M101NCM107A 9M102NCM207A (3)	Charging Pump	2,400	None	Charging Pump Piping	10/ Figures 20, 27	SR
	Charging Pump Motor	4,400	None	Charging Pump	10/ Figures 20, 27	SR
	Charging Pump Gear	2,700	None			
	Charging Pump Base	5,100	None			
	Supplementary Cooler	2,938	None			
MEAB Monorail 9M101NCM141A 9M102NCM241A (2)	Hatch	3,000	None	Boric Acid Tank	10/ Figures 20, 24, 27	SR
MEAB Monorail 9M101NCM142A 9M102NCM242A (3)	Hatch	3,000	None	Boric Acid Tank	10/ Figures 20, 24, 27	SR

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
MEAB Monorail 9M101NCM156A 9M102NCM256A (3)	Hatches (9) Heaviest	5,500	None	CVC Cation Bed Demineralizers	41/ Figures 21, 25, 28	NA
				CVC Mixed Bed Demineralizers	41/ Figures 21, 25, 28	NA
MEAB Monorail 9M101NCM160A 9M102NCM260A (5)	Hatches (22)	5,280	None	Letdown Preheat Filter	41/ Figures 21, 28	NA
				Seal Water Injection Filter	41/ Figures 21, 28	NA
				Seal Water Return Filters	41/ Figures 21, 28	NA
				Reactor Coolant Filter	41/ Figures 21, 28	NA
MEAB Monorail 9M101NCM160B 9M102NCM260B (5)	Hatches (22)	5,280	None	Letdown Preheat Filter	41/ Figures 21, 28	NA

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
Fuel Handling Building (FHB) Overhead Crane 7F101NCB103A 7F102NCB203A (15/2)	Containment Spray Pumps	7,155	None	Spent Fuel Pool	68/ Figures 30, 31, 33, 34	SF
	Containment Spray Pump Motors	5,820	None			
	Containment Spray Pump Outer Barrel	3,924	None	SFP Heat Exchangers	Figure 34	SF, SR
	L.H. Safety Injection Pump	7,155	None			
	L.H. Safety Injection Pump Motors	3,400	None			
	L.H. Safety Injection Pump Outer Barrel	3,924	None			
	H.H. Safety Injection Pump	7,155	None			
	H.H. Safety Injection Pump Motor	3,400	None			
	H.H. Safety Injection Pump Outer Barrel	3,924	None			
	Inner Gate (FTC to SFP)	8,400	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
FHB Overhead Crane (Continued) 7F101NCB103A 7F102NCB203A (15/2)	Outer Gate (FTC to SFP)	5,950	None			
	Inner Gate (SFP to CLP)	8,400	None			
	Outer Gate (SFP to CLP)	5,950	None			
	Spent Fuel Pool Heat Exchanger Hatch	10,200	None			
	Spent Fuel Pool Heat Exchangers	14,320	None			
	Spent Fuel Shipping Cask Head	Not Available	None			
	New Fuel Shipping Containers	5,000	None			
FHB Monorail 9F101NCM104A 9F102NCM204A (5)	L.H. Safety Injection Pump	7,155	None	LH Safety Injection Pump	-19/ Figures 29, 33, 34	SR
	L.H. Safety Injection Pump Motor	5,820	None			
	L.H. Safety Injection Pump Outer Barrel	3,924	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
FHB Monorail 9F101NCM104B 9F102NCM204B (5)	H.H. Safety Injection Pump	7,155	None	HH Safety Injection Pump	-19/ Figure 29, 33, 34	SR
	H.H. Safety Injection Pump Motor	5,820	None			
	H.H. Safety Injection Pump Outer Barrel	3,924	None			
FHB Monorail 9F101NCM104C 9F102NCM204C (5)	Containment Spray Pump	7,155	None	Containment Spray Pump	-19/ Figure 29, 33, 34	SR
	Containment Spray Pump Motor	5,820	None			
	Containment Spray Pump Outer Barrel	3,924	None			
FHB Monorail 9F101NCM104D 9F102NCM204D (5)	L.H. Safety Injection Pump	7,155	None	LH SI Pump	-19/ Figures 29, 33, 34	SR
	L.H. Safety Injection Pump Motor	5,820	None			
	L.H. Safety Injection Pump - Outer Barrel	3,924	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
FHB Monorail 9F101NCM104E 9F102NCM204E (5)	H.H. Safety Injection Pump	7,155	None	HH SI Pump	-19/ Figures 29, 33, 34	SR
	H.H. Safety Injection Pump Motor	5,820	None			
	H.H. Safety Injection Pump - Outer Barrel	3,924	None			
FHB Monorail 9F101NCM104F 9F102NCM204F (5)	Containment Spray Pump	7,155	None	Containment Spray Pump	-19/ Figures 29, 33, 34	SR
	Containment Spray Pump Motor	5,820	None			
	Containment Spray Pump - Outer Barrel	3,924	None			
FHB Monorail 9F101NCM104G 9F102NCM204G (5)	L.H. Safety Injection Pump	7,155	None	LH Safety Injection Pump	-19/ Figures 29, 33, 34	SR
	L.H. Safety Injection Pump Motor	5,820	None			
	L.H. Safety Injection Pump - Outer Barrel	3,924	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
FHB Monorail 9F101NCM104H 9F102NCM204H (5)	H.H. Safety Injection Pump	7,155	None	HH SI Pump	-19/ Figures 29, 33, 34	SR
	H.H. Safety Injection Pump Motor	5,820	None			
	H.H. Safety Injection Pump - Outer Barrel	3,924	None			
FHB Monorail 9F101NCM104I 9F102NCM204I (5)	Containment Spray Pump	7,155	None	Containment Spray Pump	-19/ Figures 29, 33, 34	SR
	Containment Spray Pump Motor	5,820	None			
	Containment Spray Pump - Outer Barrel	3,924	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
Essential Cooling Water (ECW) Intake Gantry 7P200NCG001C (20)	ECW Pump and Motor	26,300	None	ECW Piping	34/ Figure 36	SR
	Traveling Screen	19,700	None	ECW Pumps	34/ Figure 36	SR
	Strainers (Wet)	19,467	None	ECW Screens	34/ Figure 36	SR
	Stop Log	5,300	None	Strainers	31.5/ Figure 36	SR
	Hatch to Screens	38,250	None			
	Hatch to Pumps	24,500	None			
	Hatch to Strainers	25,500	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
Diesel Generator Building (DGB) Overhead Crane 8D101NCB101A 8D102NCB201A (3)	Starting Air Tank	2,710	None	Diesel Generators	29/ Figure 37	SR
	Flywheel	4,450	None			
	Bearing & Stand	2,300	None			
	Air Filter	5,400	None			
DGB Overhead Crane 8D101NCB101B 8D102NCB201B (3)	Starting Air Tank	2,710	None	Diesel Generators	29/ Figure 37	SR
	Flywheel	4,540	None			
	Bearing & Stand	2,300	None			
	Air Filter	5,400	None			

TABLE 1 (Cont'd.)
CRANES IDENTIFIED IN ITEM 2.1

CRANE/TAG NO. (CAPACITY IN TONS)	CRANE/LOAD INFORMATION			CRANE/TARGET INFORMATION		
	Load(s)	Weight (lbs.)	Special Lifting Device	Targets (Note 2)	Target Elevation ft/ Location	Elimination Category (Note 1)
DGB Overhead Crane 8D101NCB101C 8D102NCB201C (3)	Starting Air Tank	2,710	None	Diesel Generators	29/ Figure 37	SR
	Flywheel	4,540	None			
	Bearing & Stand	2,300	None			
	Air Filter	5,400	None			

Notes

1. In the elimination category column the following abbreviations are used to indicate the method of elimination.

   SR = separation and redundancy
   IL = interlocks
   SS = site specific
   AN = analysis
   SF = single-failure-proof crane
   NA = not required for safe shutdown, decay heat removal or spent fuel cooling

2. The targets and elimination categories identified are applicable to all loads handled by the crane.

TABLE 2

OVERHEAD HANDLING SYSTEMS EXCLUDED FROM ITEM 2.1.1

Crane	Tag No.	Capacity (Tons)	Reason for Exclusion*	General Arrangement Drawing No.
Reactor Containment Building				
Monorail	9C101NCM101A 9C102NCM201A	3	D	6-18-9-N-5002
Monorail	9C101NCM103A 9C102NCM203A	3	D	6C-18-9-N-5002
Monorail	9C101NCM104B 9C102NCM204B	4	A	6C-18-9-N-5002
Monorail	9C101NCM105A 9C102NCM205A	3	D	6C-18-9-N-5002
Monorail	9C101NCM106A 9C102NCM206A	3	D	6C-18-9-N-5002
Monorail	9C101NCM107B 9C102NCM207B	4	A	6C-18-9-N-5002
Monorail	9C101NCM107C 9C102NCM207C	4	A	6C-18-9-N-5002
Refueling Machine	3R231NCB101A 3R232NCB201A	1 1/2	A, C	6C-18-9-N-5007
IVC				
Monorail	9I101NCM109A 9I101NCM209A	4	A	6G-01-9-M-0025
Mechanical and Electrical Auxiliary Building				
Monorail	9M101NCM109A 9M102NCM209A	2	A	6M-18-9-N-5017
Monorail	9M101NCM110A 9M102NCM210A	1 1/2	A	6M-18-9-N-5017
Monorail	9M101NCM110A 9M102NCM210A	1 1/2	A	6M-18-9-N-5017
Monorail	9M101NCM111A 9M102NCM211A	1 1/2	A	6M-18-9-N-5017
Monorail	9M101NCM111B 9M102NCM211B	1 1/2	A	6M-18-9-N-5017

TABLE 2 (Cont'd.)

OVERHEAD HANDLING SYSTEMS EXCLUDED FROM ITEM 2.1.1

Crane	Tag No.	Capacity (Tons)	Reason for Exclusion*	General Arrangement Drawing No.
Mechanical and Electrical Auxiliary Building (continued)				
Monorail	9M101NCM111C 9M102NCM211C	1 1/2	A	6M-18-9-N-5017
Monorail	9M101NCM111D 9M102NCM211D	1 1/2	A	6M-18-9-N-5017
Monorail	9M101NCM113A 9M102NCM213A	2	A	6M-18-9-N-5017
Monorail	9M101NCM129A 9M102NCM229A	2	A	6M-18-9-N-5020
Monorail	9M101NCM131A 9M102NCM231A	3	A	6M-18-9-N-5022
Monorail	9M101NCM132A 9M102NCM232A	3	A	6M-18-9-N-5022
Monorail	9M101NCM139A 9M102NCM239A	1 1/2	A	6M-18-9-N-5025
Monorail	9M101NCM140A 9M102NCM240A	3	A	6M-18-9-N-5025
Monorail	9M101NCM143A 9M102NCM243A	3	A	6M-18-9-N-5025
Monorail	9M101NCM144A 9M102NCM244A	3	A	6M-18-9-N-5026
Monorail	9M101NCM145A 9M102NCM245A	3	A	6M-18-9-N-5026
Monorail	9M101NCM146A 9M102NCM246A	3	A	6M-18-9-N-5026
Monorail	9M101NCM147A 9M102NCM247A	3	A	6M-18-9-N-5026
Monorail	9M101NCM148A 9M102NCM248A	3	A	6M-18-9-N-5026
Monorail	9M101NCM149A 9M102NCM249A	3	A	6M-18-9-N-5026

TABLE 2 (Cont'd.)

OVERHEAD HANDLING SYSTEMS EXCLUDED FROM ITEM 2.1.1

Crane	Tag No.	Capacity (Tons)	Reason for Exclusion*	General Arrangement Drawing No.
Mechanical and Electrical Auxiliary Building (continued)				
Monorail	9M101NCM149B 9M102NCM249B	3	A	6M-18-9-N-5026
Monorail	9M101NCM150A 9M102NCM250A	3	A	6M-18-9-N-5026
Monorail	9M101NCM151A 9M102NCM251A	3	A	6M-18-9-N-5026
Monorail	9M101NCM152A 9M102NCM252A	3	A	6M-18-9-N-5026
Monorail	9M101NCM154A 9M102NCM254A	7.5	A	6M-18-9-N-5029
Monorail	9M101NCM154B 9M102NCM254B	7.5	A	6M-18-9-N-5029
Monorail	9M101NCM154C 9M102NCM254C	7.5	A	6M-18-9-N-5030
Monorail	9M101NCM154D 9M102NCM254D	7.5	A	6M-18-9-N-5030
Monorail	9M101NCM154E 9M102NCM254E	7.5	A	6M-18-9-N-5030
Monorail	9M101NCM155A 9M102NCM255A	5	A	6M-18-9-N-5029
Monorail	9M101NCM157A 9M102NCM257A	5	A	6M-18-9-N-5030
Monorail	9M101NCM158A 9M102NCM258A	6	A	6M-18-9-N-5030
Monorail	9M101NCM159A 9M102NCM259A	3	A	6M-18-9-N-5030
Monorail	9M101NCM160C 9M102NCM260C	5	A	6M-18-9-N-5030
Monorail	9M101NCM161A 9M102NCM261A	5	A	6M-18-9-N-5032

TABLE 2 (Cont'd.)

OVERHEAD HANDLING SYSTEMS EXCLUDED [illegible] 2.1.1

Cra[illegible]	Tag No.	Capacity (Tons)	Reason fo[illegible] Exclusion*	General Arrangement [illegible]awing No.
Mechanical and Electrical Auxiliary Building (continued)				
Monorail	9M101NCM163A 9M102NCM263A	3	A	6M-18-9-N-60159
Monorail	9M101NCM162A 9M102NCM262A	5	A	6M-18-9-N-5026
Radwaste Crane		20	A	6M-18-9-N-5038
Fuel Handling Building				
Cask Handling Crane	7F101NCB102A 7F102NCB202A	150	A	6F-18-9-N-5064
New Fuel Area Bridge Crane	7F101NCB101A 7F102NCB201A	5	A	6F-18-9-N-5064
Fuel Handling Machine	3R231NOB102A 3R232NOB202A	1 1/2	A, C	6F-18-9-N-5064
Monorail	9F101NCM105A 9F102NCM205A	2	C (heaviest load 1400 lb.)	6F-18-9-N-5058
Monorail	9F101NCM105B 9F102NCM205B	2	C (heaviest load 1400 lb.)	6F-18-9-N-5058
ECW Intake Structure				
Jib Crane	9Q190MH0001 9Q190MH0002	5	A	6D-01-9-M-0020
Turbine Generator Building (TGB)				
Overhead Crane	9Q191MCG0138 9Q191MCG0138	200/40	B	9-M-0016
Overhead Crane	9Q191MCG0238 9Q192MCG0238	10	B	9-M-0016
Overhead Crane	9Q191MCG0338 9Q192MCG0338	135/30	B	9-M-0016

2362N/0151N

TABLE 2 (Cont'd.)

OVERHEAD HANDLING SYSTEMS EXCLUDED FROM ITEM 2.1.1

Crane	Tag No.	Capacity (Tons)	Reason for Exclusion*	General Arrangement Drawing No.
Machine Shop				
Overhead Crane (Bridge)	9P040ACB01-054	50/20	B	
Warehouse				
Overhead Crane (Bridge)	9PC30ACB02-054	10	B	
Pumping Structure (Reservoir Makeup Pumping Facilities)				
Gantry Crane	8Y500HCG001	35	B	0-H-4912
Screen Intake Structure (Reservoir Makeup Pumping Facilities)				
Gantry Crane	8Y500HCG002	15	B	0-H-4903
Circulating Water Intake Structure				
Gantry Crane	9P220HCG003	30	B	0-M-0029
Fire Pump House				
Monorail	9Q100NCM001A	2	B	9Q-27-0-M-0037
Monorail	9Q100NCM002A	2	B	9Q-27-0-M-0037
Monorail	9Q100NCM003A	2	B	9Q-27-0-M-0037

*Reasons For Exclusion

A = Crane is not capable of passing over equipment required for safe shutdown or decay heat removal.

B = There is no safe shutdown or decay heat removal equipment located in this building.

C = Crane does not carry any heavy loads.

D = The load is a component of the piece of equipment required for safe shutdown or decay heat removal; therefore, the target equipment is not functional at time of lift.

TABLE 3
TABULATION OF EXCEPTIONS TO ANSI N14.6-1978 REQUIREMENTS FOR THE SOUTH TEXAS LIFTING DEVICES (1)

ANSI N14.6 REQUIREMENT	JUSTIFICATION OF ACCEPTABILITY OF STP DESIGN
Paragraph 3.1.4 - requires the designer to indicate permissible repair procedures and acceptance criteria for the repair.	Any repair to these special lifting devices is considered to be in the form of welding. Should pins, bolts or other fasteners need repair, they will be replaced, in lieu of repair, in accordance with the original or equivalent requirements for material and non-destructive testing. Weld repairs will be performed in accordance with the requirements identified in NF-4000 and NF-5000 (Fabrication and Examination) of the ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NF. Acceptance criteria will be that identified in the applicable code section.
Paragraph 3.2.1.1 - requires the design, when using materials with yield strengths above 80 percent of their ultimate strengths, to be based on the material's fracture toughness and not the listed design factors.	Materials for these rigs were chosen for their excellent fracture toughness characteristics. The stress design factors listed in 3.2.1 of 3 and 5 were used in the analysis and the resulting stresses are acceptable.
Paragraph 3.2.6 - requires material for load-bearing members to be subjected to drop-weight or Charpy impact tests.	Fracture toughness requirements were not identified for all the material used in these special lifting devices. However, the material selection was based on its excellent fracture toughness characteristics.
Paragraph 5.1 lists Owner Responsibilities and 5.1.2 requires the owner to verify that the special lifting devices meet the performance criteria of the design specification by records and witness of testing.	The Westinghouse Quality Release verifies that the criteria for the letters of compliance for materials and specifications required by Westinghouse drawings and purchasing documents were satisfied.

(1) a. Load Cell Linkage
b. Reactor Vessel Internals Lift Rig
c. Reactor Vessel Head Lift Rig

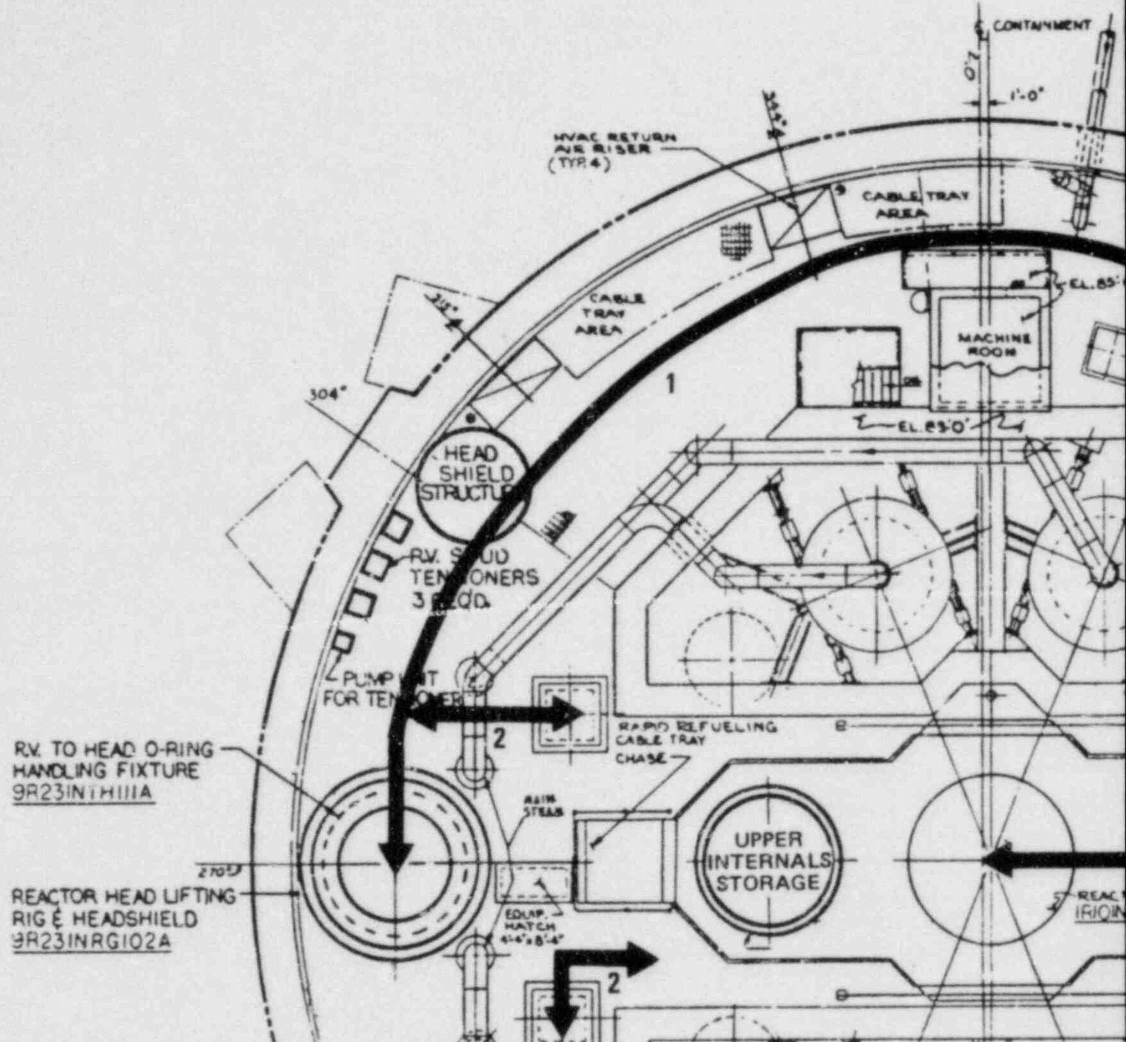
TABLE 3 (Cont'd)
TABULATION OF EXCEPTIONS TO ANSI N14.6-1978 REQUIREMENTS
FOR THE SOUTH TEXAS LIFTING DEVICES (1)

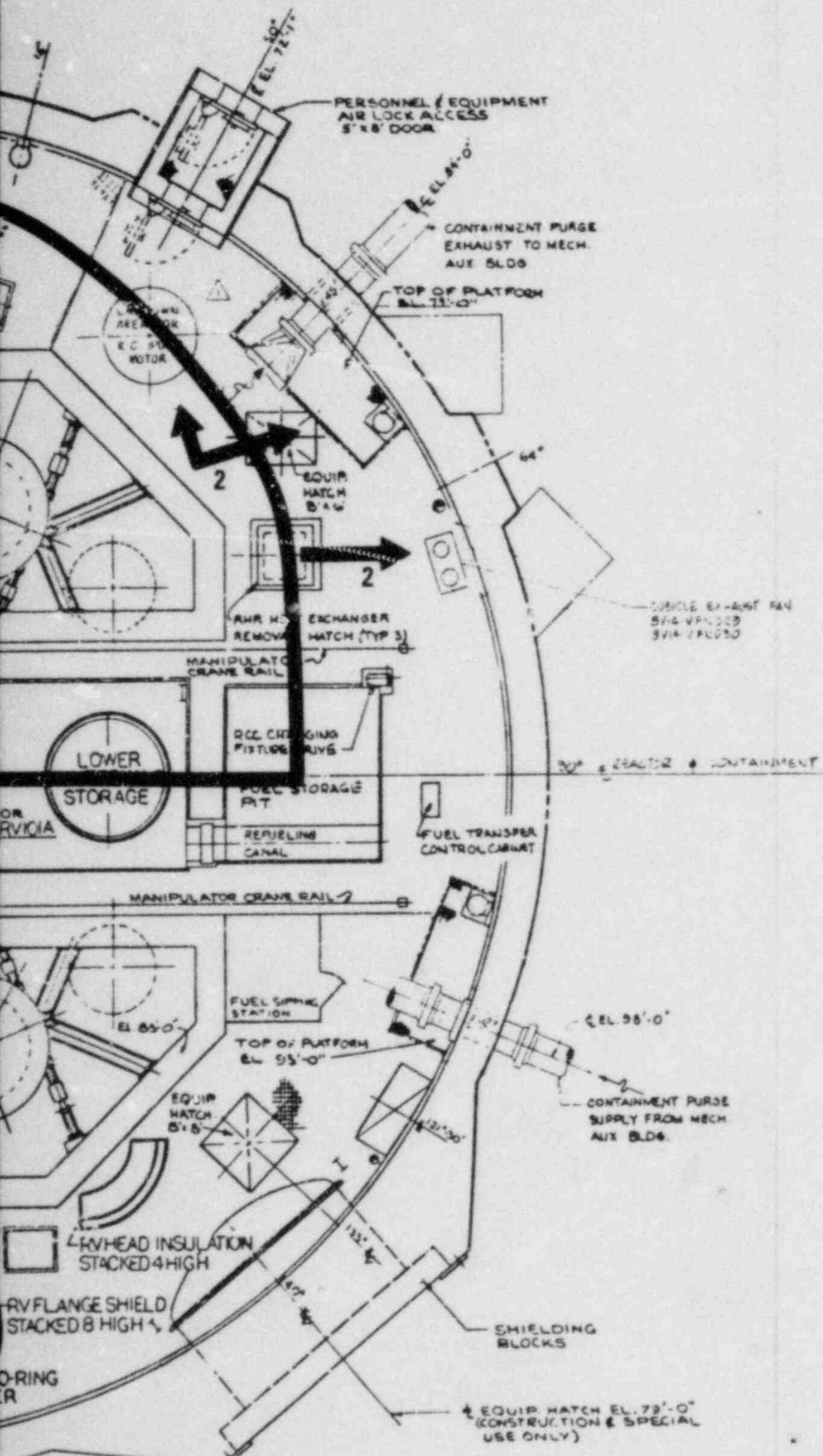
ANSI N14.6 REQUIREMENT	JUSTIFICATION OF ACCEPTABILITY OF STP DESIGN
Paragaph 5.1.5, 5.1.5.1, and 5.1.5.2 requires special identification and marking to prevent misuse.	It is obvious from their designs that these rigs are specific lifting devices and can only be used for their intended purpose.
Paragraph 5.2.1 requires the rigs to be initially tested at 150 percent maximum load followed by non-destructive testing of critical load bearing parts and welds.	These lifting devices were proof tested, upon completion, with a load of approximately 125% of design weight in accordance with industry standards. All parts, particularly welds, were visually inspected for cracks or obvious deformation and critical welds were magnetic particle inspected.
Paragraph 5.2.2 requires replacement parts to be individually qualified and tested.	Replacement parts, should they be required, will be made of identical (or equivalent) material and inspections as originally required. Only pins, bolt and nuts are considered replacement parts for the reactor vessel head and internal lift rigs.
Paragraph 5.3 requires testing to verify continuing compliance and annual 150 percent load tests or annual non-destructive tests and examinations to be performed.	These special lifting devices are used during plant refueling. During plant operation these devices are inaccessible since they remain in Containment. Load testing to 150 percent of the total weight before each use would require special fixtures and is impractical to perform. In addition, the movement of a 150 percent test load in containment for the purposes of annual testing would initiate an unnecessary safety risk. A 100% load test will be performed on each device (exclusive of the

(1) a. Load Cell Linkage
b. Reactor Vessel Internals Lift Rig
c. Reactor Vessel Head Lift Rig

ANSI N14.6 REQUIREMENT	JUSTIFICATION OF ACCEPTABILITY OF STP DESIGN
	upper internals lift rods, the load cell and load cell linkage) at each refueling, followed by a visual check of critical welds. This check (visual) of critical welds and parts will be conducted at initial lift prior to moving to full lift and movement for these devices. Further note that with the use of the load cell for the head and internals lift rig, all lifting and lowering is monitored at all times. No check of the upper internals lift rods will be done since these items remain either inside the head penetration or on the upper internals and are highly radioactive. The upper internals lift rods are purposely preloaded to a higher load than is present at lifting.

(1) a. Load Cell Linkage
b. Reactor Vessel Internals Lift Rig
c. Reactor Vessel Head Lift Rig


CONTAINMENT
1'-0"
HVAC RETURN AIR RISER (TYP. 4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
304°
1
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS 3 REQD.
PUMP UNIT FOR TENSIONER
2
RAPID REFUELING CABLE TRAY CHASE
R.V. TO HEAD O-RING HANDLING FIXTURE
9R23INTH111A
UPPER INTERNALS STORAGE
EQUIP. HATCH
REACTOR HEAD LIFTING RIG & HEADSHIELD
9R23INRG102A
2
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS
9R23INRG103A
R.V. HEAD
REACTOR



Also Available On Aperture Card

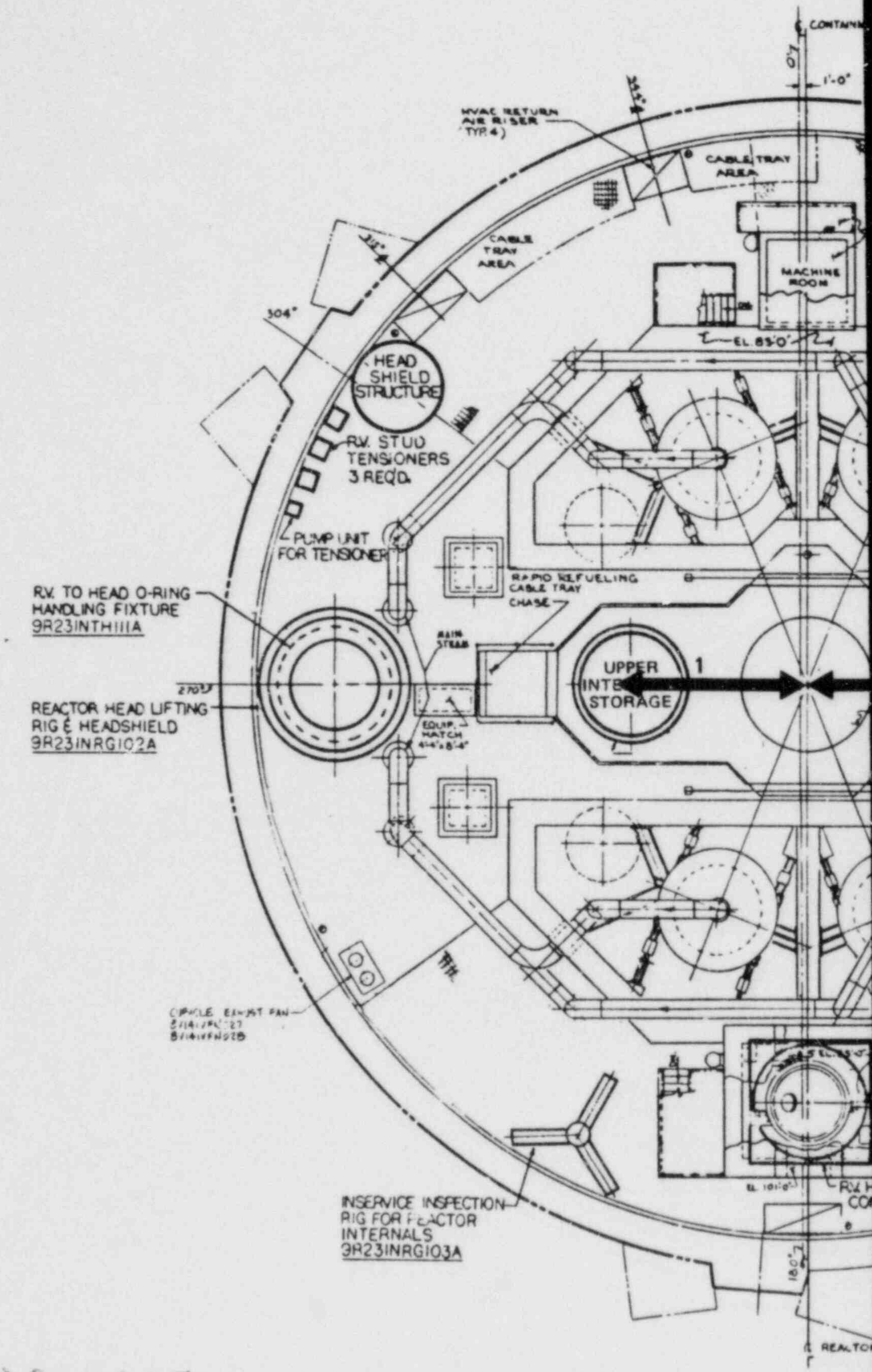
TI APERTURE CARD

1 – INTERNALS LIFT RIG,
2 – HATCHES

Figure 1
SAFE LOAD PATHS FOR
INTERNALS LIFT RIG, HATCHES
RCB, EL. 68

DWG. 6C-18-8-N-5010

8411010420 -1



HVAC RETURN AIR RISER (TYP 4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
EL 83'-0"
304°
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS 3 REQ'D.
PUMP UNIT FOR TENSIONER
RAPID REFUELING CABLE TRAY CHASE
R.V. TO HEAD O-RING HANDLING FIXTURE
9R23INTHIIIA
REACTOR HEAD LIFTING RIG & HEADSHIELD
9R23INRGI02A
UPPER INTE STORAGE
1
EQUIP. HATCH
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS
9R23INRGI03A
EL 101'-0"
180°

84110_0008

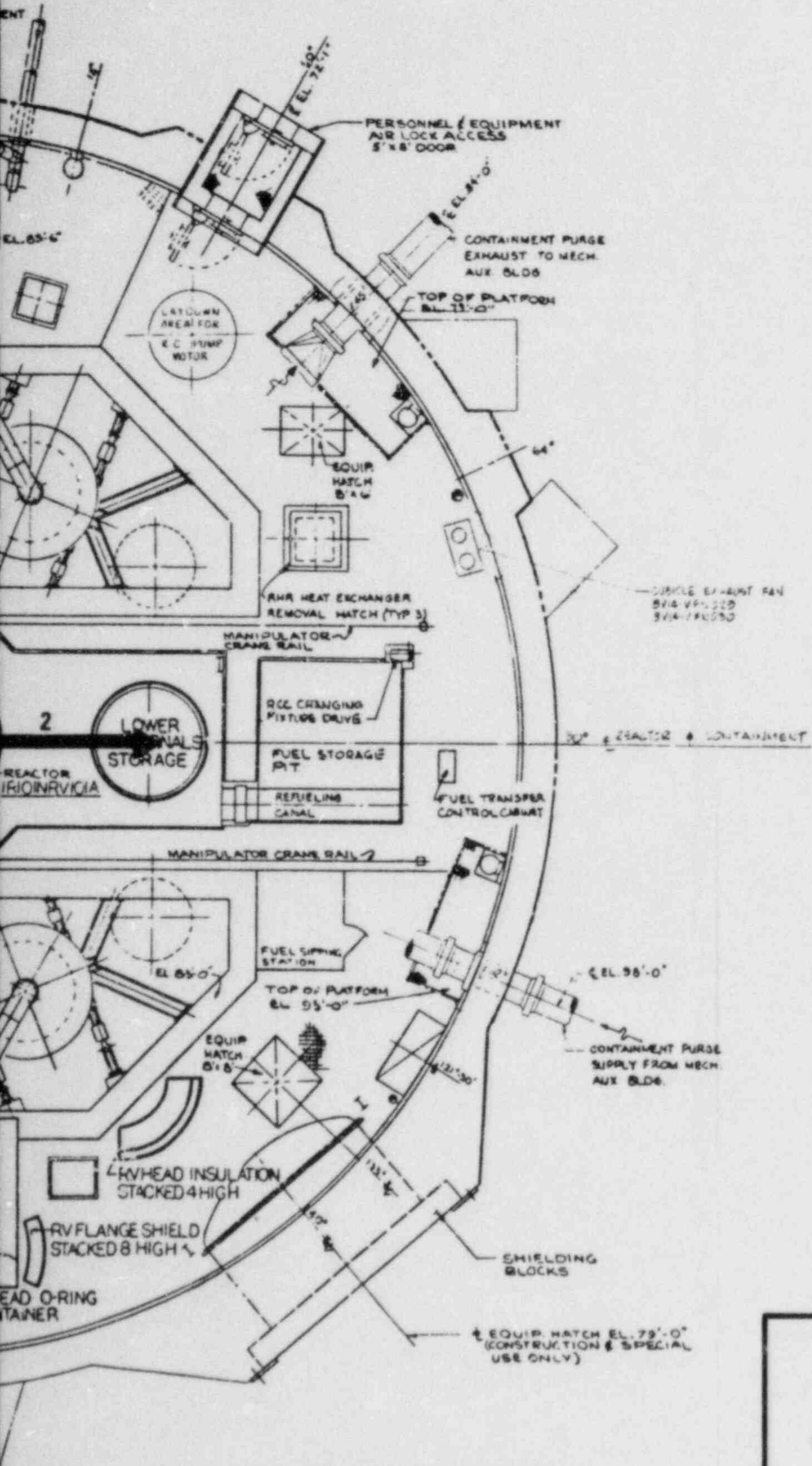


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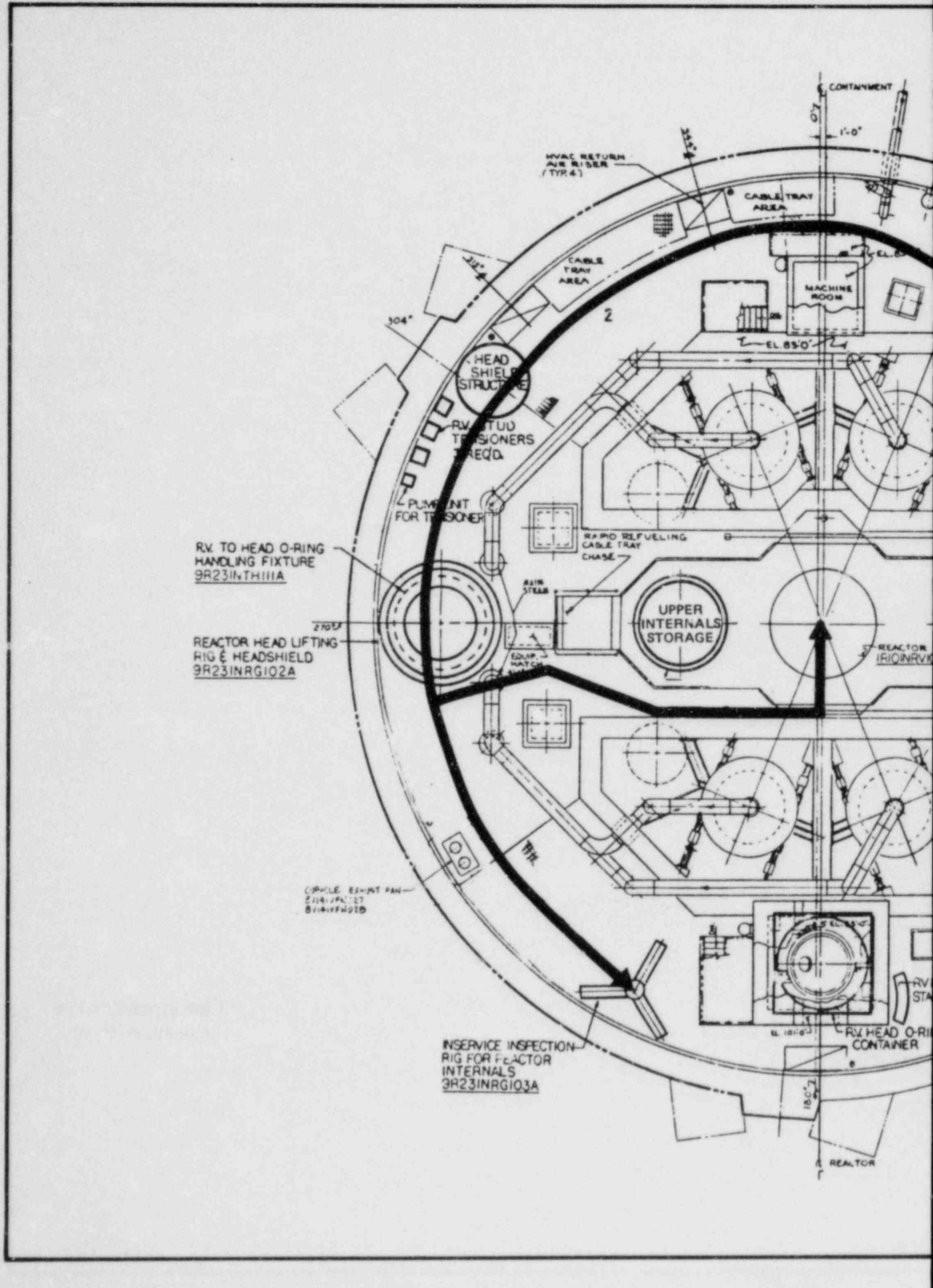
Figure 2

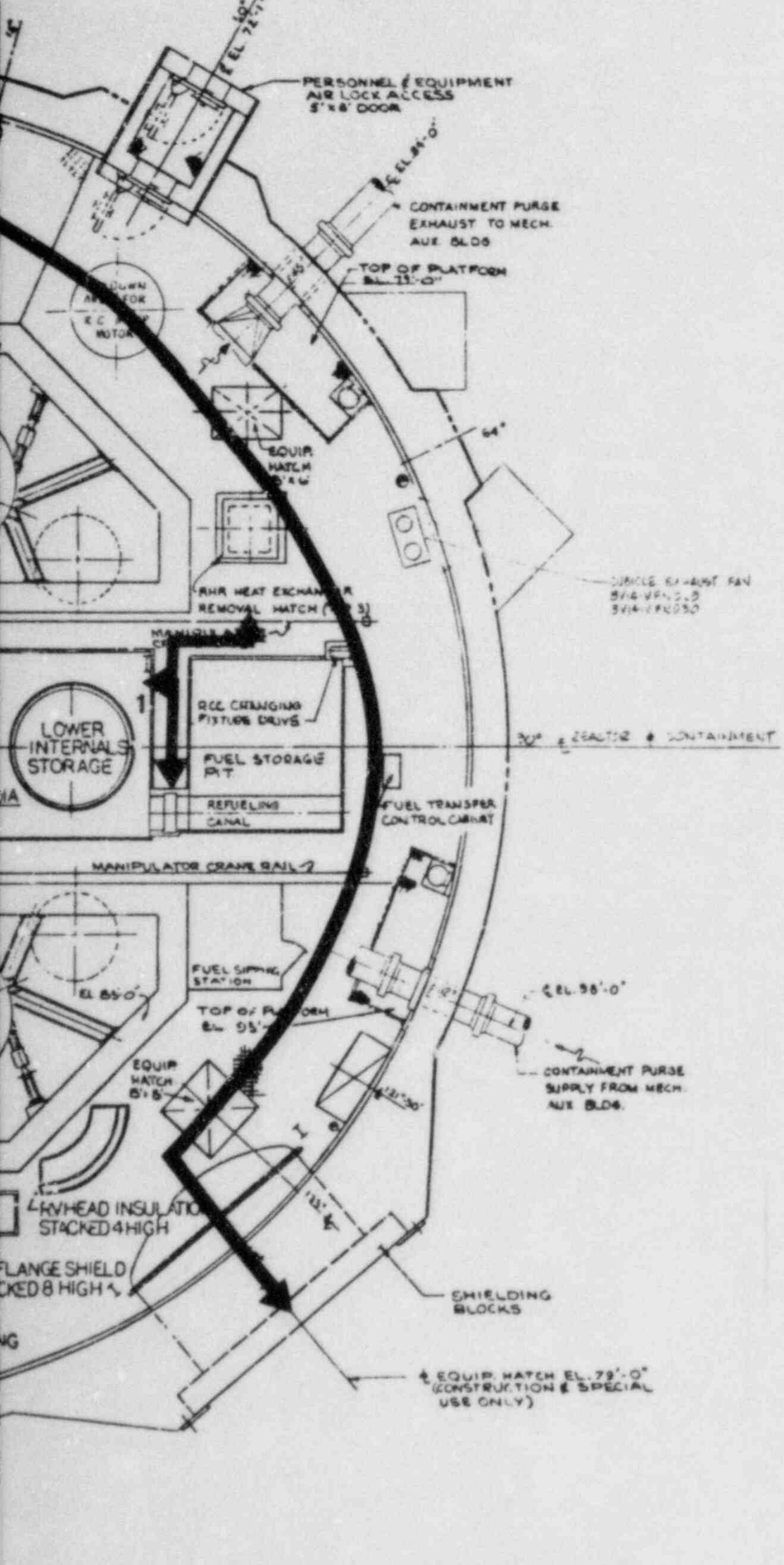
SAFE LOAD PATHS FOR UPPER INTERNALS, LOWER INTERNALS RCB, EL. 68'

DWG. 6C-18-9-N-5010

8411010420 2



CONTAINMENT
1'-0"
HVAC RETURN AIR RISER (TYP 4)
CABLE TRAY AREA
CABLE TRAY AREA
304°
2
MACHINE ROOM
EL. 83'-0"
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS
PUMP UNIT FOR TENSIONER
R.V. TO HEAD O-RING HANDLING FIXTURE 9R23INTH111A
REACTOR HEAD LIFTING RIG & HEADSHIELD 9R23INRG102A
RAPID REFUELING CABLE TRAY CHASE
UPPER INTERNALS STORAGE
EQUIP. HATCH
REACTOR
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS 9R23INRG103A
R.V. HEAD O-RING CONTAINER
180°
REACTOR



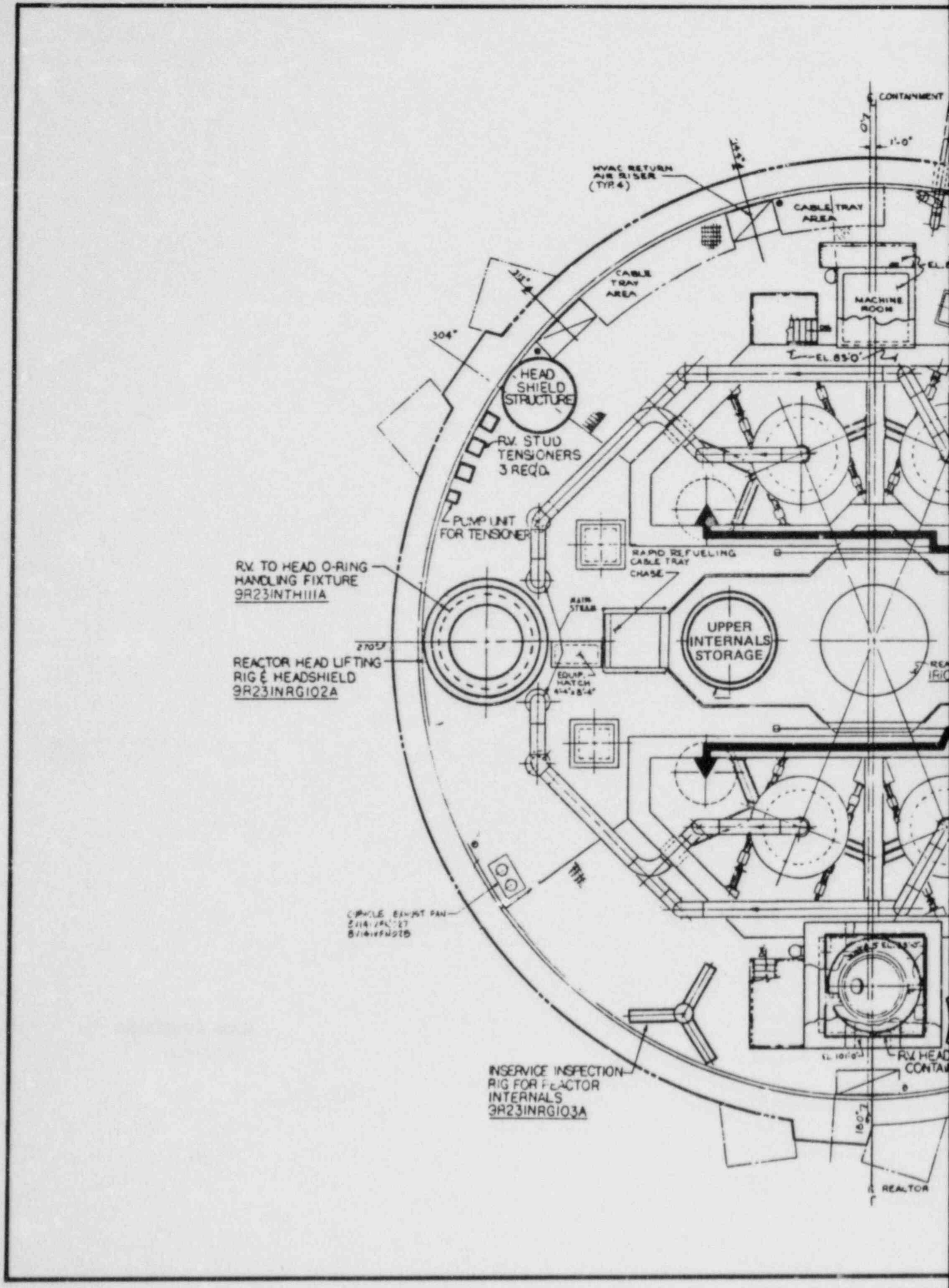
TI APERTURE CARD

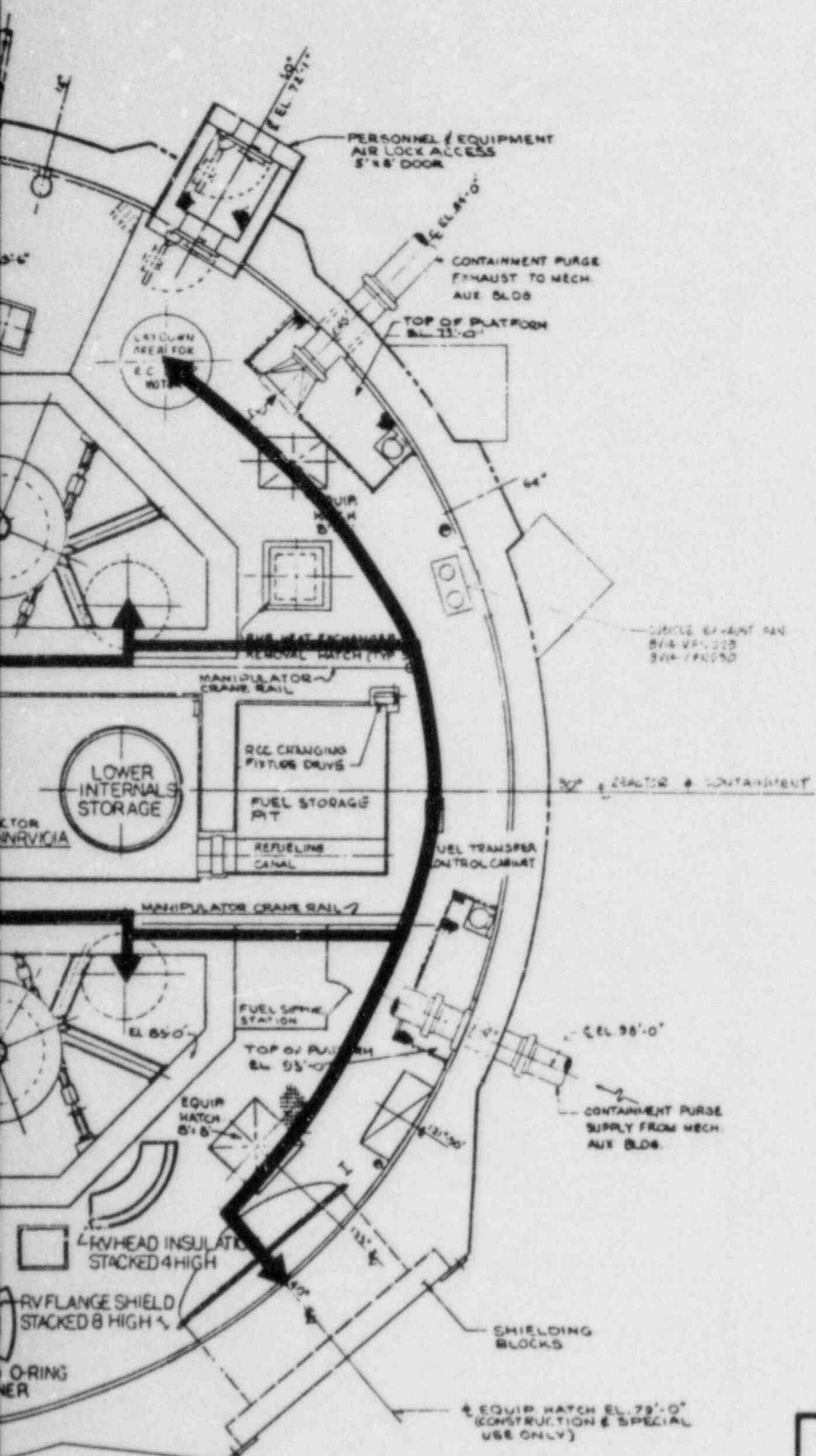
Also Available On Aperture Card

Figure 3
SAFE LOAD PATHS FOR FUEL POOL GATES, INSERVICE INSPECTION RIG
RCB, EL. 68'

DWG. 6C-18-9-N-5010

8411010420 -3


CONTAINMENT
1'-0"
HVAC RETURN AIR RISER (TYP.4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
EL. 83'-0"
304°
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS 3 REQ'D.
PUMP UNIT FOR TENSIONER
RAPID REFUELING CABLE TRAY CHASE
R.V. TO HEAD O-RING HANDLING FIXTURE
9R23INTH111A
270°
REACTOR HEAD LIFTING RIG & HEADSHIELD
9R23INRG102A
EQUIP. HATCH
UPPER INTERNALS STORAGE
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS
9R23INRG103A
R.V. HEAD
180°
REACTOR



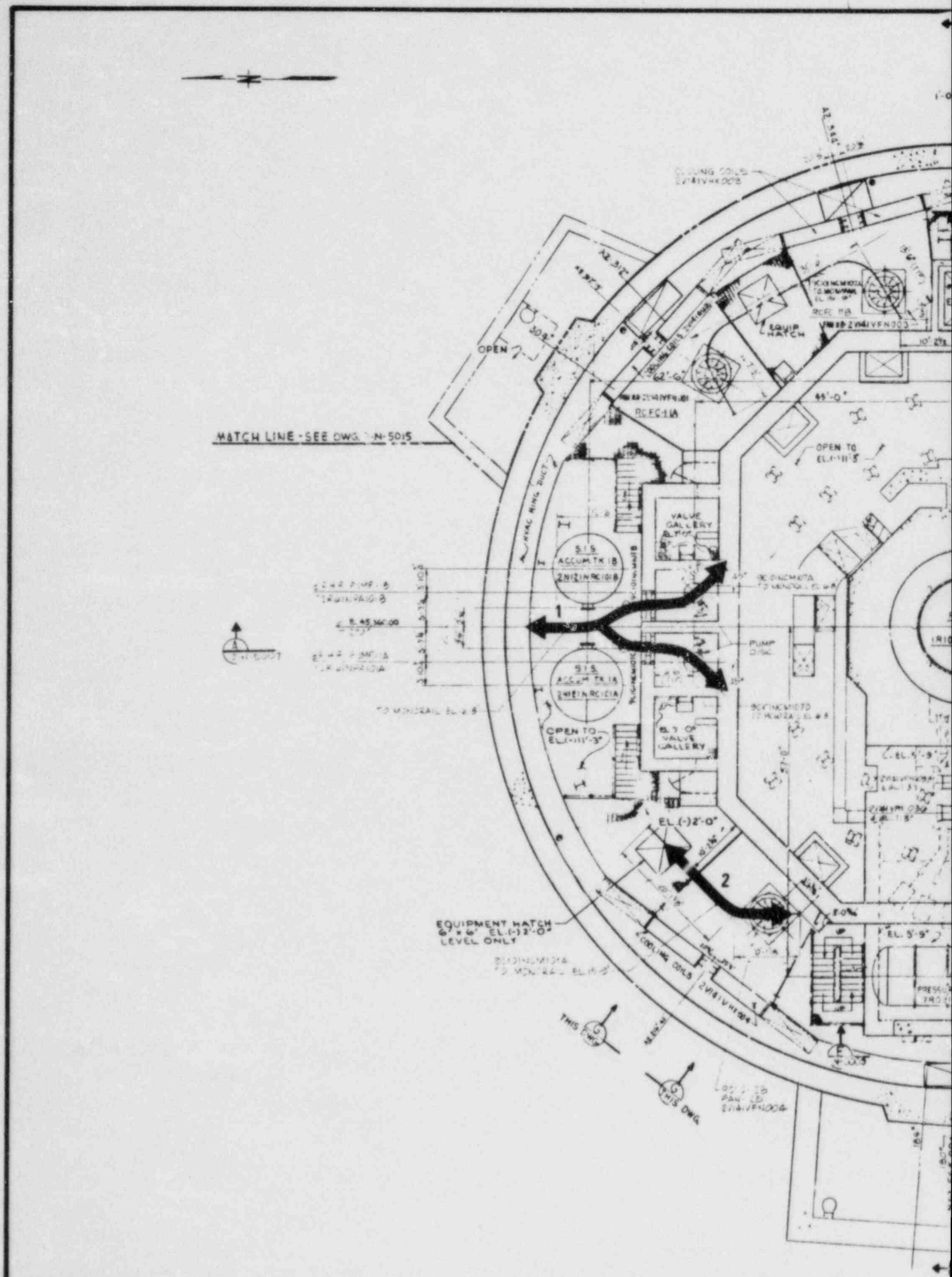
TI
APERTURE
CARD

Also Available On
Aperture Card

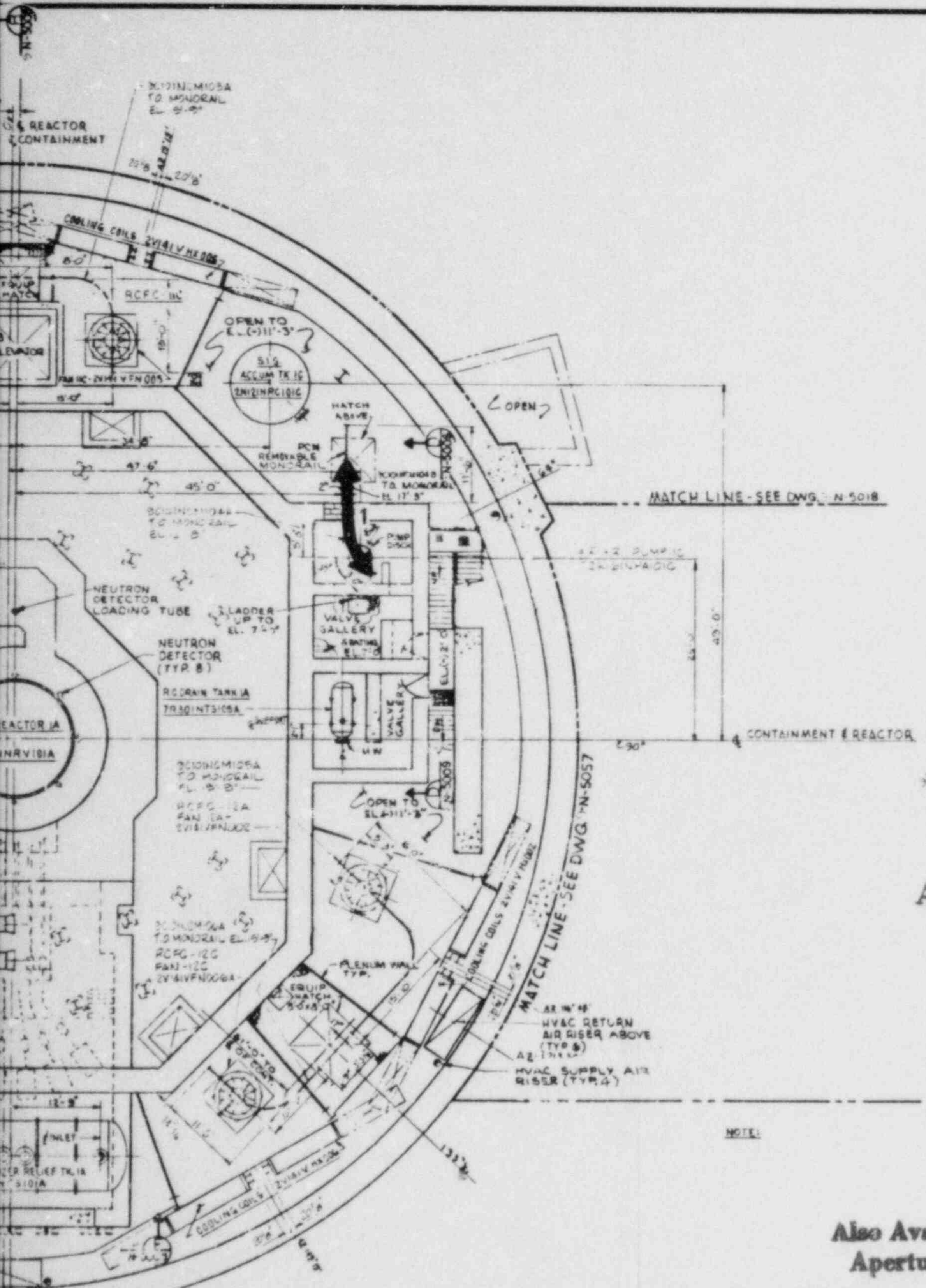
Figure 4
SAFE LOAD PATHS FOR
RCP FLYWHEEL, MOTOR, ROTOR
RCB, EL. 68'

DWG. 6C-18-9-N-5010

8411010420 -4



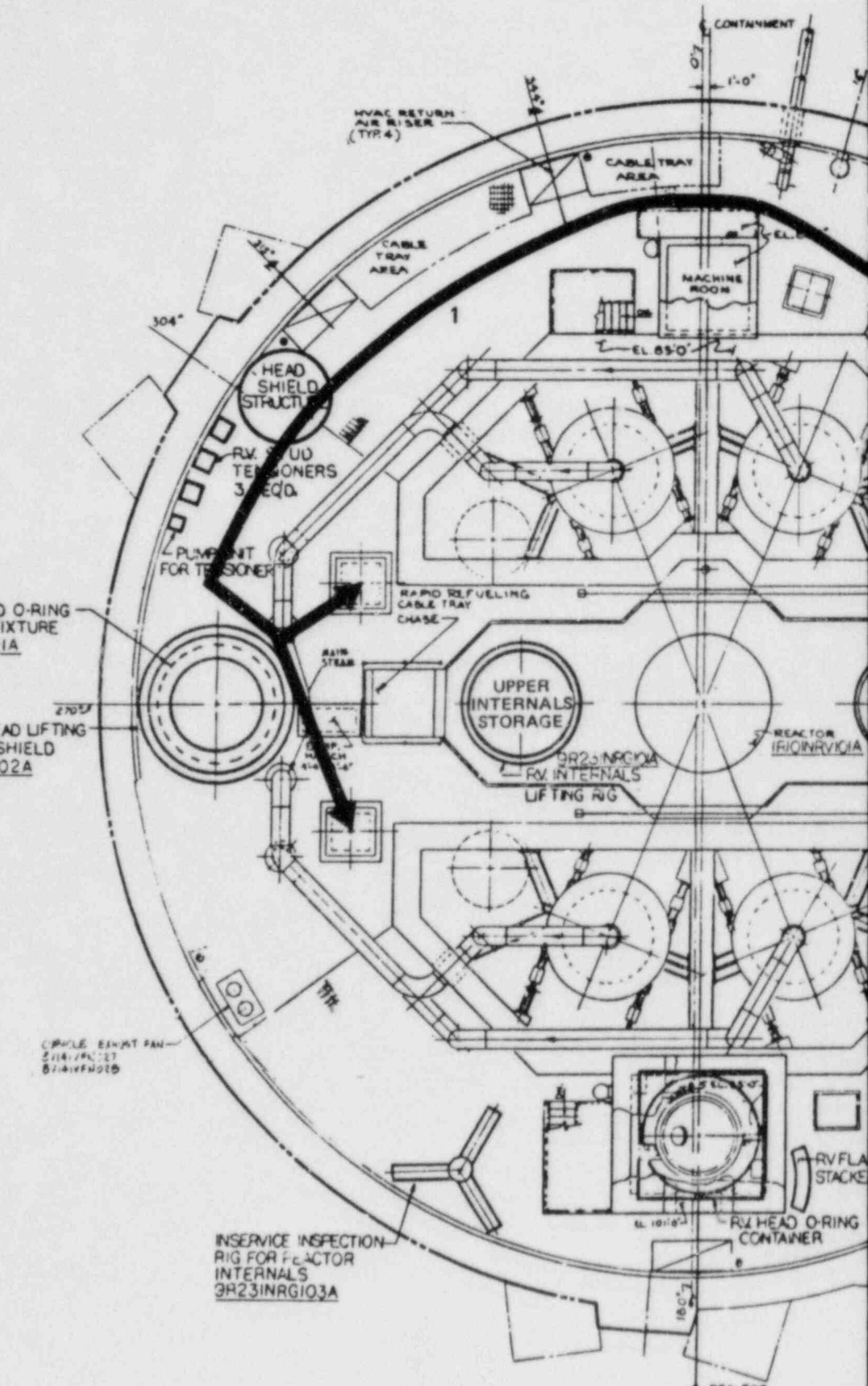
MATCH LINE - SEE DWG.
OPEN
EQUIP HATCH
VALVE GALLERY
S.I.S. ACCUM TK 1B
S.I.S. ACCUM TK 1A
1
PUMP DISC
OPEN TO EL.(-)11'-3"
VALVE GALLERY
EL.(-)2'-0"
2
EQUIPMENT HATCH 6' x 6' EL.(-)2'-0" LEVEL ONLY
COOLING COILS
THIS DWG

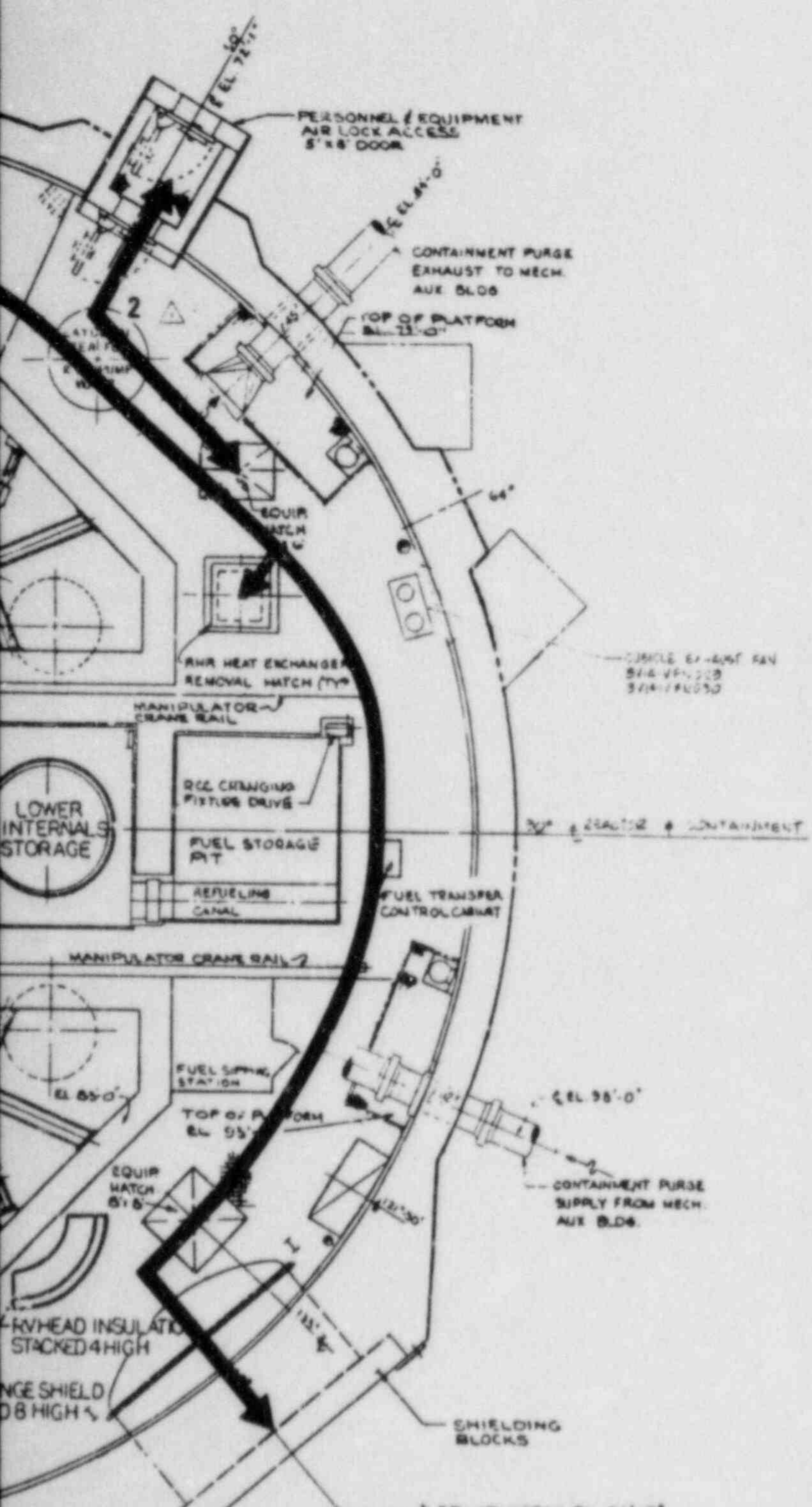


1 – RHR PUMPS, MOTORS
2 – RC FAN COOLER

Figure 5
SAFE LOAD PATHS FOR
RHR PUMPS, MOTORS, RC FAN COOLER
RCB, EL: (-) 2'

DWG. 8C-18-9-N-5002


CONTAINMENT
HVAC RETURN AIR RISER (TYP. 4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
304°
1
EL. 83'-0"
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS
PUMP UNIT FOR TENSIONER
RAPID REFUELING CABLE TRAY CHASE
R.V. TO HEAD O-RING HANDLING FIXTURE
9R23INTHI11A
REACTOR HEAD LIFTING RIG & HEADSHIELD
9R23INRGI02A
UPPER INTERNALS STORAGE
9R23INRGI01A
R.V. INTERNALS LIFTING RIG
REACTOR
1RI0INRVI01A
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS
9R23INRGI03A
R.V. HEAD O-RING CONTAINER
RV FLA
STACKE
180°
REACTOR



1 – RHR HXS, TUBE BUNDLES
2 – PUMPS, MOTORS

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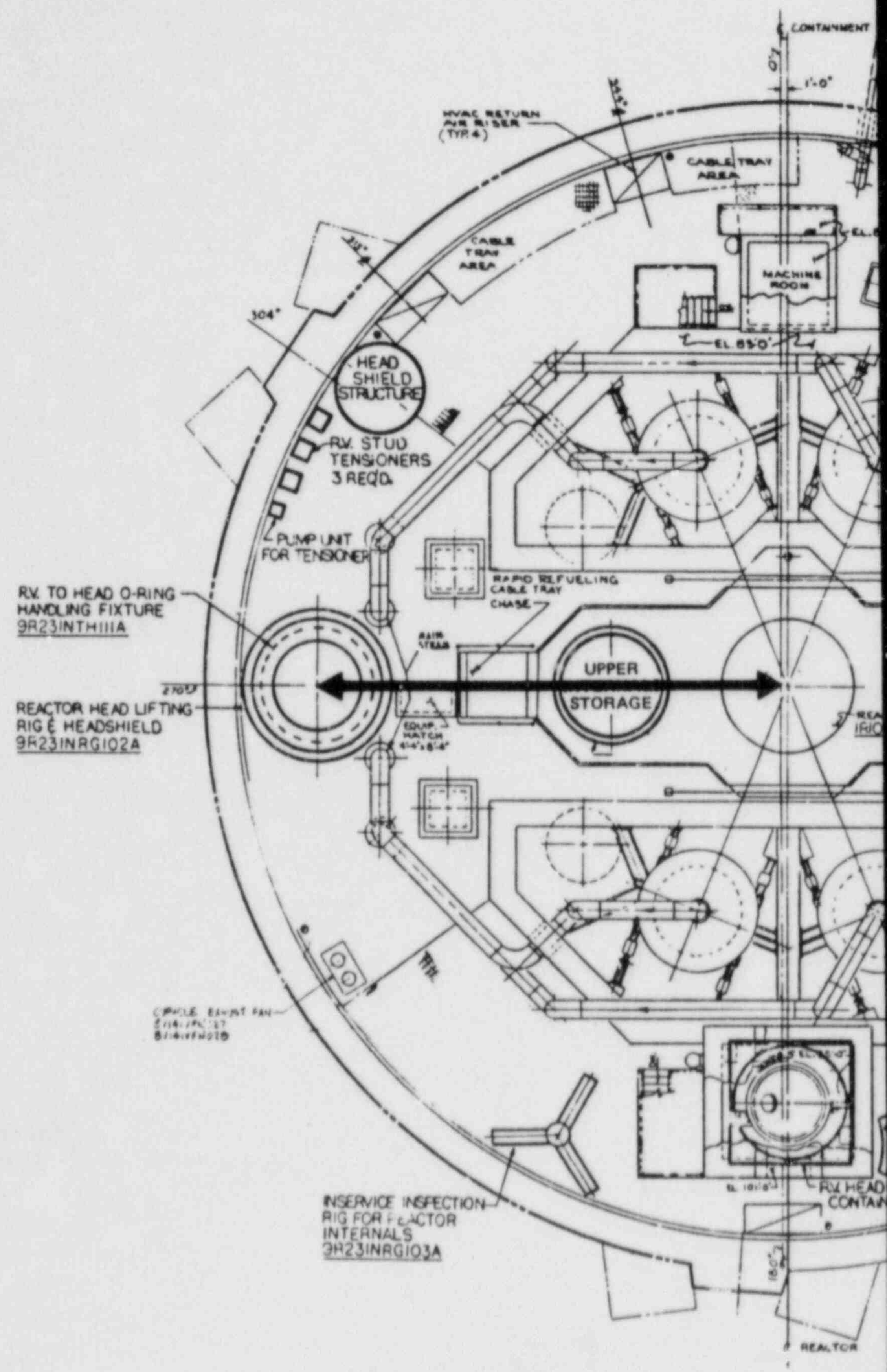
Figure 6
SAFE LOAD PATHS FOR
RHR HXS, TUBE BUNDLES,
PUMPS, MOTORS
RCB, EL. 68'

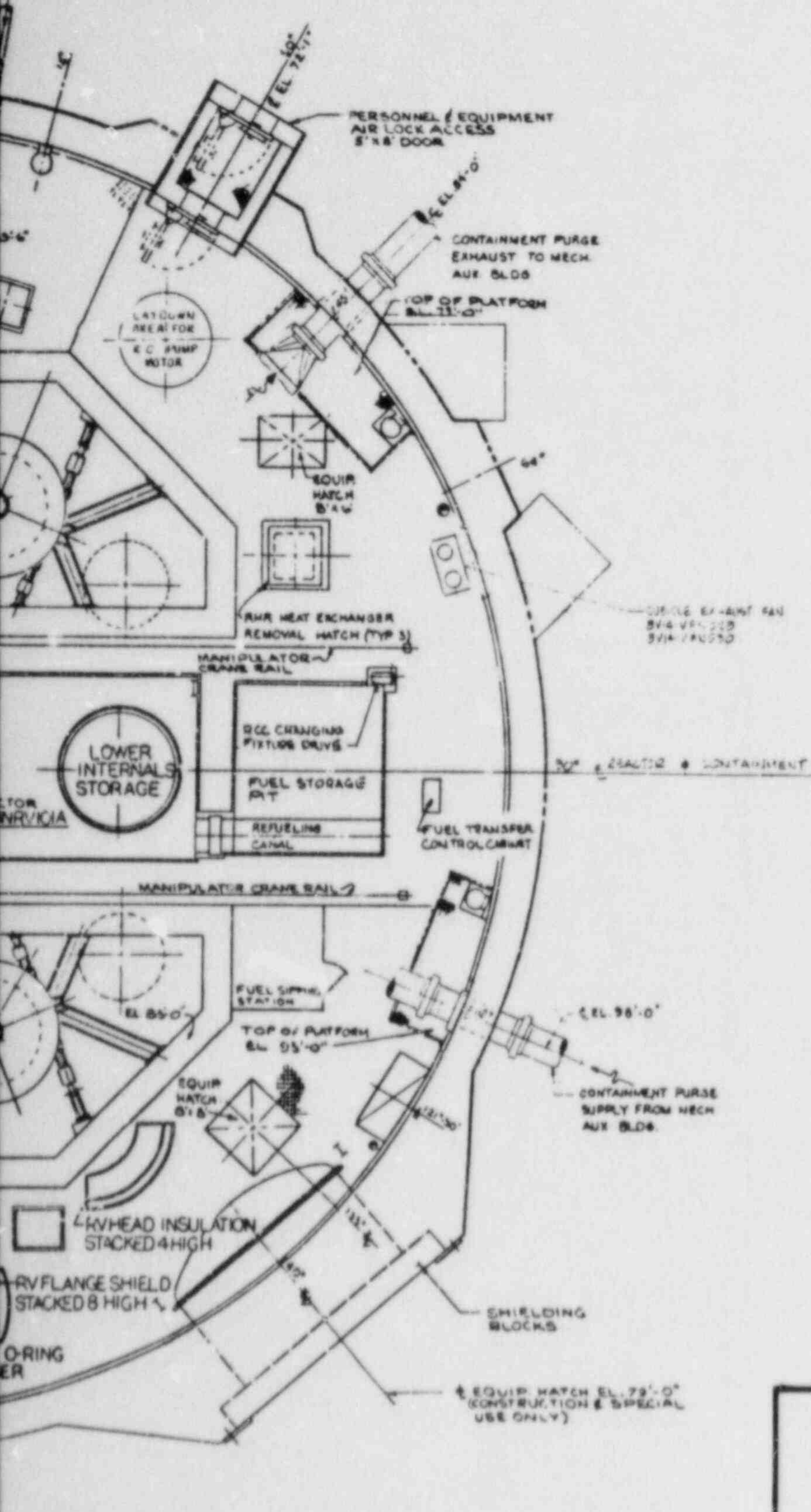
DWG. 6C-18-9-N-5006

8411010420

6



CONTAINMENT
HVAC RETURN AIR RISER (TYP.4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
EL. 83'-0"
304°
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS 3 REQ'D.
PUMP UNIT FOR TENSIONER
RAPID REFUELING CABLE TRAY CHASE
R.V. TO HEAD O-RING HANDLING FIXTURE
9R23INTH111A
REACTOR HEAD LIFTING RIG & HEADSHIELD
9R23INRG102A
UPPER
STORAGE
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS
9R23INRG103A
R.V. HEAD
REACTOR



TI APERTURE CARD

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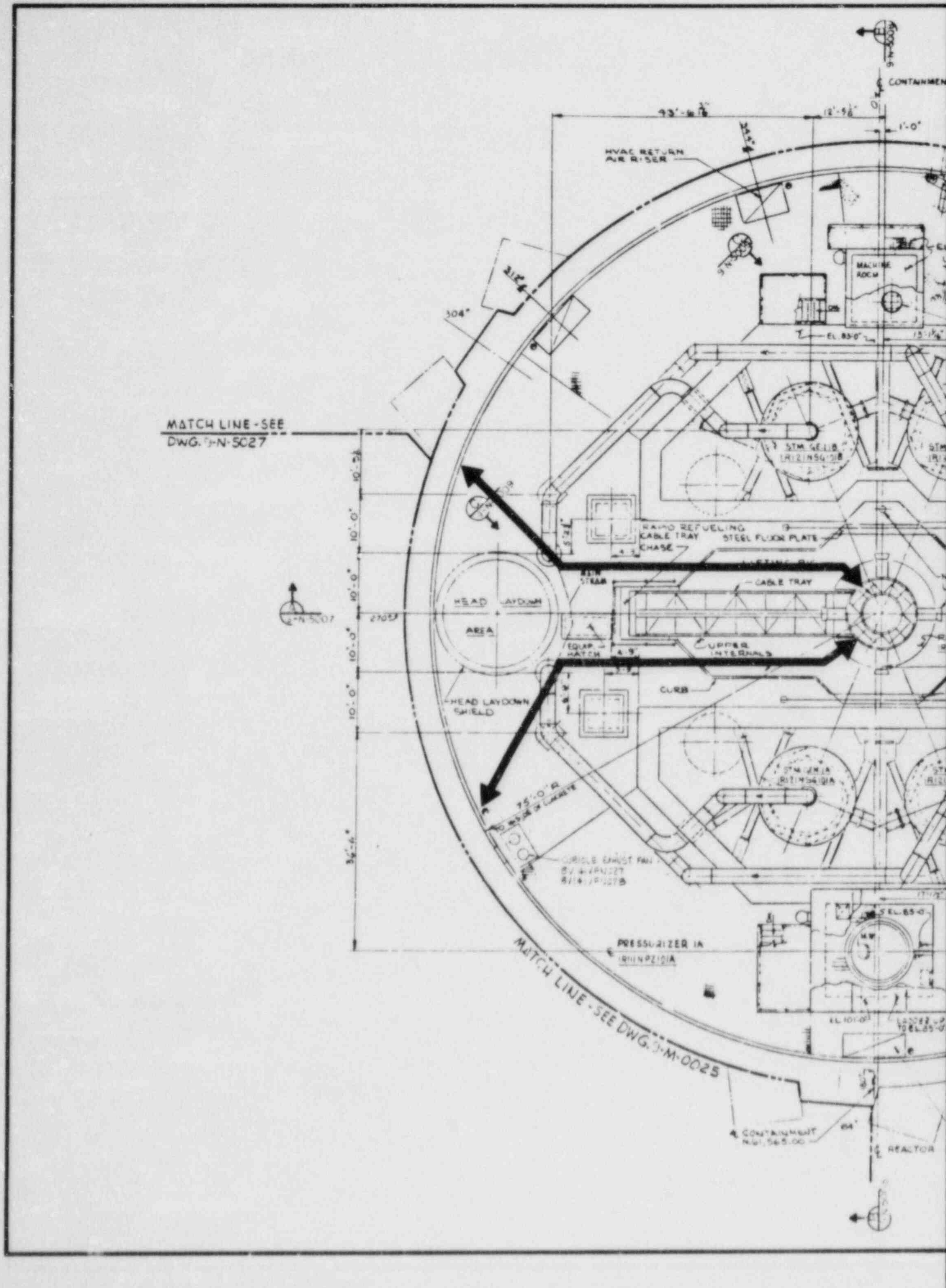
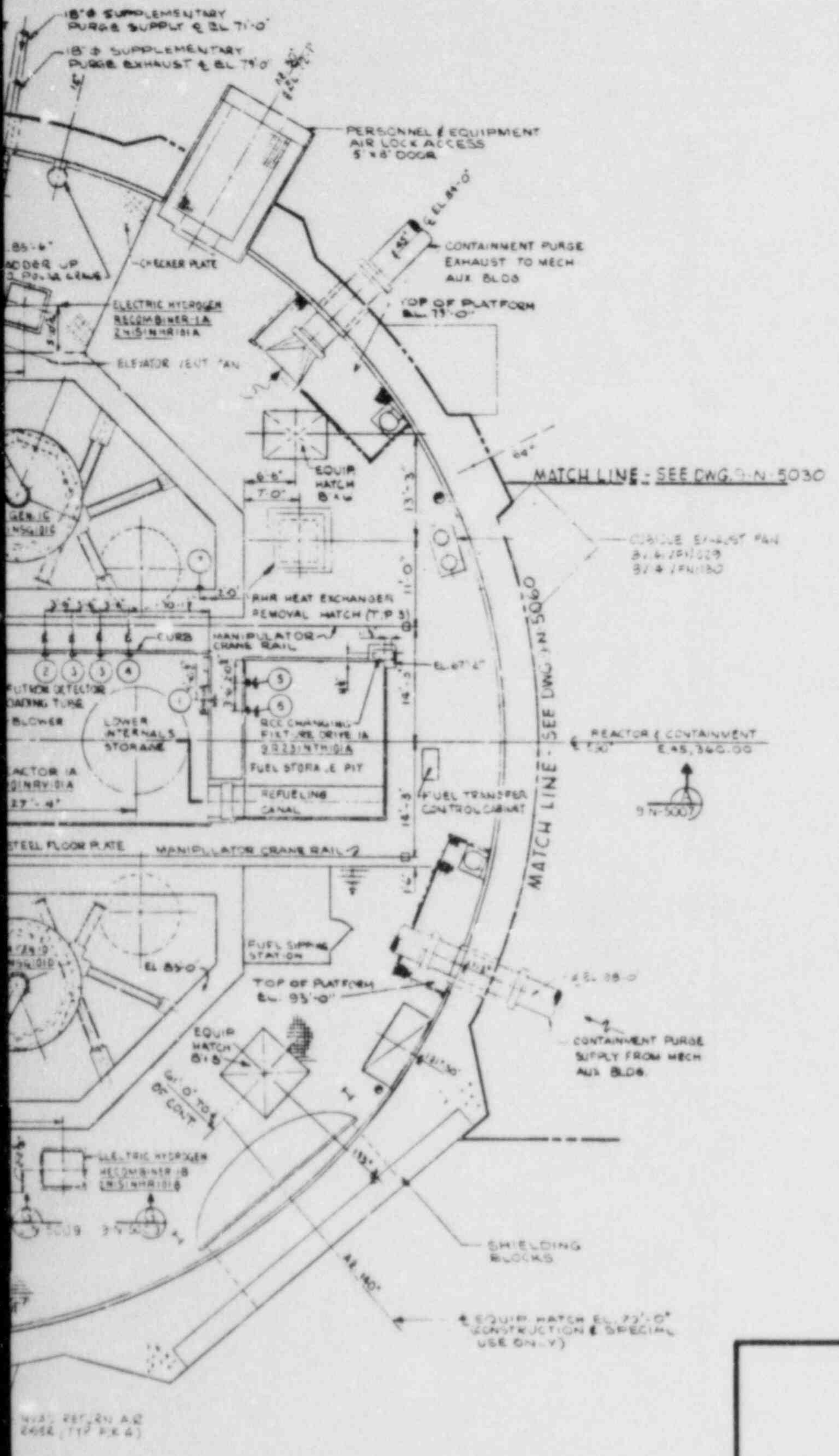
Figure 7
SAFE LOAD PATH
FOR REACTOR VESSEL HEAD
RCB, EL. 68'

DWG. 6C-18-9-N-5010

8411010420 -7



CONTAINMENT
HVAC RETURN AIR RISER
MACHINE ROOM
MATCH LINE - SEE DWG. 5-N-5027
RAPID REFUELING CABLE TRAY CHASE
STEEL FLOOR PLATE
CABLE TRAY
HEAD LAYDOWN AREA
EQUIP. HATCH
UPPER INTERNALS
CURB
HEAD LAYDOWN SHIELD
75'-0" R
PRESSURIZER 1A
MATCH LINE - SEE DWG. 5-M-0025
CONTAINMENT
REACTOR



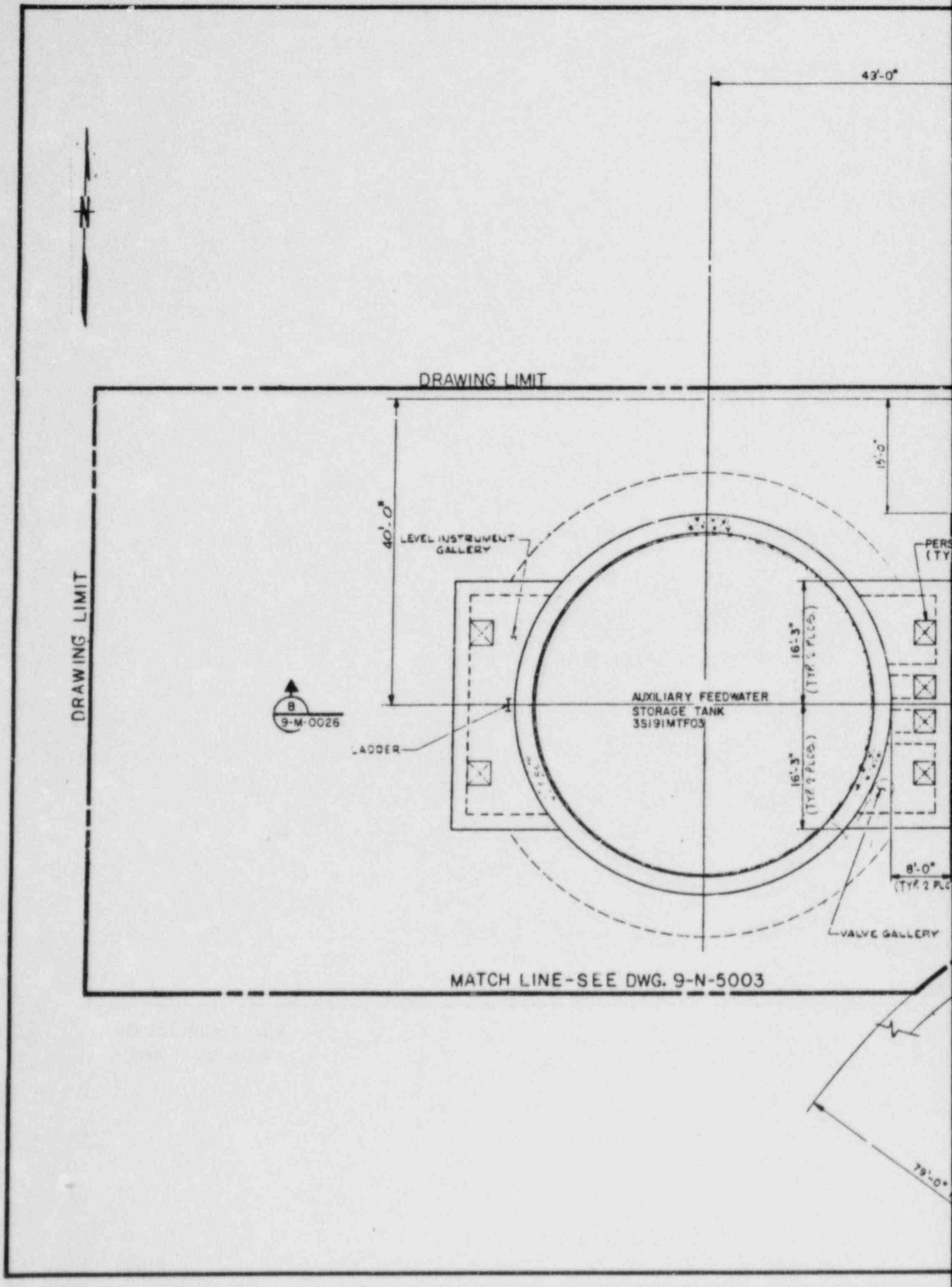
TI
APERTURE
CARD

Also Available On
Aperture Card

Figure 8
SAFE LOAD PATHS FOR
STUDS, NUTS, WASHERS,
STUD TENSIONERS
RCB, EL. 68'

DWG. 6C-18-9-N-5006

8411010420 -8



43'-0"
DRAWING LIMIT
DRAWING LIMIT
40'-0"
15'-0"
LEVEL INSTRUMENT GALLERY
PERS (TY
16'-3" (TYP 2 PLCS)
16'-3" (TYP 2 PLCS)
AUXILIARY FEEDWATER STORAGE TANK 3S191MTF03
B 9-M-0026
LADDER
8'-0" (TYP 2 PLC
VALVE GALLERY
MATCH LINE-SEE DWG. 9-N-5003
79'-0"

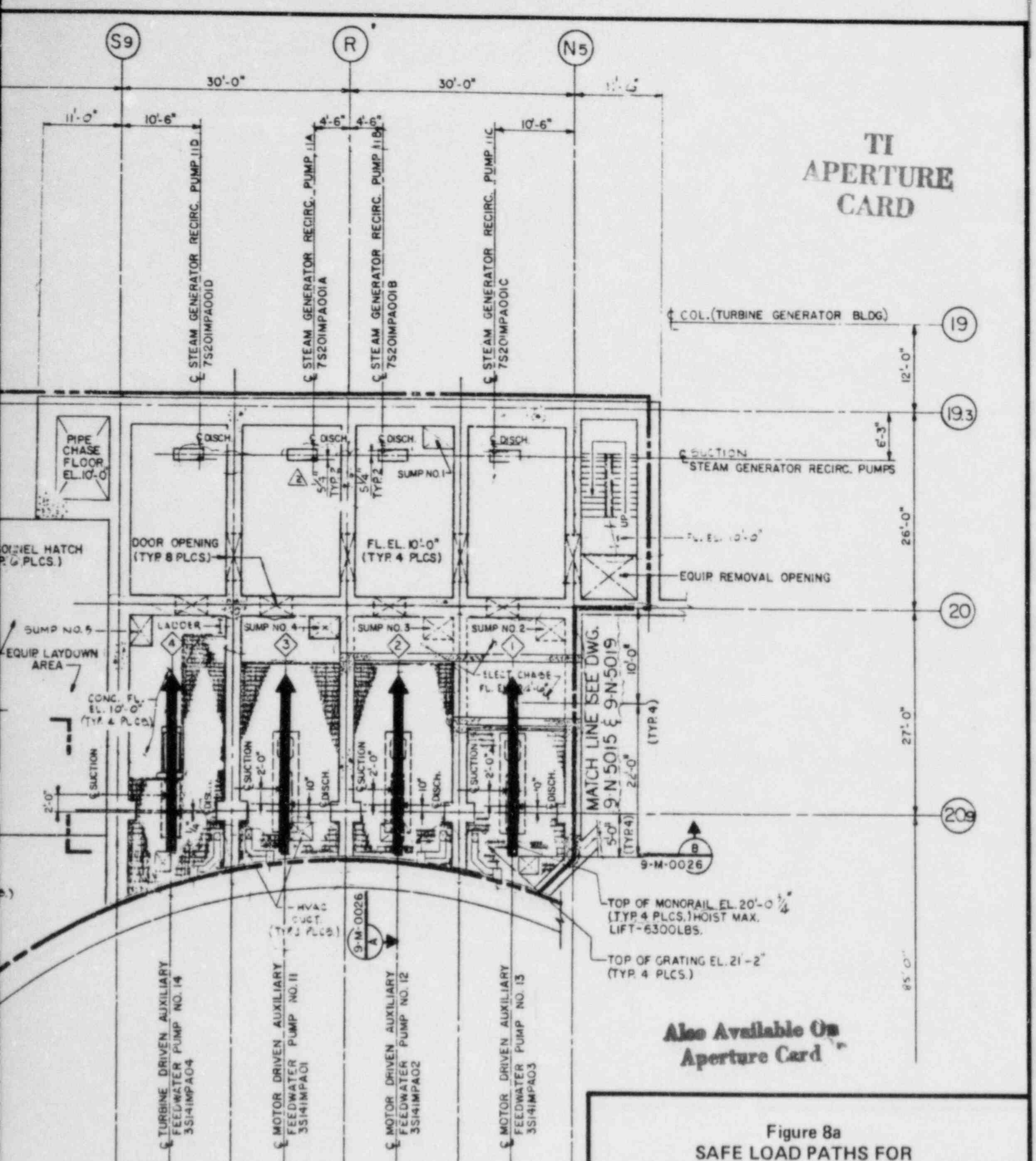
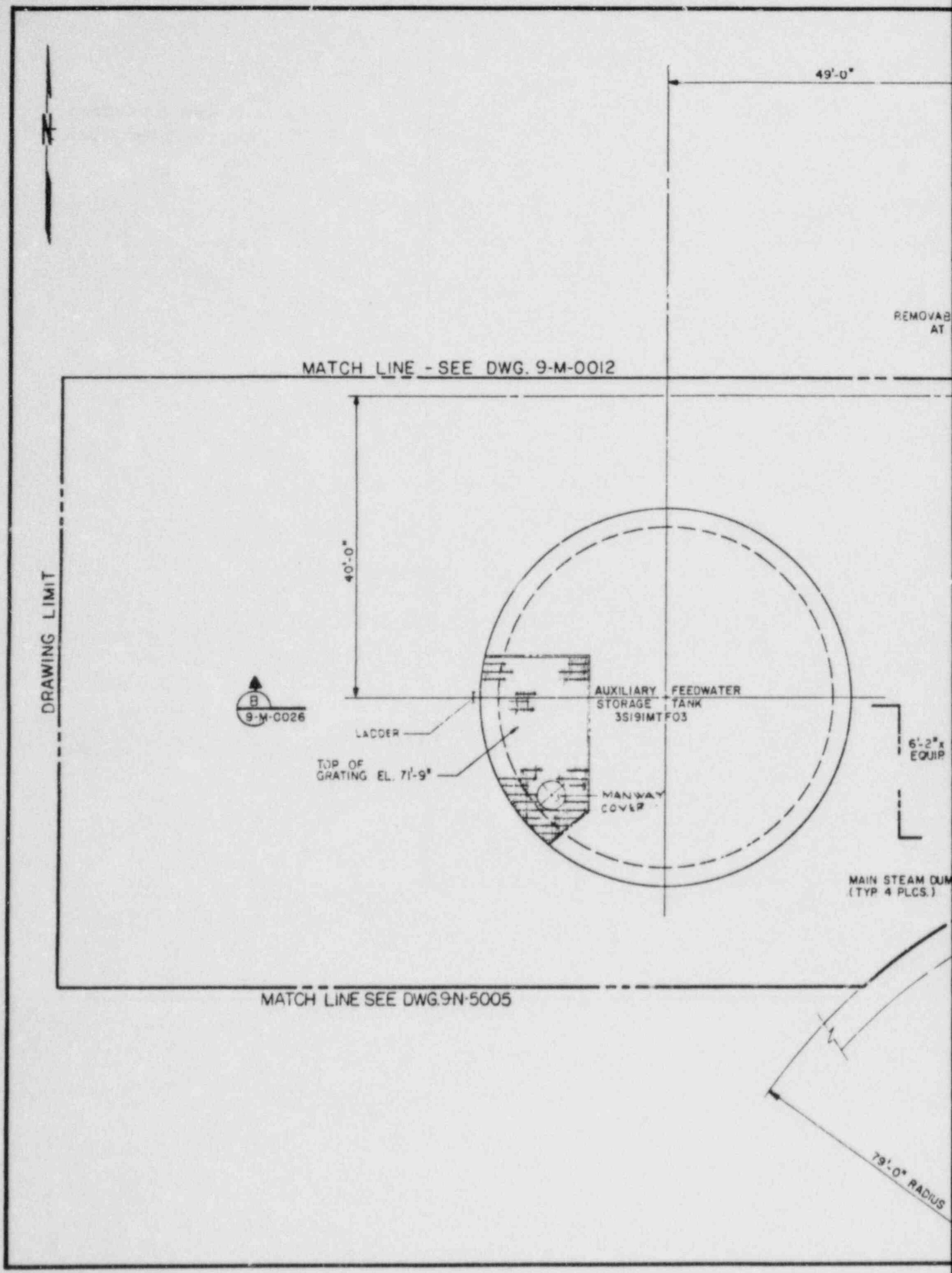


Figure 8a
SAFE LOAD PATHS FOR
AUX. FEEDWATER PUMPS, DRIVERS
ETC., EL. 10'

DWG. 6G-01-9-M-0022



49'-0"
REMOVAB
AT
MATCH LINE - SEE DWG. 9-M-0012
40'-0"
DRAWING LIMIT
B
9-M-0026
AUXILIARY FEEDWATER
STORAGE TANK
3S191MTF03
LADDER
TOP OF
GRATING EL. 71'-9"
MANWAY
COVER
6'-2"x
EQUIP
MAIN STEAM DUM
(TYP 4 PLCS.)
MATCH LINE SEE DWG.9N-5005
79'-0" RADIUS

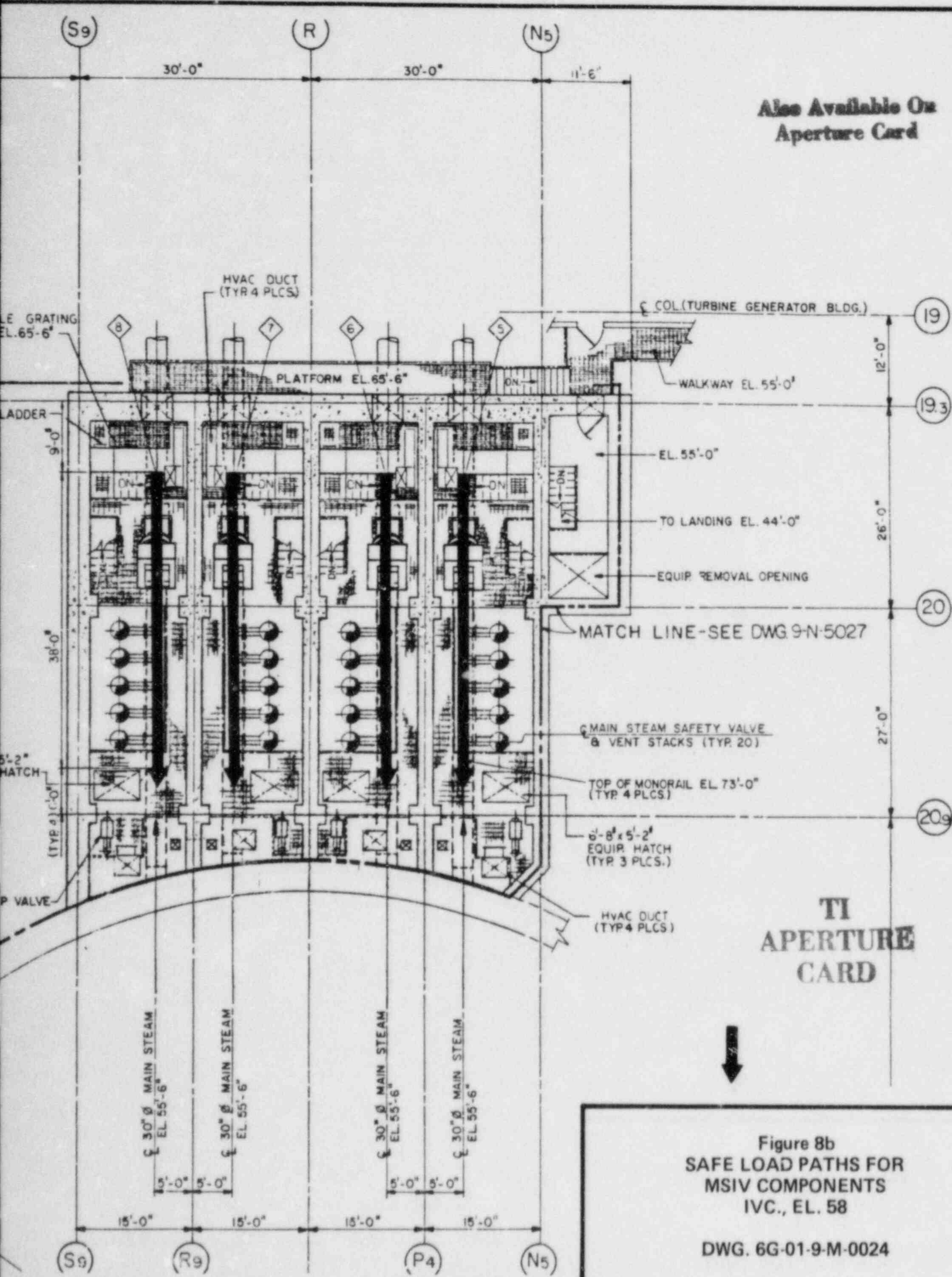
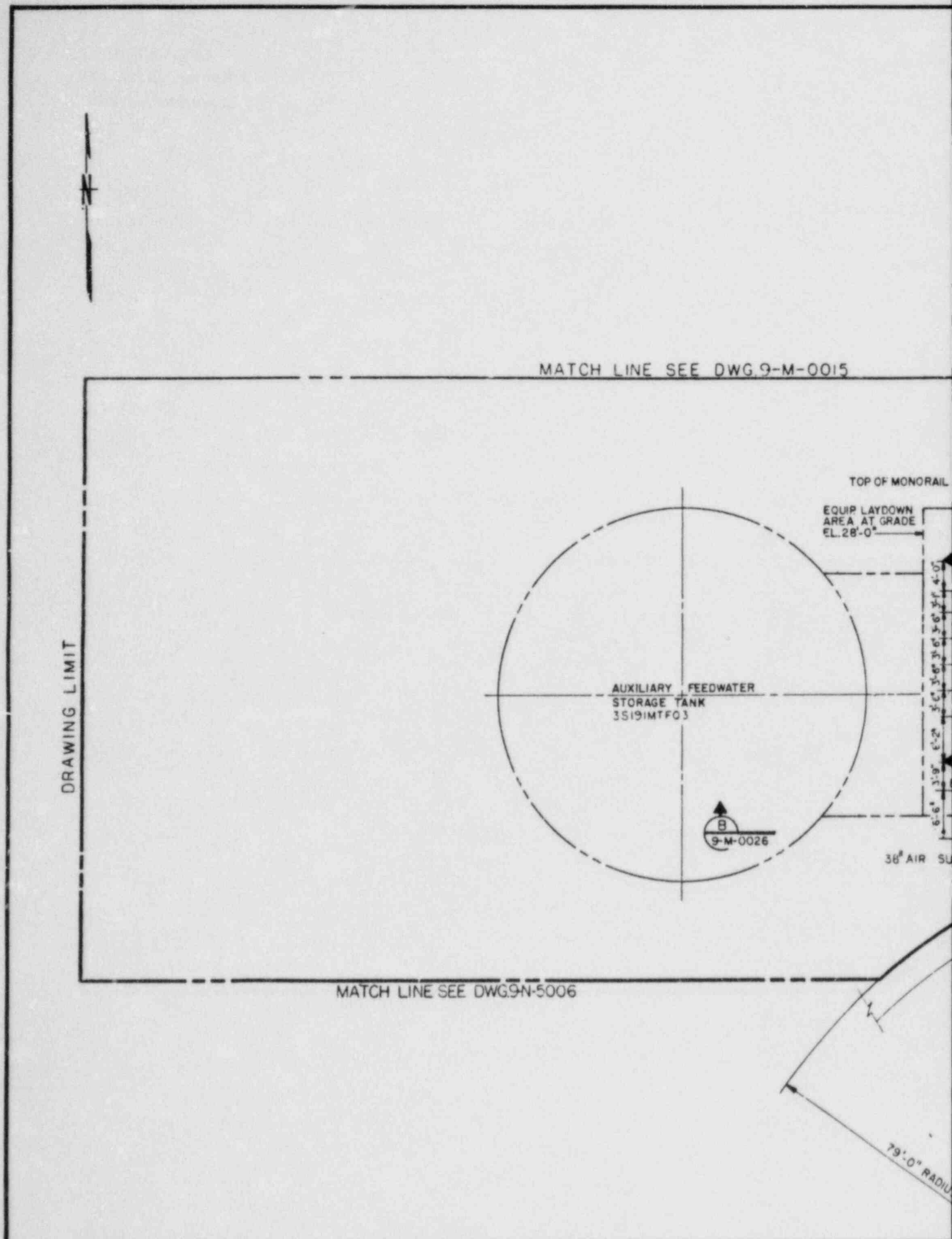


Figure 8b
SAFE LOAD PATHS FOR
MSIV COMPONENTS
IVC., EL. 58

DWG. 6G-01-9-M-0024

-10


N
MATCH LINE SEE DWG.9-M-0015
DRAWING LIMIT
TOP OF MONORAIL
EQUIP LAYDOWN
AREA AT GRADE
EL.28'-0"
AUXILIARY FEEDWATER
STORAGE TANK
3S191MTF03
B
9-M-0026
MATCH LINE SEE DWG.9-N-5006

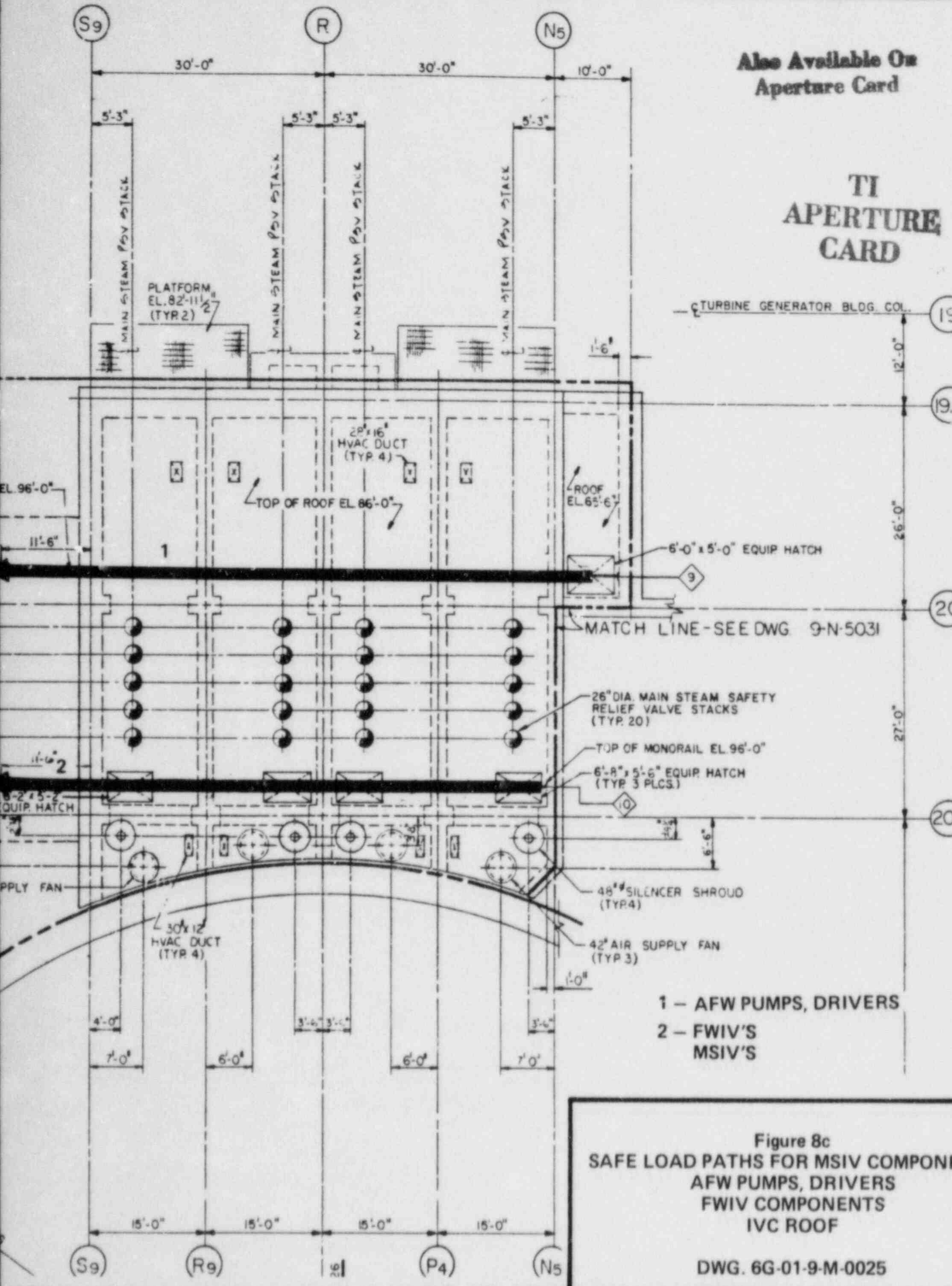
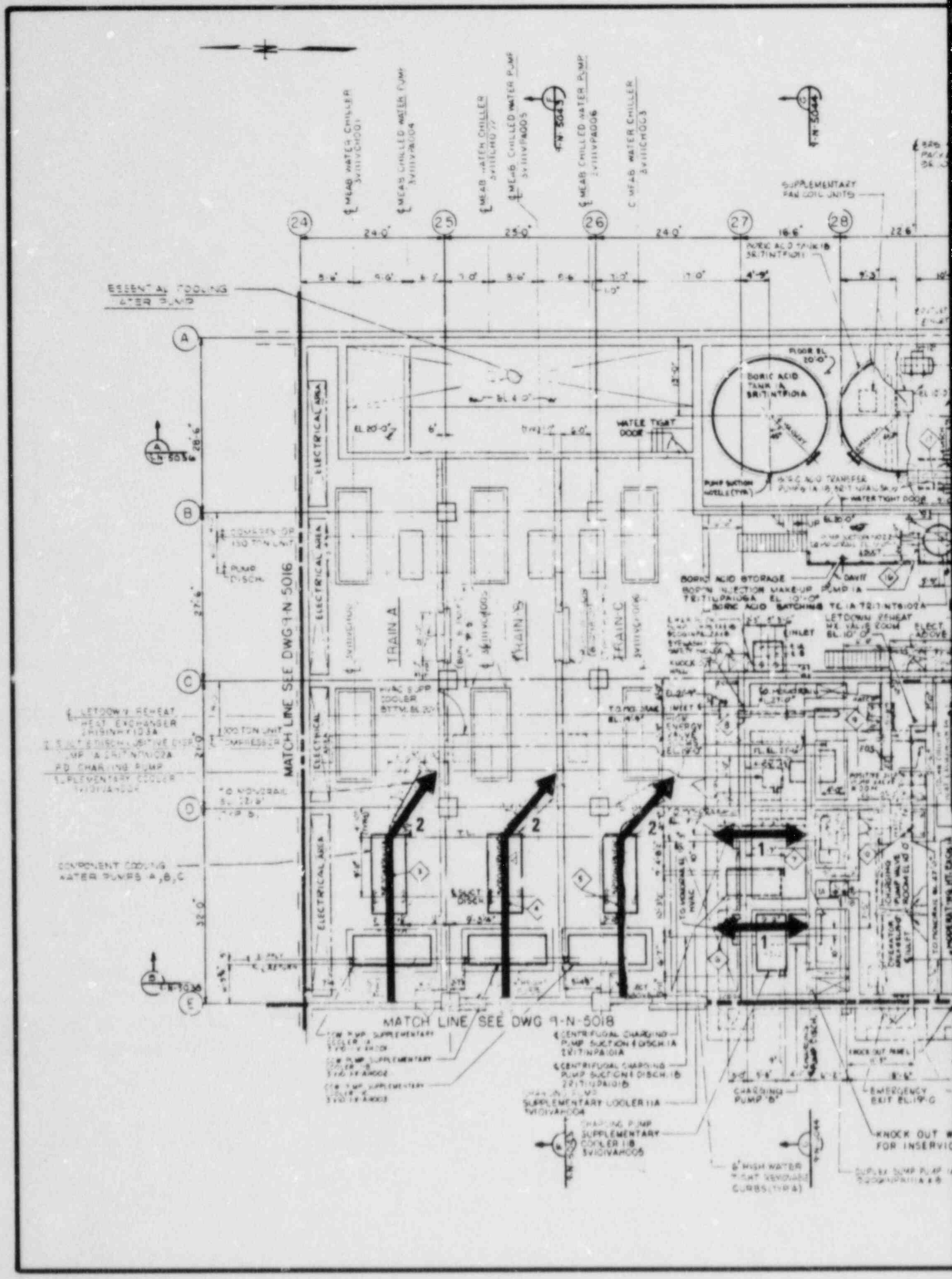


Figure 8c
SAFE LOAD PATHS FOR MSIV COMPONENTS
AFW PUMPS, DRIVERS
FWIV COMPONENTS
IVC ROOF

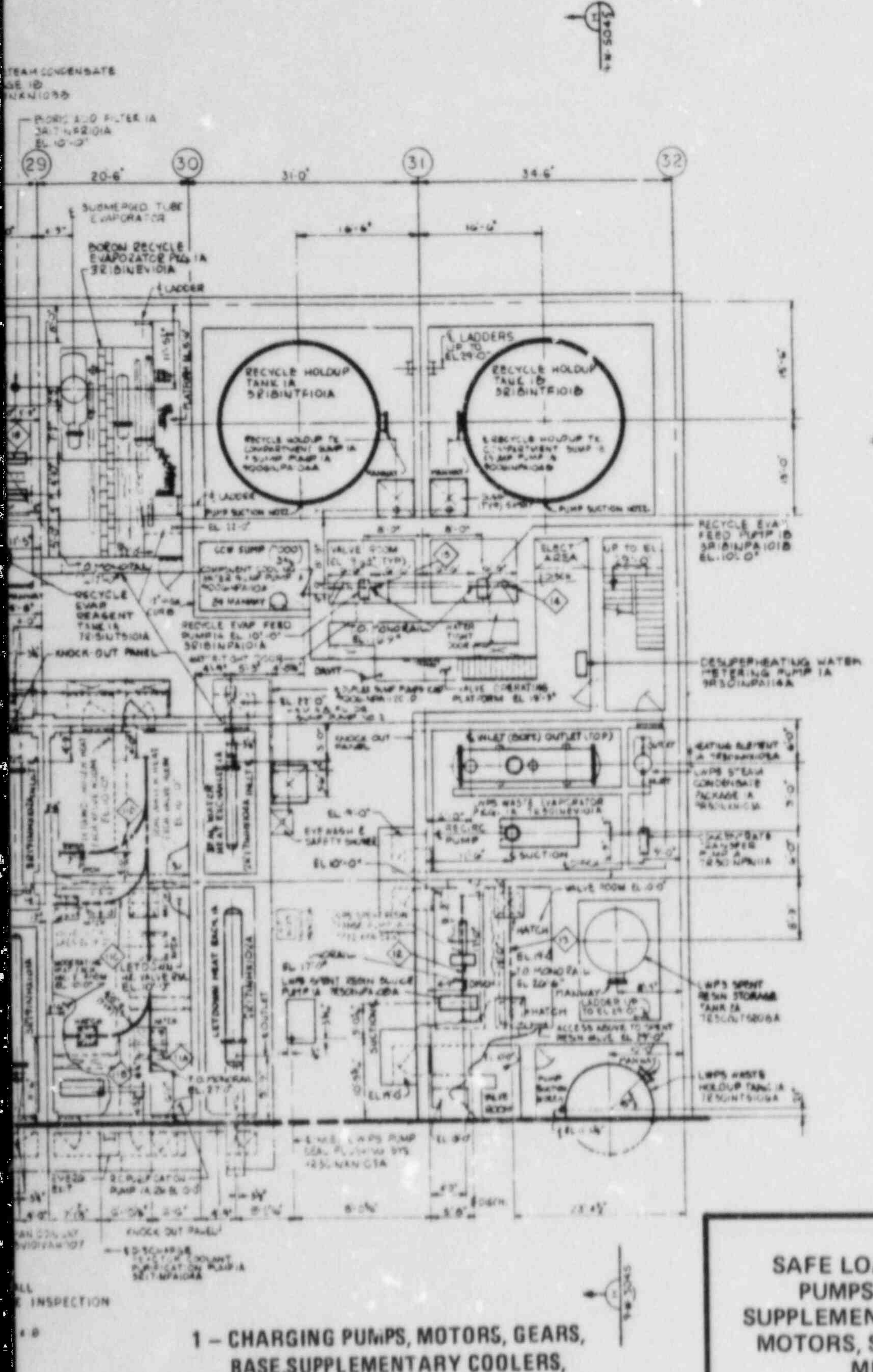
DWG. 6G-01-9-M-0025

8411010420

11



MATCH LINE SEE DWG 9-N-5016
MATCH LINE SEE DWG 9-N-5018
ESSENTIAL COOLING WATER PUMP
TRAIN A
TRAIN B
TRAIN C
BORIC ACID STORAGE
COMPONENT COOLING WATER PUMPS A,B,C
LETDOWN REHEAT HEAT EXCHANGER
SUPPLEMENTARY FAN COIL UNITS
CHARGING PUMP "B"
EMERGENCY EXIT
KNOCK OUT



1 – CHARGING PUMPS, MOTORS, GEARS, BASE,SUPPLEMENTARY COOLERS,

2 – CCW PUMPS, MOTORS, SUPPLEMENTARY COOLERS

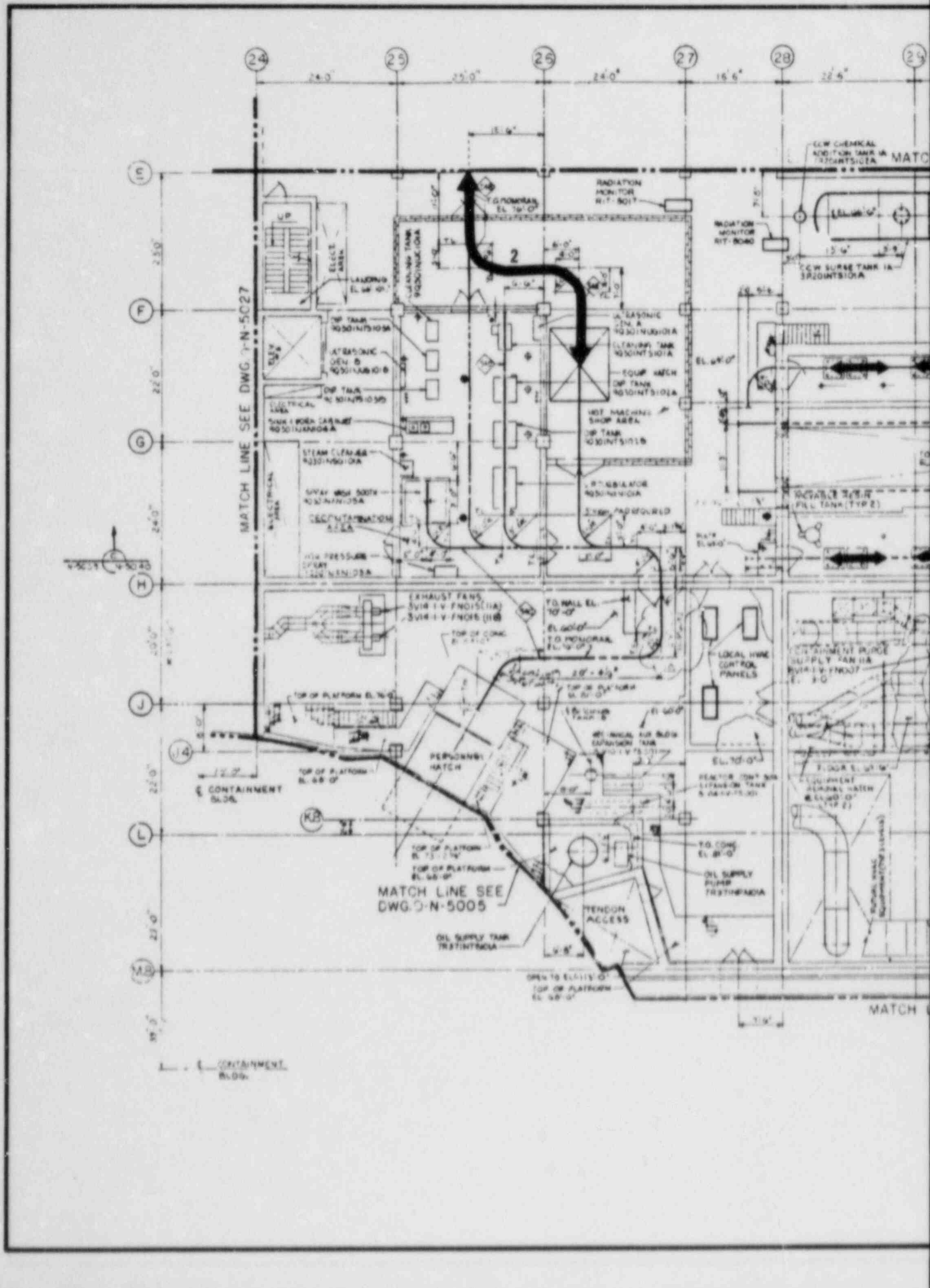
TI APERTURE CARD

Also Available On Aperture Card

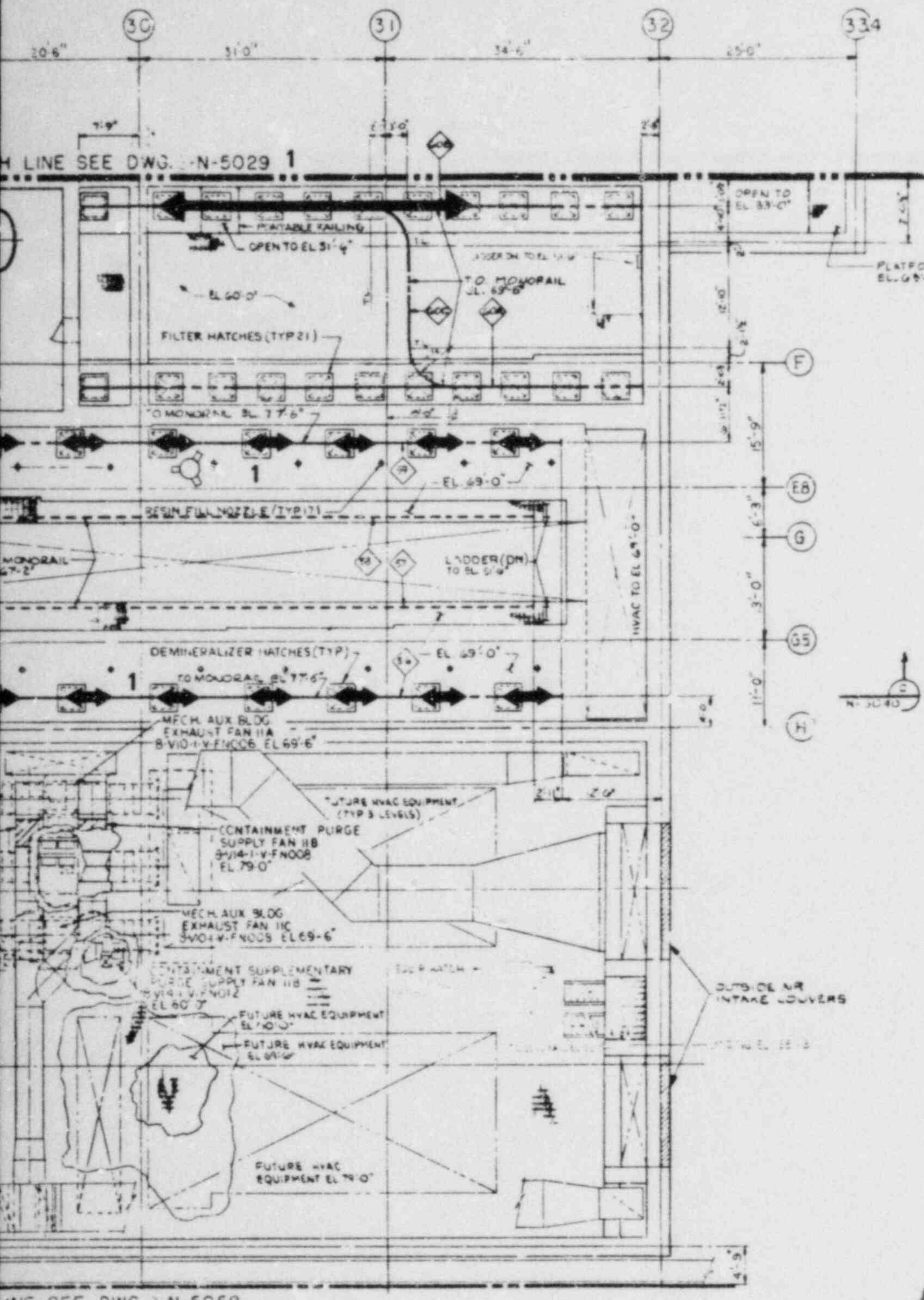
Figure 9
SAFE LOAD PATHS FOR CHARGING PUMPS, MOTORS, GEARS, BASE SUPPLEMENTARY COOLERS, CCW PUMPS, MOTORS, SUPPLEMENTARY COOLERS MEAB, EL. 10' AREA K

DWG. 6M-18-9-N-5017

8411010420 -12



24
25
26
27
28
29
E
F
G
H
J
J4
K8
L
M8
MATCH LINE SEE DWG. 9-N-5027
MATCH LINE SEE
DWG. 9-N-5005
RADIATION MONITOR
EXHAUST FANS
HOT MACHINE SHOP AREA
DECONTAMINATION AREA
PERSONNEL HATCH
TENDON ACCESS
LOCAL HVAC CONTROL PANELS
OIL SUPPLY PUMP
OIL SUPPLY TANK
CONTAINMENT PURGE SUPPLY FAN
ELECTRICAL AREA
LANDING
UP
E CONTAINMENT BLDG.
MATCH



TI APERTURE CARD

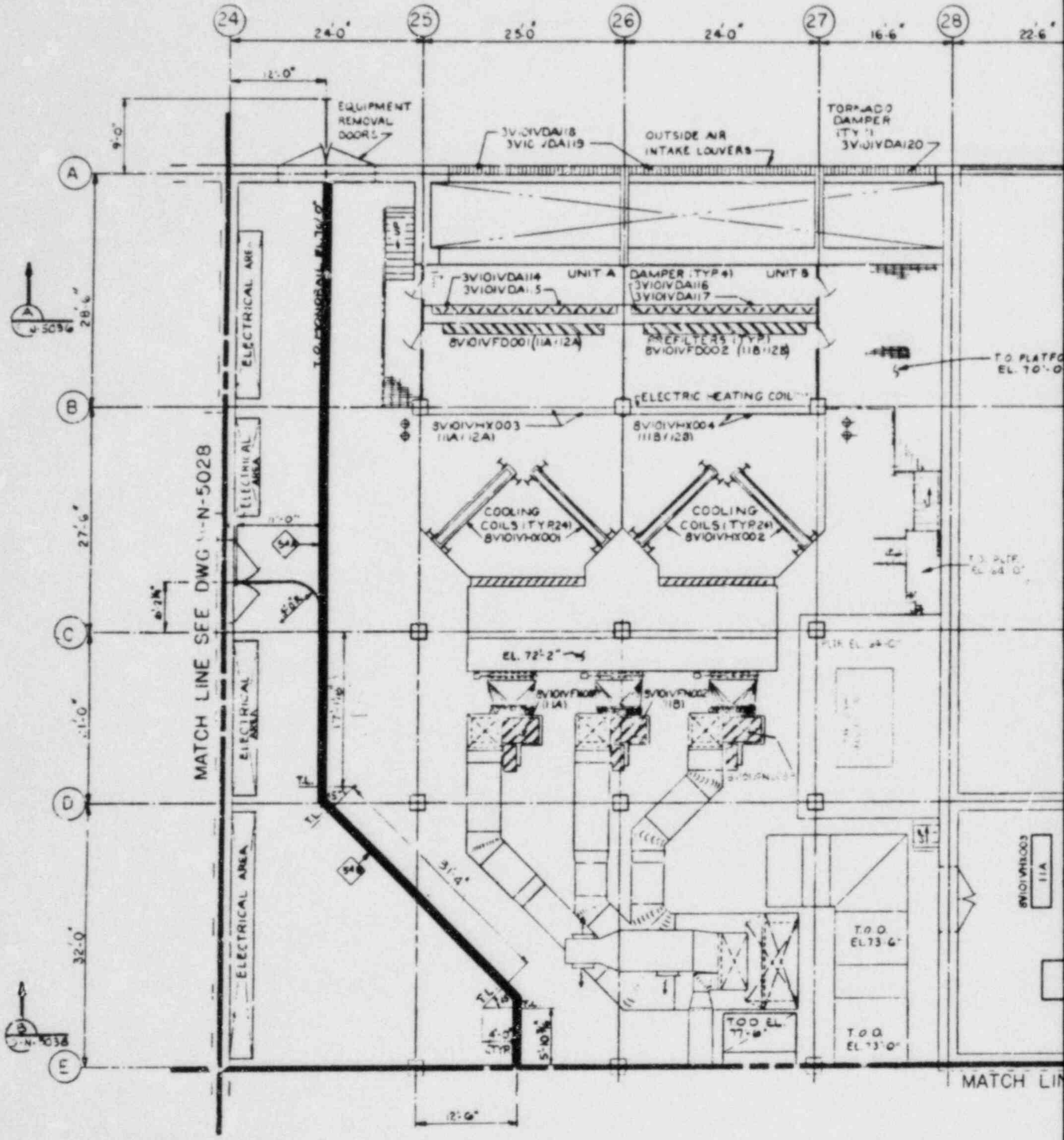
Also Available On Aperture Card

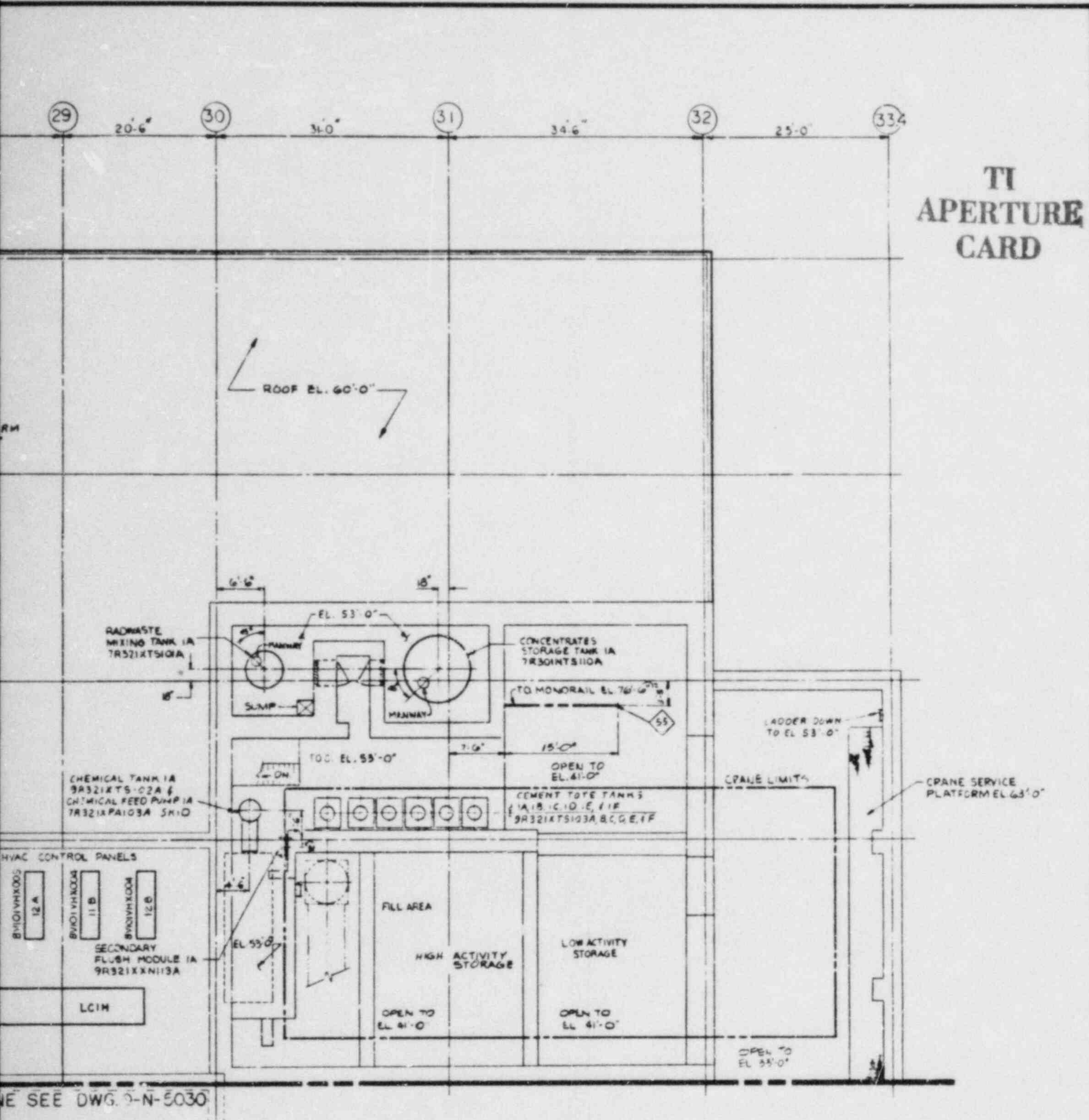
1 – SAFE LOAD PATHS FOR HATCHES
2 – CHARGING PUMPS, MOTORS, GEARS, BASES, SUPPLEMENTARY COOLERS, CCW PUMPS, MOTORS, SUPPLEMENTARY COOLERS

Figure 10
SAFE LOAD PATHS FOR HATCHES; CHARGING PUMPS, MOTORS, GEARS, BASES, SUPPLEMENTARY COOLERS, CCW PUMPS, MOTORS, SUPPLEMENTARY COOLERS
MEAB, EL. 60, AREA L

DWG. 6M-18-9-N-5030

8411010420 – 13


24
25
26
27
28
24'-0"
25'-0"
24'-0"
16'-6"
22'-6"
12'-0"
9'-0"
EQUIPMENT REMOVAL DOORS
OUTSIDE AIR INTAKE LOUVERS
TORNADO DAMPER
UNIT A
UNIT B
PREFILTERS (TYP)
ELECTRIC HEATING COIL
COOLING COILS (TYP 2)
ELECTRICAL AREA
MATCH LINE SEE DWG
A
B
C
D
E
28'-6"
27'-6"
32'-0"
EL. 72'-2"
T.O.P. EL. 73'-6"
T.O.P. EL. 73'-0"
31'-4"
12'-6"
MATCH LIN



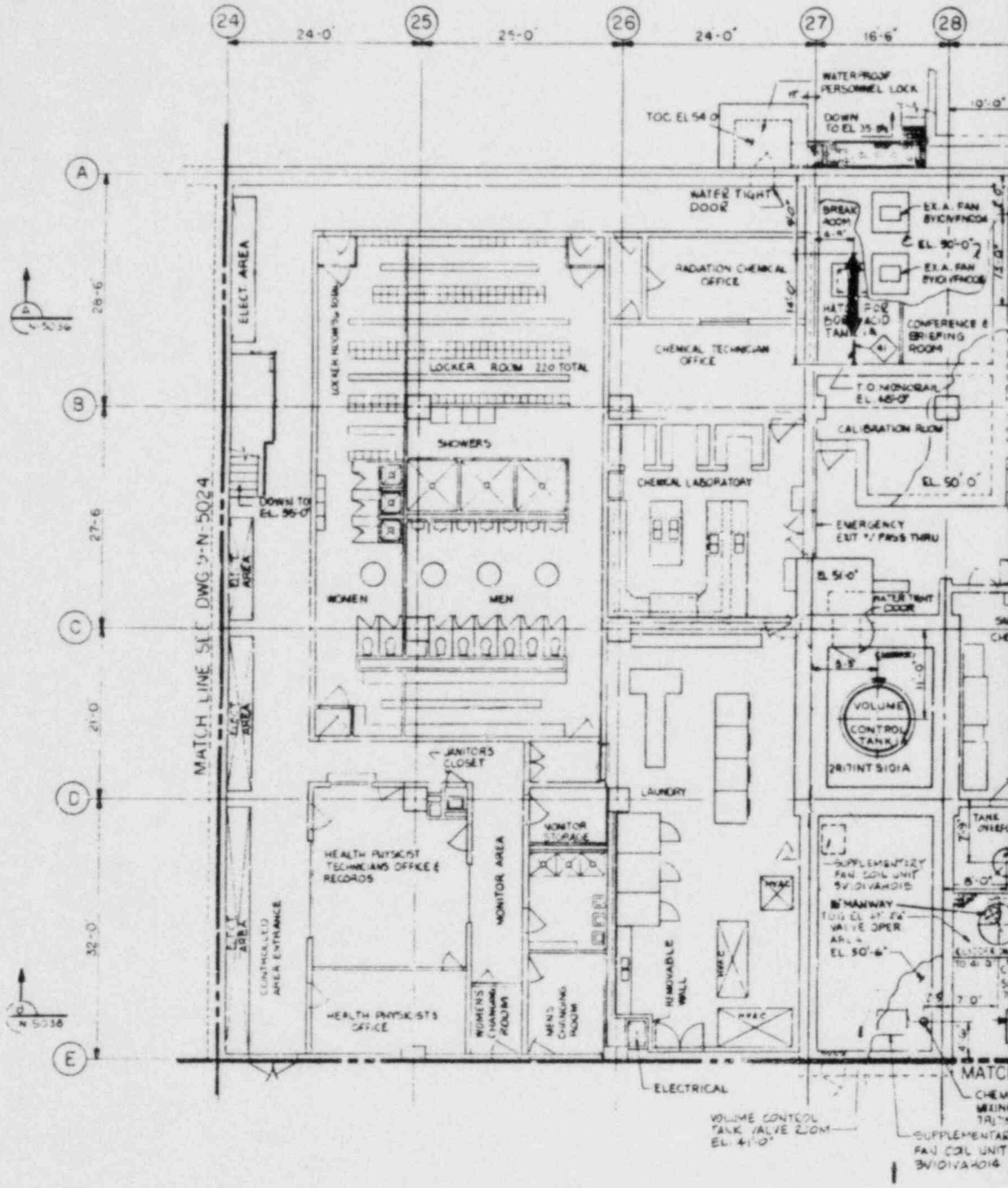
TI APERTURE CARD

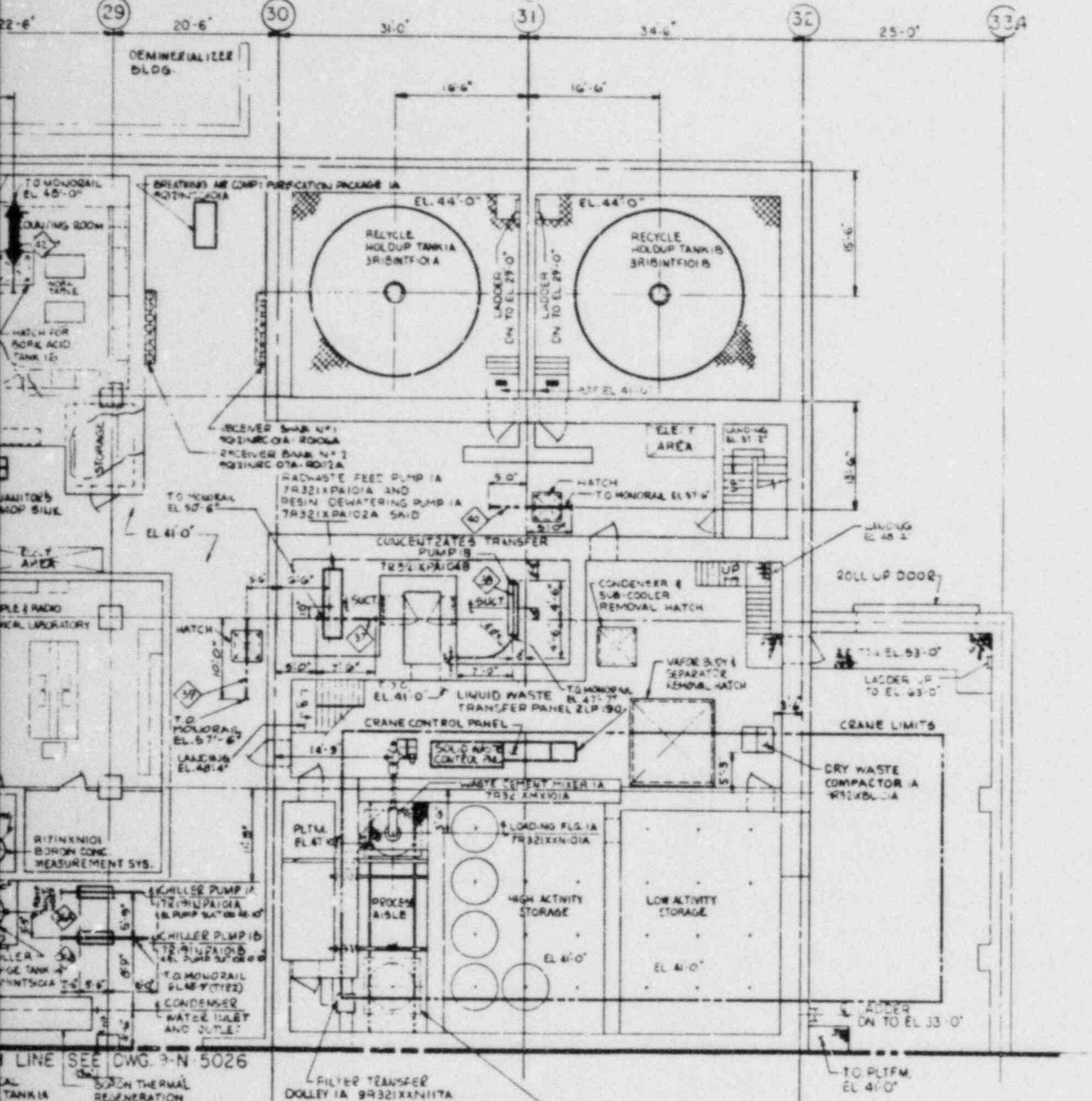
Also Available On Aperture Card

Figure 11
SAFE LOAD PATH FOR CHARGING PUMP COMPONENTS, CCW PUMPS, MOTORS, AND SUPPLEMENTARY COOLERS MEAB EL. 60', AREA K

DWG. 6M-18-9-N-5029

8411010420 -14


24
25
26
27
28
24-0'
25-0'
24-0'
16-6'
WATERPROOF PERSONNEL LOCK
TOC EL 54 0
DOWN TO EL 35
WATER TIGHT DOOR
A
B
C
D
E
28-6
27-6
21-0
32-0
ELECT AREA
LOCKER ROOM 220 TOTAL
SHOWERS
WOMEN
MEN
RADIATION CHEMICAL OFFICE
CHEMICAL TECHNICIAN OFFICE
CHEMICAL LABORATORY
BREAK ROOM
EX.A. FAN
CONFERENCE & BRIEFING ROOM
T.O MONORAIL EL 48-0"
CALIBRATION ROOM
EL 50'0"
EMERGENCY EXIT W/ PASS THRU
EL 51-0"
WATER TIGHT DOOR
VOLUME CONTROL TANK
MATCH LINE SEE DWG 5-N-5024
DOWN TO EL 56-0"
JANITORS CLOSET
LAUNDRY
HEALTH PHYSICIST TECHNICIANS OFFICE & RECORDS
MONITOR AREA
MONITOR STORAGE
REMOVABLE WALL
HVAC
SUPPLEMENTARY FAN COIL UNIT
CONTROLLED AREA ENTRANCE
HEALTH PHYSICISTS OFFICE
WOMENS CHANGING ROOM
MENS CHANGING ROOM
ELECTRICAL
VOLUME CONTROL TANK VALVE ROOM EL 41-0"
N-5036
N-5038
MATCH



TI
APERTURE
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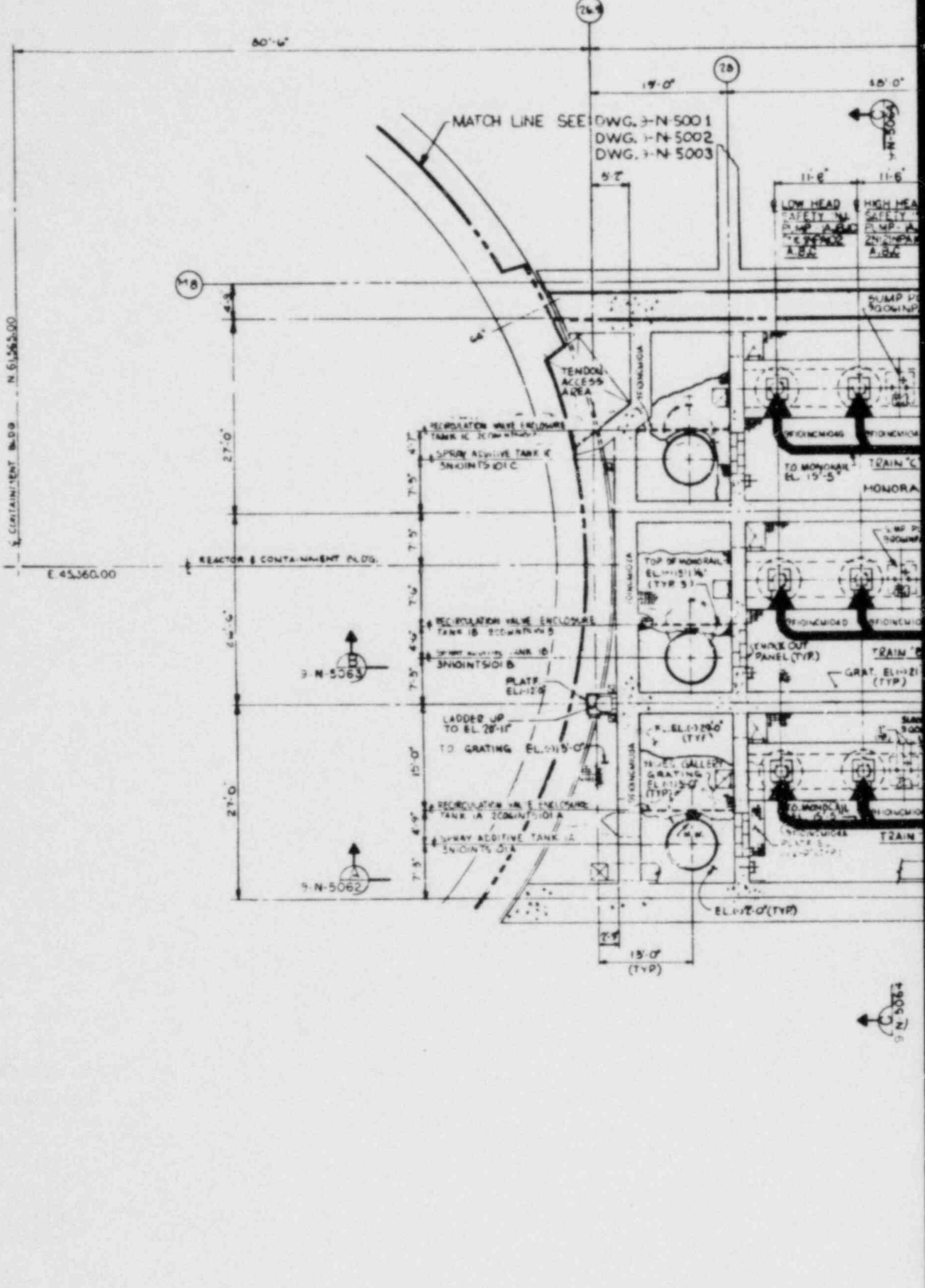
Aperture Card

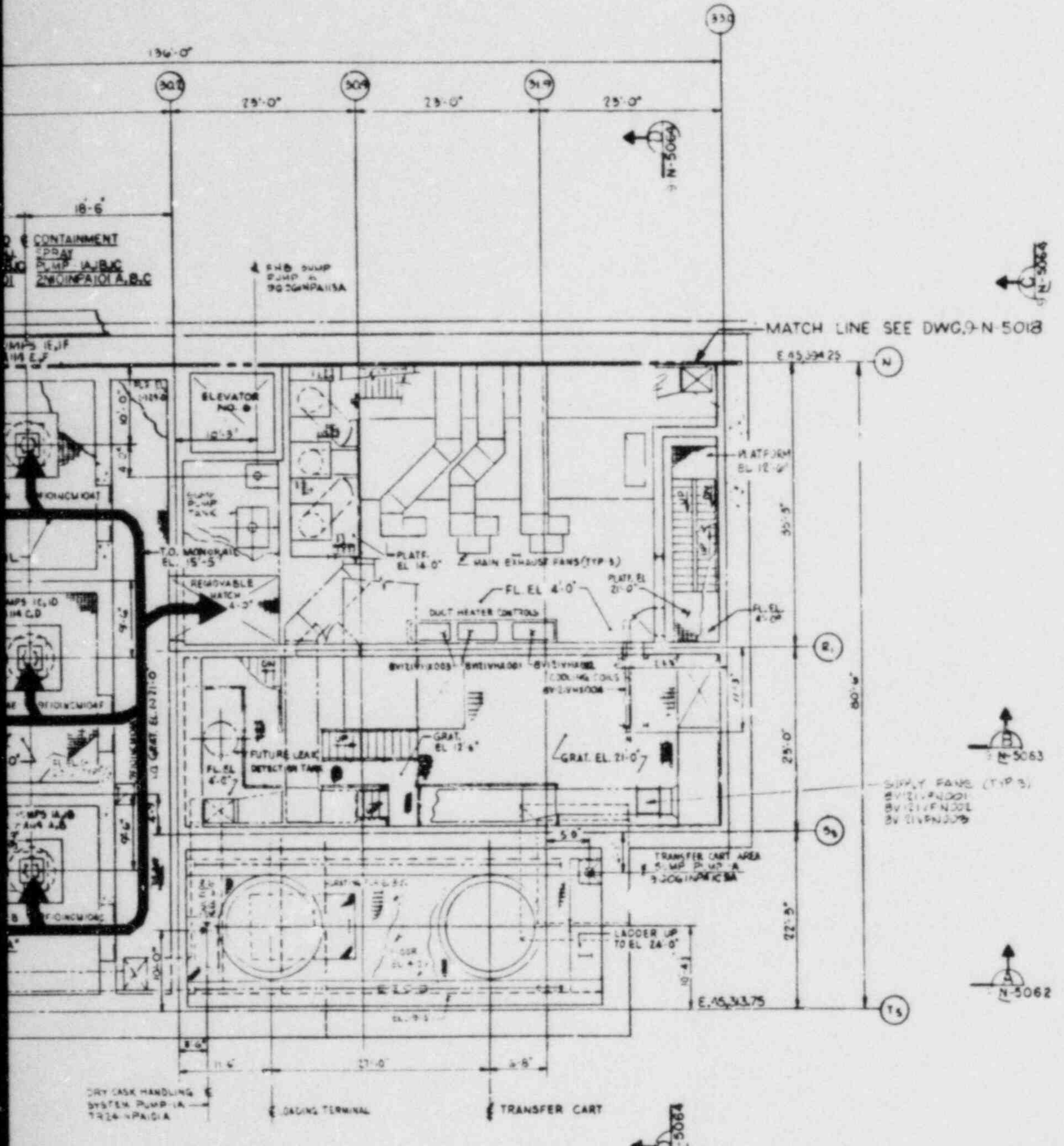
Figure 12
SAFE LOAD PATHS FOR BORIC ACID TANK HATCHES
MEAB, EL. 41', AREA M

DWG. 6M-18-9-N-5025

8411010420 -15



MATCH LINE SEE DWG. 3-N-5001
DWG. 3-N-5002
DWG. 3-N-5003
80'-6"
15'-0"
TENDON ACCESS AREA
LOW HEAD SAFETY INJ. PUMP
HIGH HEAD SAFETY INJ. PUMP
CONTAINMENT BLDG N 61,362.00
E 45,360.00
REACTOR & CONTAINMENT BLDG.
SPRAY ADDITIVE TANK 1C
SPRAY ADDITIVE TANK 1A
TO GRATING
LADDER UP
TRAIN "C"
TRAIN "B"
TO MONORAIL
TOP OF MONORAIL
PLATE
27'-0"
15'-0"
13'-0" (TYP)
3-N-5062



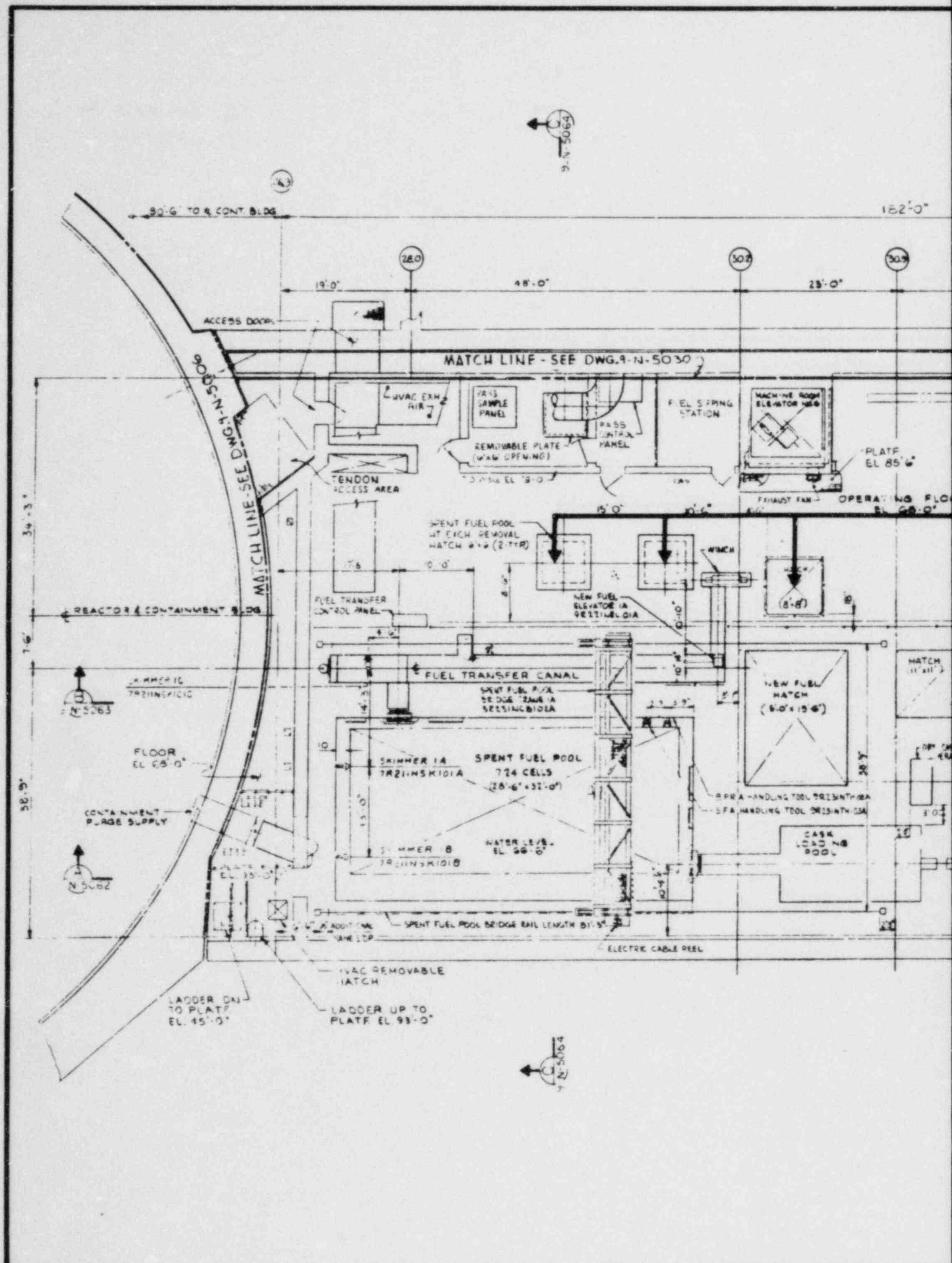
TI APERTURE CARD

Also Available On Aperture Card

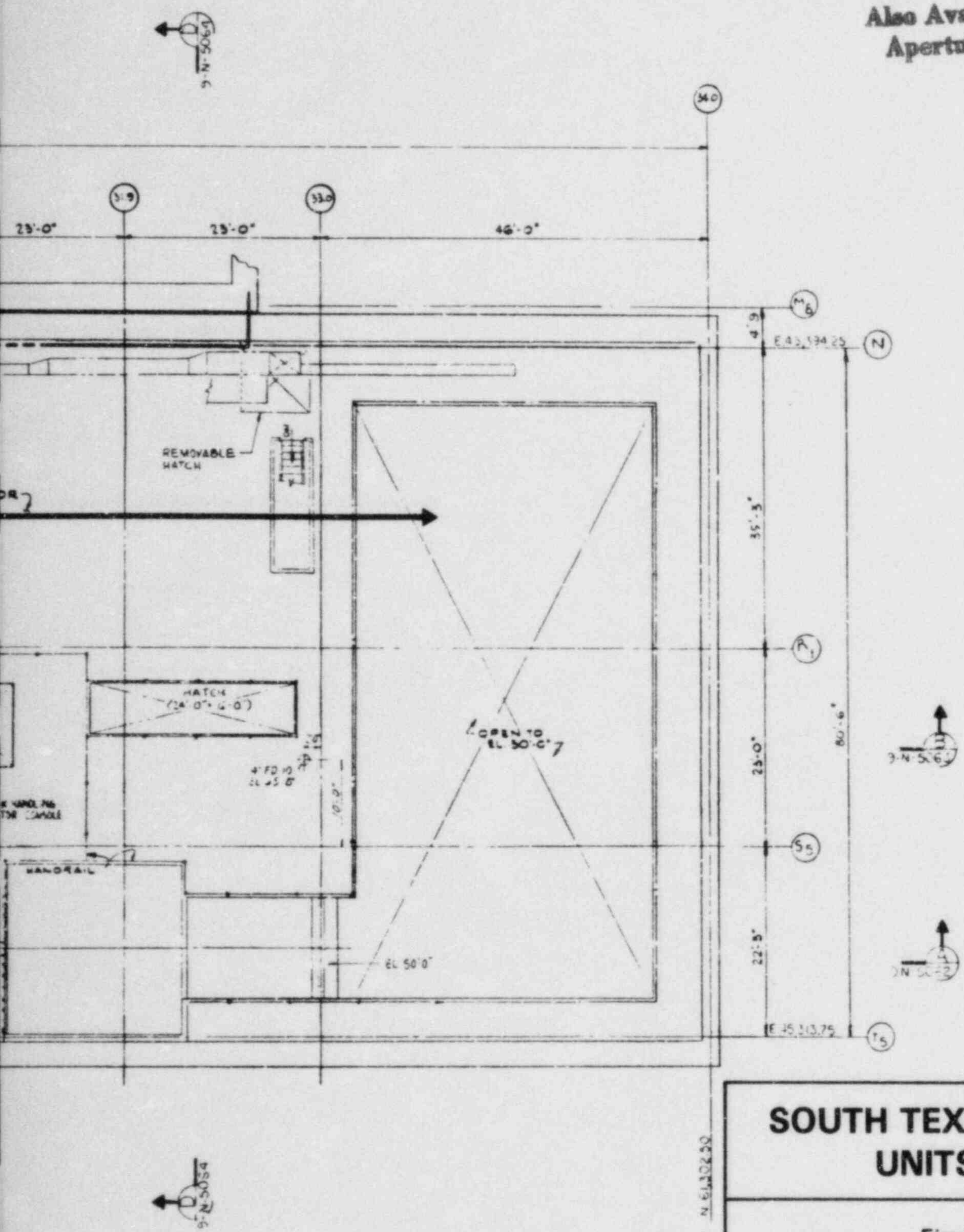
Figure 13
SAFE LOAD PATHS FOR SAFETY INJECTION PUMPS, MOTORS, BARRELS CONTAINMENT SPRAY PUMPS, MOTORS, BARRELS
FHB, EL. 4' AND (-) 29', AREA M

DWG. 6F-18-9-N-5057

8411010420 -16



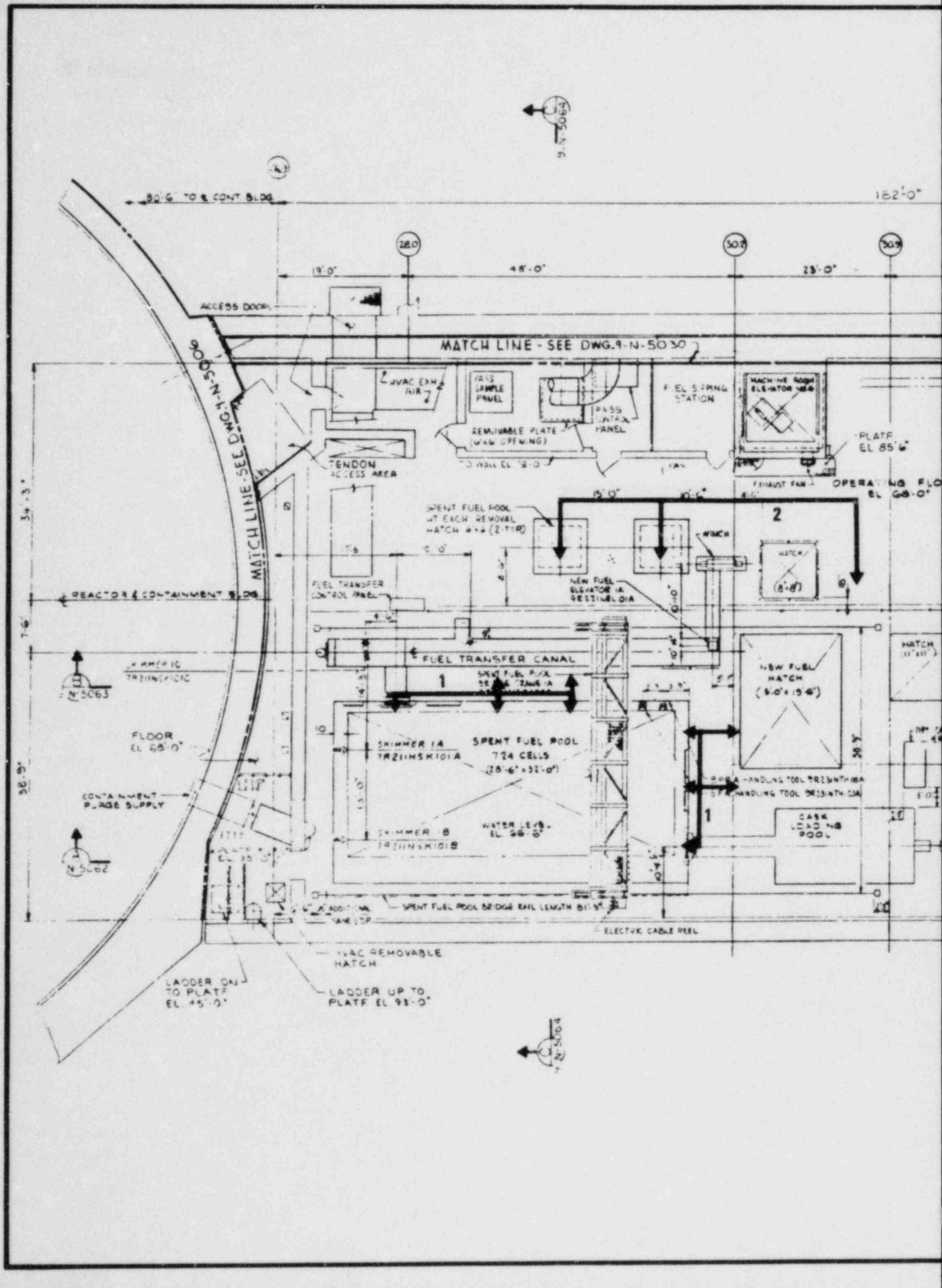
MATCH LINE - SEE DWG.9-N-5030
MATCH LINE-SEE DWG.9-N-5006
80'-6" TO ℄ CONT. BLDG
182'-0"
19'-0"
48'-0"
23'-0"
ACCESS DOORS
HVAC EXH AIR
PASS SAMPLE PANEL
PASS CONTROL PANEL
FUEL STRING STATION
MACHINE ROOM ELEVATOR
PLATE EL 85'-6"
REMOVABLE PLATE
TENDON ACCESS AREA
EXHAUST FAN
OPERATING FLOOR
SPENT FUEL POOL HT EXCH REMOVAL HATCH
WINCH
NEW FUEL ELEVATOR 1A
FUEL TRANSFER CONTROL PANEL
REACTOR & CONTAINMENT BLDG
FUEL TRANSFER CANAL
NEW FUEL HATCH
HATCH
FLOOR EL 68'-0"
SKIMMER 1A
SPENT FUEL POOL
724 CELLS
CONTAINMENT PURGE SUPPLY
SKIMMER 1B
WATER LEVEL EL 66'-0"
CASK LOADING POOL
SPENT FUEL POOL BRIDGE RAIL LENGTH
ELECTRIC CABLE REEL
HVAC REMOVABLE HATCH
LADDER DN TO PLATE EL. 45'-0"
LADDER UP TO PLATE EL 93'-0"
9-N-5064
N-5063
N-5062



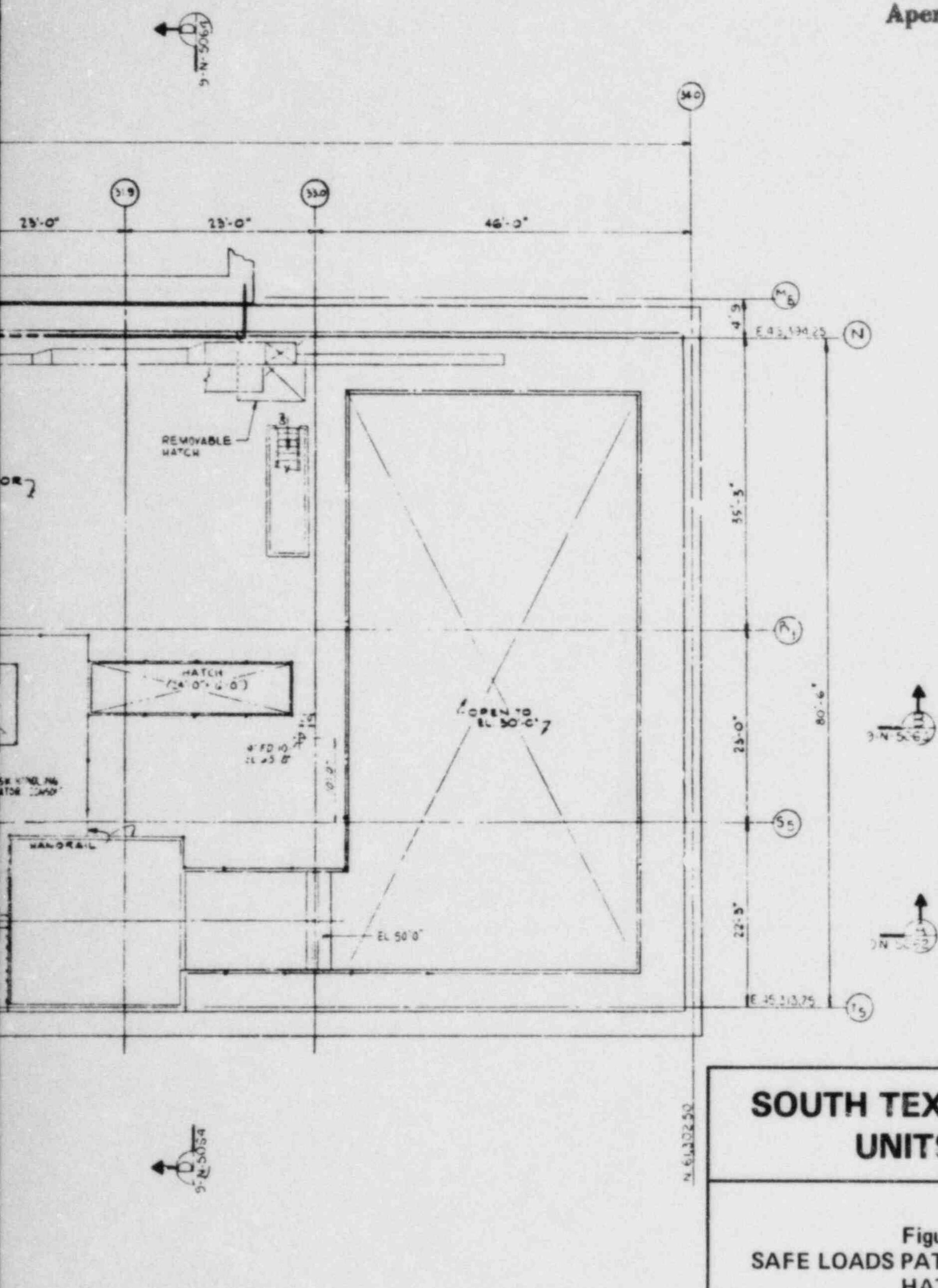
SOUTH TEXAS PROJECT
UNITS 1 & 2

Figure 13a
SAFE LOAD PATHS FOR SFP HEAT EXCHANGERS, LHSI, HHSI AND CONTAINMENT SPRAY PUMP ROTORS MOTORS AND OUTER BARRELS
FHB, EL. 68', AREA M

DWG. NO. 6F-18-9-N-5060



MATCH LINE - SEE DWG. 9-N-5030
MATCH LINE - SEE DWG. 9-N-5006
80'-6" TO ℄ CONT. BLDG
182'-0"
19'-0"
48'-0"
23'-0"
ACCESS DOOR
HVAC EXH AIR
PASS SAMPLE PANEL
PASS CONTROL PANEL
REMOVABLE PLATE (HVAC OPENING)
FUEL SIPPING STATION
MACHINE ROOM ELEVATOR NO. 6
PLATE EL 85'-6"
EXHAUST FAN
OPERATING FLOOR EL 68'-0"
TENDON ACCESS AREA
SPENT FUEL POOL HT EACH REMOVAL HATCH (2-TYP)
WINCH
HATCH (8'-8")
NEW FUEL ELEVATOR
REACTOR & CONTAINMENT BLDG
FUEL TRANSFER CONTROL PANEL
FUEL TRANSFER CANAL
NEW FUEL HATCH (6'-0" x 15'-6")
HATCH
SKIMMER 1A
SPENT FUEL POOL
724 CELLS
(28'-6" x 32'-0")
SKIMMER 1B
WATER LEVEL EL 96'-0"
CASK LOADING POOL
FLOOR EL 68'-0"
CONTAINMENT PURGE SUPPLY
SPENT FUEL POOL BRIDGE RAIL LENGTH 81'-5"
ELECTRIC CABLE REEL
HVAC REMOVABLE HATCH
LADDER DN TO PLATE EL 45'-0"
LADDER UP TO PLATE EL 93'-0"
34'-3"
38'-9"
7'-6"
1
2

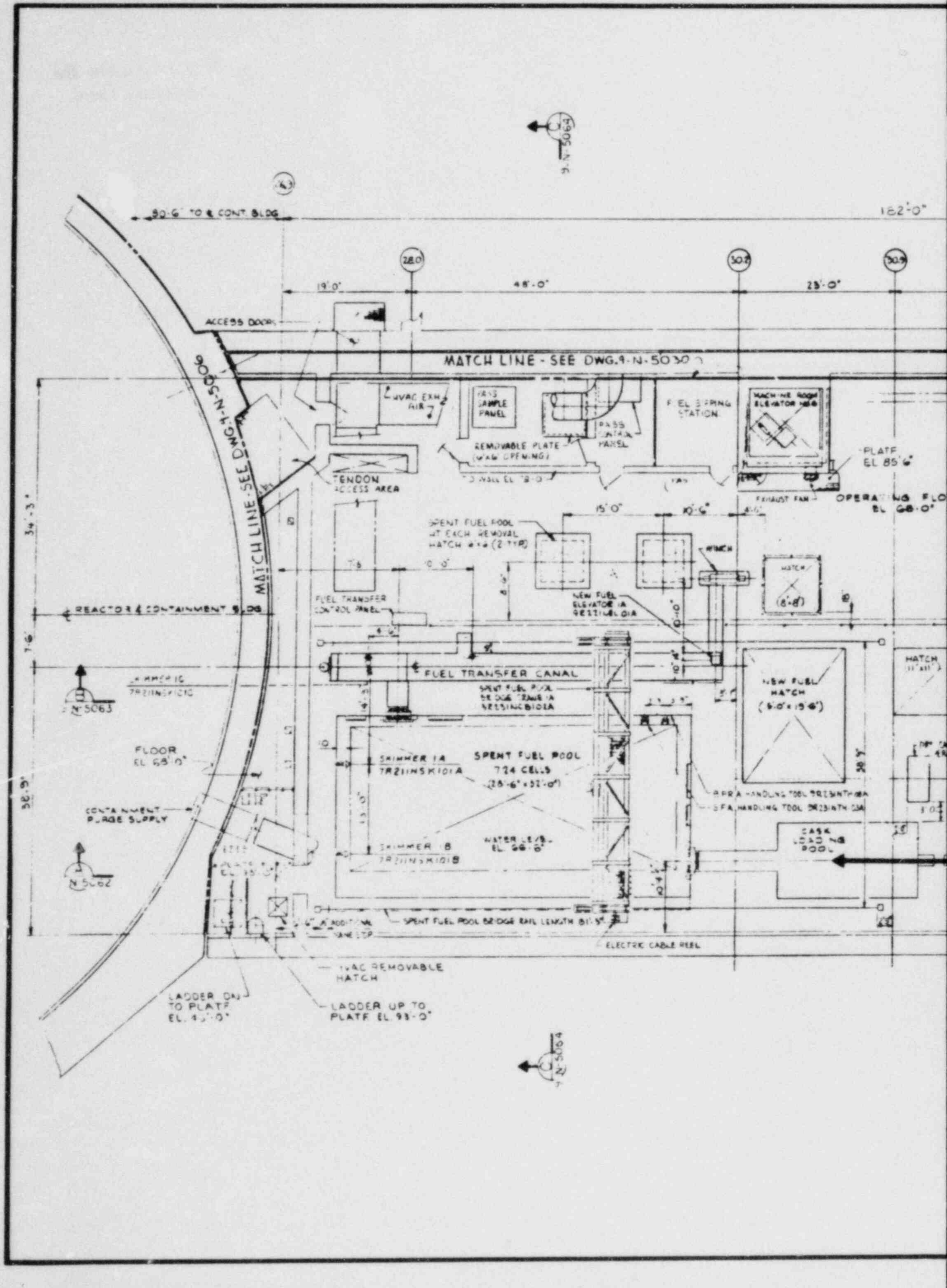


1 – SFP GATES,
2 – HATCHES

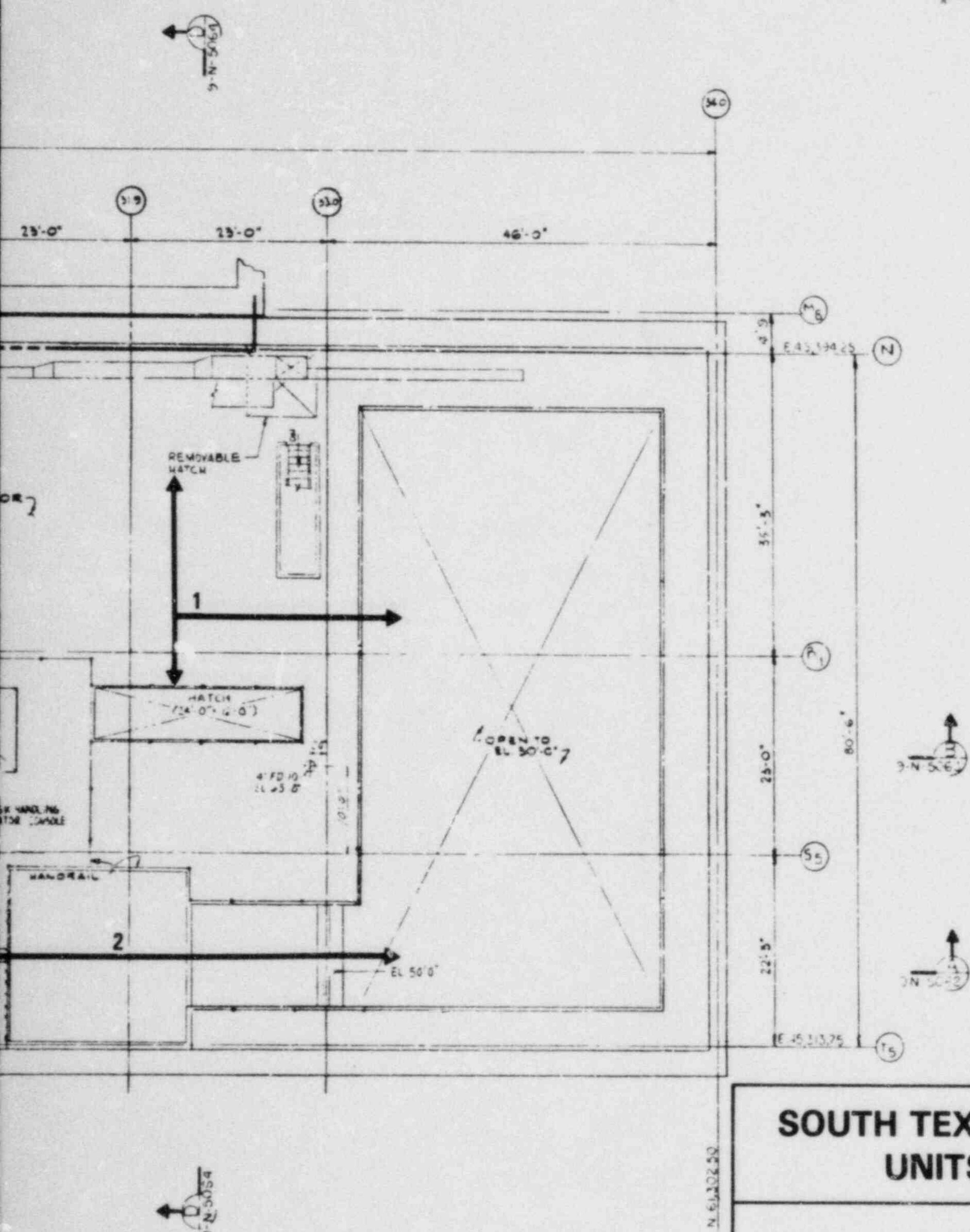
**SOUTH TEXAS PROJECT
UNITS 1 & 2**

Figure 13b
SAFE LOADS PATHS FOR SFP GATES
HATCHES
FHB, EL. 68', AREA M

DWG. NO. 6F-18-9-N-5060



80'-6" TO ℄ CONT. BLDG.
182'-0"
19'-0"
48'-0"
23'-0"
ACCESS DOORS
MATCH LINE - SEE DWG. 9-N-5030
MATCH LINE - SEE DWG. 9-N-5006
HVAC EXH AIR
PASS SAMPLE PANEL
PASS CONTROL PANEL
REMOVABLE PLATE (HVAC OPENING)
FUEL SIPPING STATION
MACHINE ROOM ELEVATOR
PLATE EL 85'-6"
TENDON ACCESS AREA
OPERATING FLOOR EL 68'-0"
SPENT FUEL POOL HT EXCH REMOVAL HATCH (2 TYP)
15'-0"
10'-6"
WINCH
HATCH (8'-8")
NEW FUEL ELEVATOR
FUEL TRANSFER CONTROL PANEL
REACTOR ℄ CONTAINMENT BLDG.
FUEL TRANSFER CANAL
SPENT FUEL POOL
724 CELLS
(28'-6" x 52'-0")
WATER LEVEL EL 66'-6"
NEW FUEL HATCH (6'-0" x 19'-6")
HATCH
CASK LOADING POOL
FLOOR EL 68'-0"
CONTAINMENT PURGE SUPPLY
SKIMMER 1A
SKIMMER 1B
SPENT FUEL POOL BRIDGE RAIL LENGTH
ELECTRIC CABLE REEL
HVAC REMOVABLE HATCH
LADDER DN TO PLATE
LADDER UP TO PLATE EL 93'-0"
N-5063
N-5062
9-N-5064
34'-3"
7'-6"
38'-9"

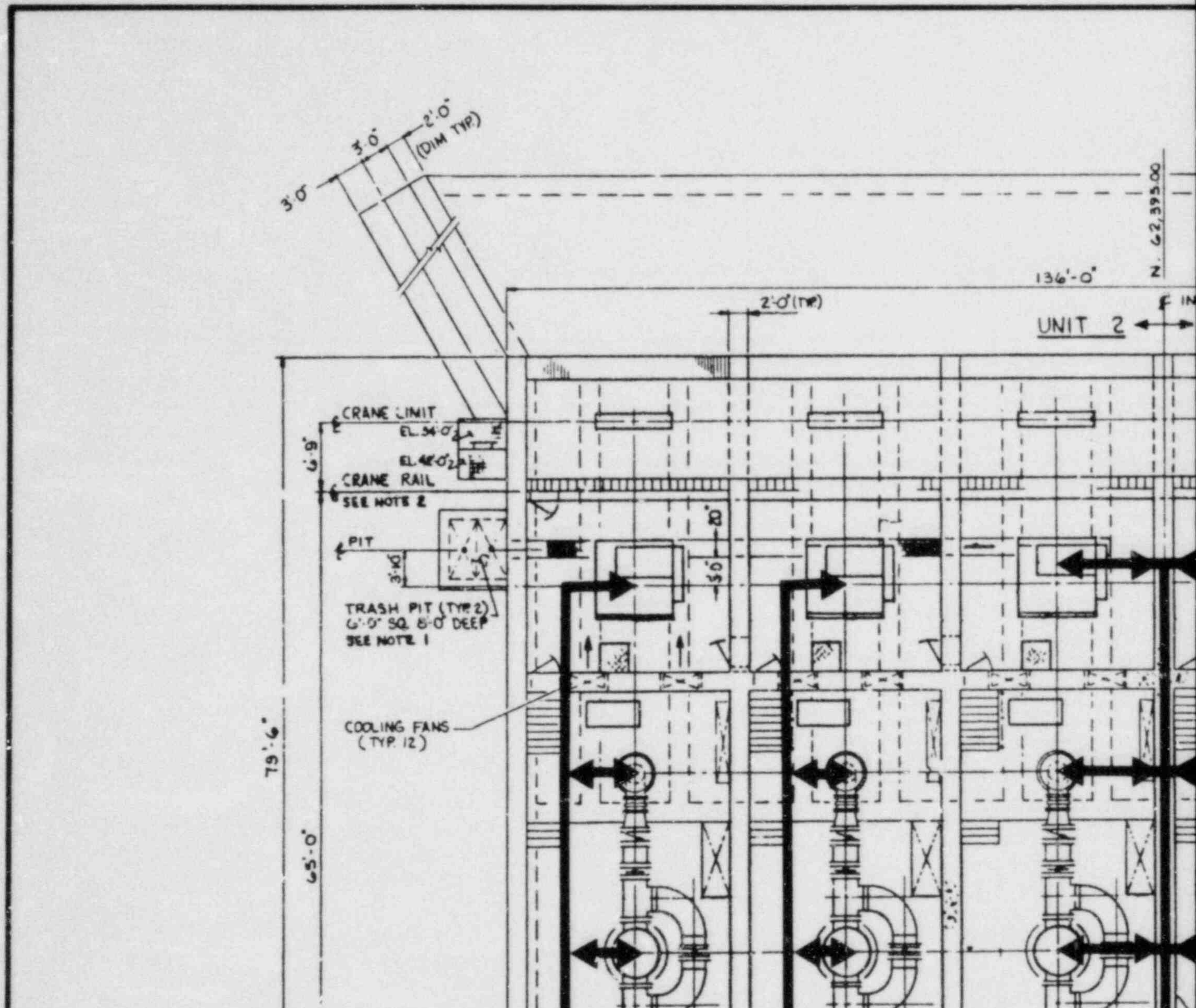


1 – NEW FUEL CONTAINERS
2 – SPENT FUEL SHIPPING CASK HEAD

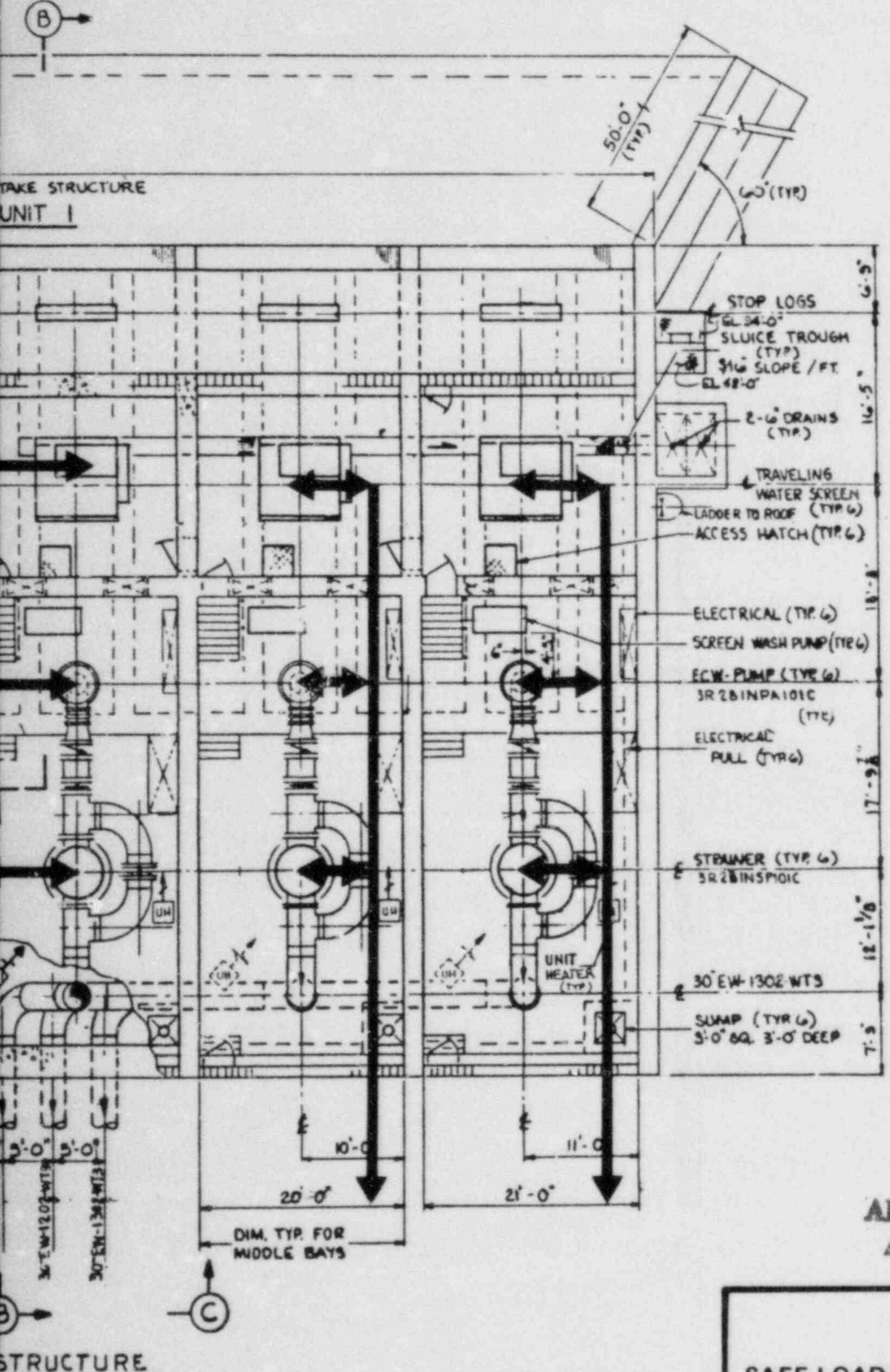
SOUTH TEXAS PROJECT
UNITS 1 & 2

Figure 13c
SAFE LOAD PATHS FOR
NEW FUEL CONTAINERS, SPENT FUEL
SHIPPING CASK HEAD
FHB, EL. 68', AREA M

DWG. NO. 6-F-18-9-N-5060



3'-0"
3'-0"
2'-0"
(DIM TYP)
N. 62,395.00
136'-0"
2'-0"(TYP)
UNIT 2
CRANE LIMIT
EL. 54'-0"
EL. 46'-0"
6'-9"
CRANE RAIL
SEE NOTE 2
PIT
3'-10"
3'-0"
TRASH PIT (TYP 2)
6'-0" SQ. 8'-0" DEEP
SEE NOTE 1
COOLING FANS
(TYP. 12)
79'-6"
65'-0"
LOUVERS TO RUN
LENGTH OF BAYS
(TYP.)
1'-0"
CRANE RAIL
E. 45,940.75
15'-0"
40'-0"
1'-0"
21'-0"
CRANE LIMIT
LAYDOWN AREA
TO. CONC. EL. 34'-0"
5'-0"
5'-0"
30"EW-2102-WT3
30"EW-2202-WT3
30"EW-2302-WT3
30"EW-1102-WT3
C
PLAN-INTAKE



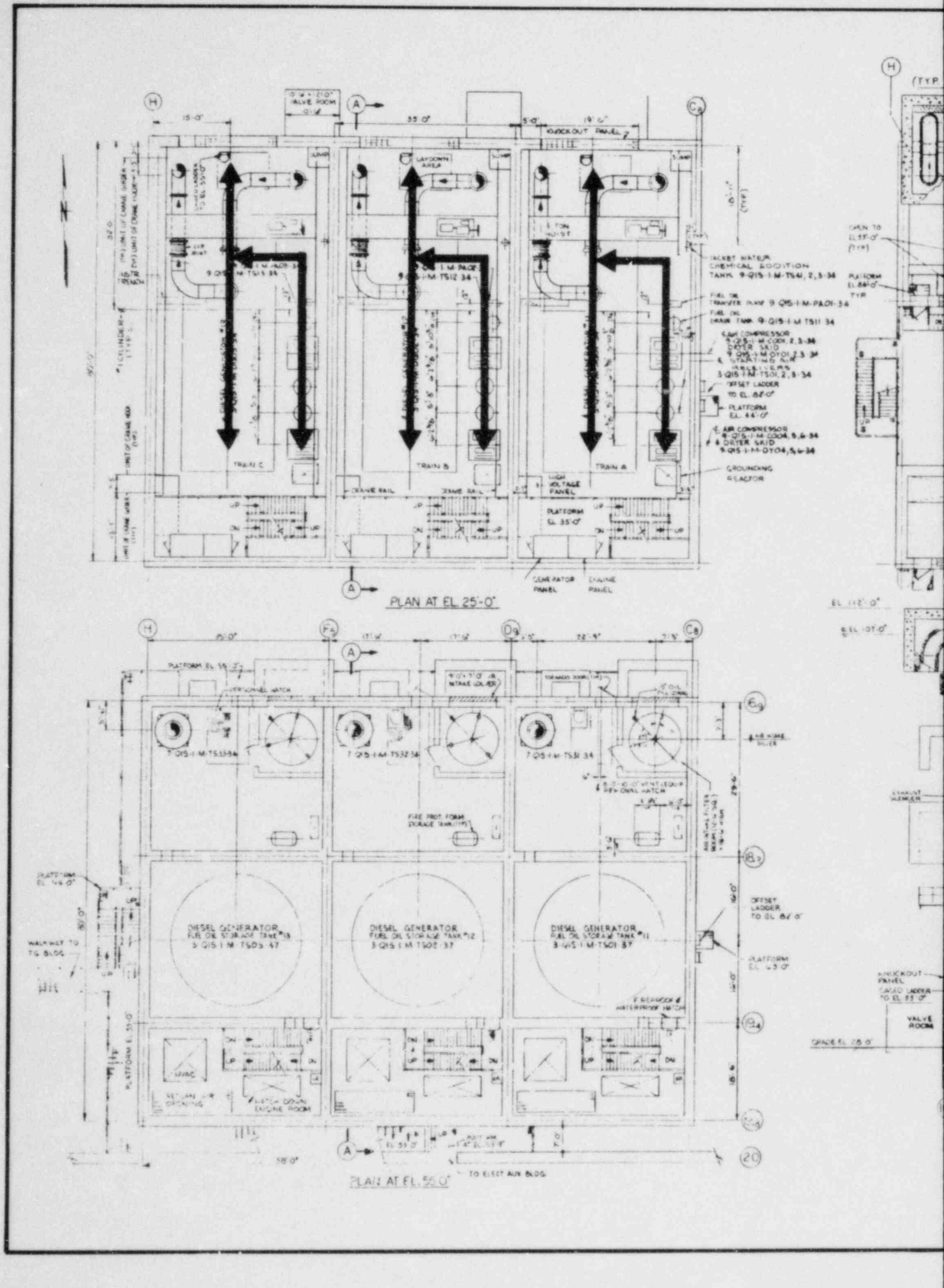
TI APERTURE CARD

Also Available On Aperture Card

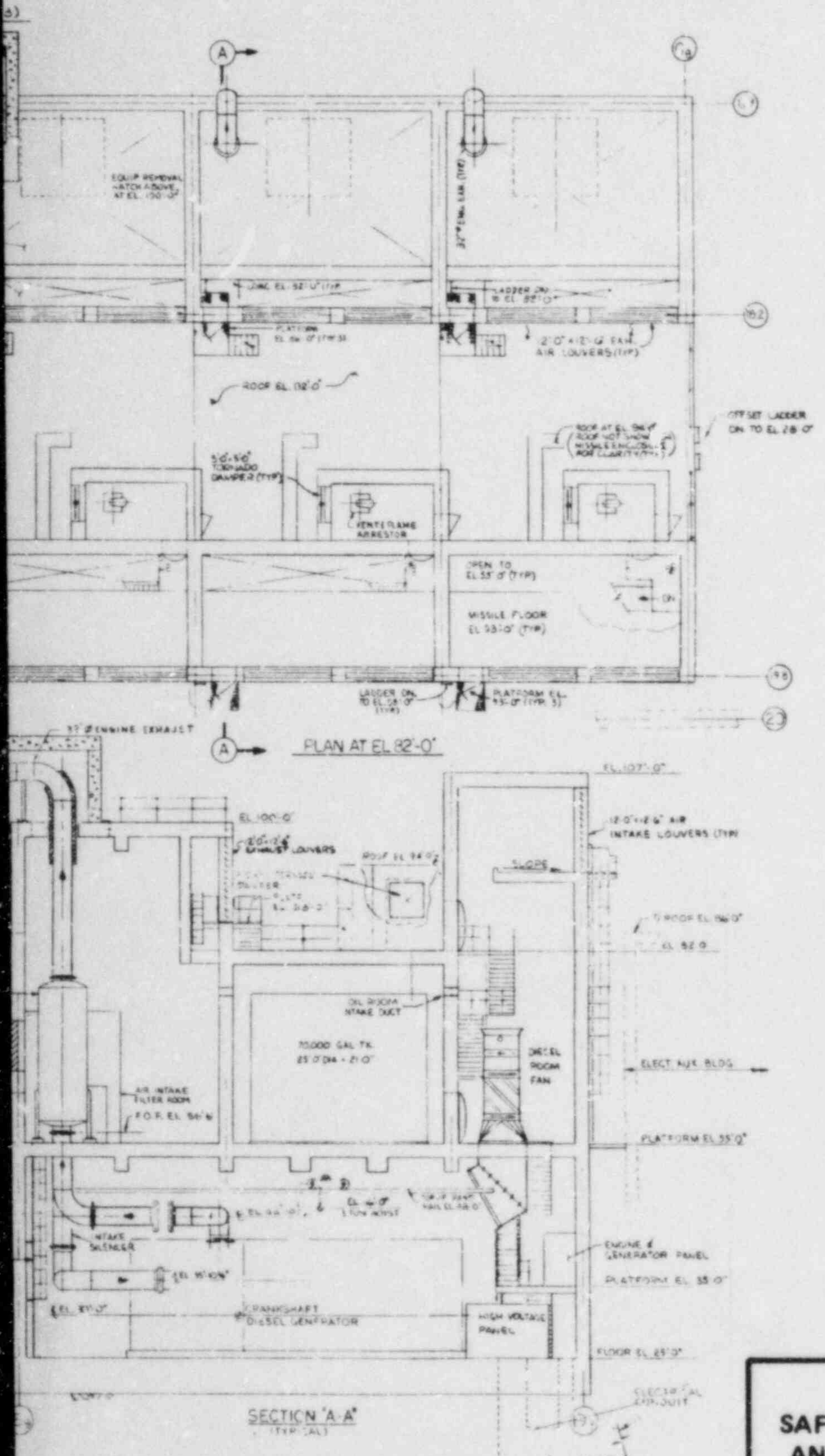
Figure 14
SAFE LOAD PATHS FOR ECW PUMP, MOTOR, TRAVELING SCREEN, STRAINERS, HATCHES ECW INTAKE STRUCTURE

DWG. 6P-20-0-M-0031

8411010420 - 20



VALVE ROOM
KNOCKOUT PANEL
LAYDOWN AREA
TRAIN C
TRAIN B
TRAIN A
CRANE RAIL
HIGH VOLTAGE PANEL
PLATFORM EL. 35'-0"
GENERATOR PANEL
ENGINE PANEL
JACKET WATER CHEMICAL ADDITION TANK 9-Q1S-1-M-TS41, 2, 3-34
FUEL OIL TRANSFER PUMP 9-Q1S-1-M-PA01-34
FUEL OIL DRAIN TANK 9-Q1S-1-M-TS11-34
OFFSET LADDER TO EL. 82'-0"
PLATFORM EL. 44'-0"
AIR COMPRESSOR & DRYER SKID 9-Q1S-1-M-OY04, 5, 6-34
GROUNDING REACTOR
PLAN AT EL. 25'-0"
PLATFORM EL. 55'-0"
INTAKE LOUVER
7-Q1S-1-M-TS33-34
7-Q1S-1-M-TS32-34
7-Q1S-1-M-TS31-34
FIRE PROT. FOAM STORAGE TANK (TYP)
DIESEL GENERATOR FUEL OIL STORAGE TANK #13 3-Q1S-1-M-TS03-37
DIESEL GENERATOR FUEL OIL STORAGE TANK #12 3-Q1S-1-M-TS02-37
DIESEL GENERATOR FUEL OIL STORAGE TANK #11 3-Q1S-1-M-TS01-37
OFFSET LADDER TO EL. 82'-0"
PLATFORM EL. 44'-0"
WALKWAY TO T.G. BLDG.
PLATFORM EL. 55'-0"
HVAC
RETURN AIR OPENING
HATCH DOWN ENGINE ROOM
TO ELECT AUX BLDG
PLAN AT EL. 55'-0"
KNOCKOUT PANEL
CAGED LADDER TO EL. 55'-0"
VALVE ROOM
GRADE EL. 28'-0"



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Also Available On
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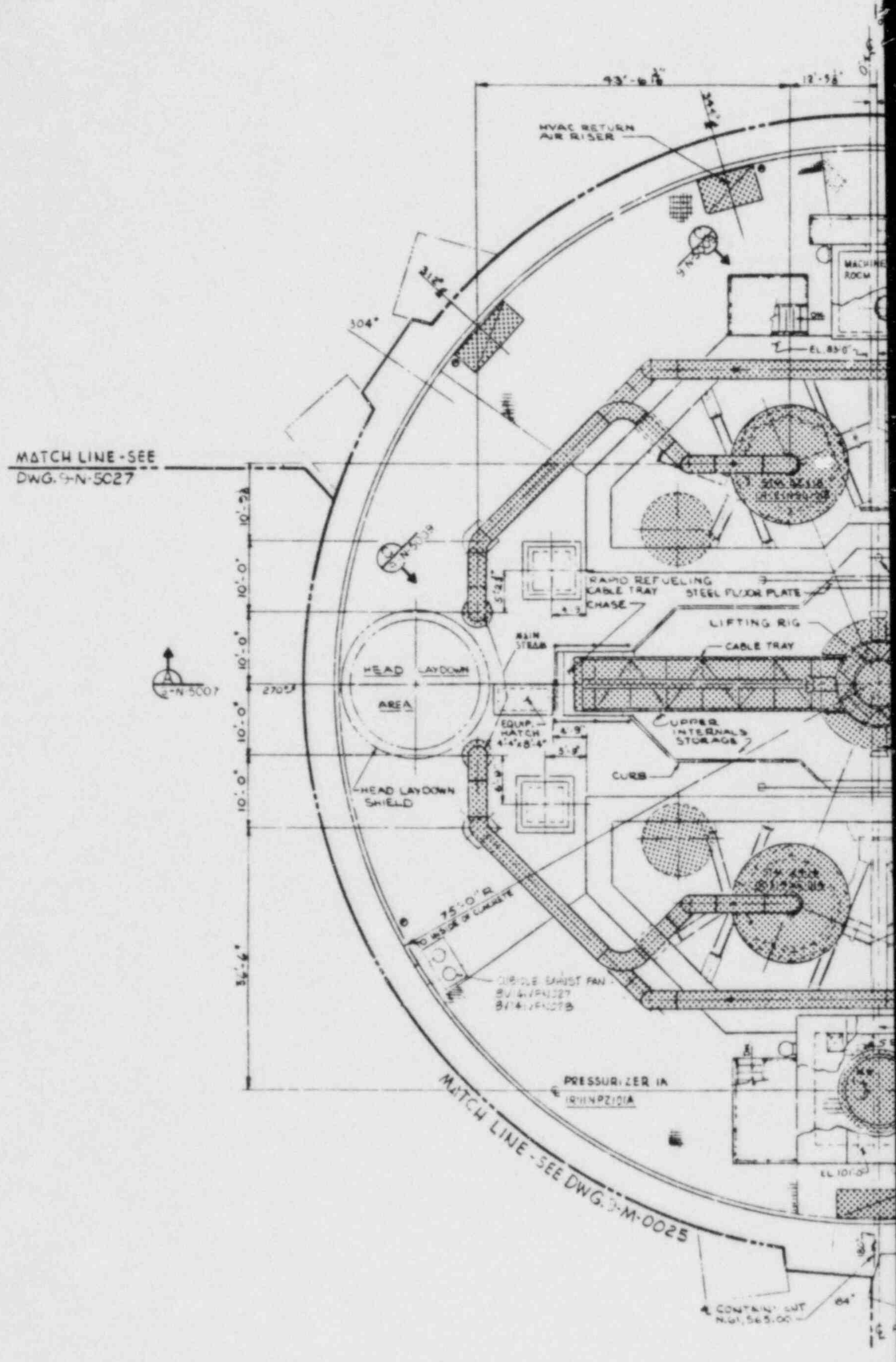
Figure 15
SAFE LOAD PATHS FOR AIR COMPRESSOR AND DRYER-SKID, STARTING AIR TANK, FLYWHEEL, BEARINGS AND STAND DIESEL GENERATOR BLDG.

DWG. 6D-01-9-M-0020

8411010420 -21


MATCH LINE-SEE
DWG. 9-N-5027
HVAC RETURN
AIR RISER
304°
MACHINE ROOM
RAPID REFUELING
CABLE TRAY
CHASE
STEEL FLOOR PLATE
LIFTING RIG
CABLE TRAY
HEAD LAYDOWN
AREA
EQUIP. HATCH
UPPER
INTERNALS
STORAGE
CURB
HEAD LAYDOWN
SHIELD
10'-0"
10'-0"
10'-0"
10'-0"
75'-0" R
CUBICLE EXHAUST FAN
PRESSURIZER 1A
MATCH LINE - SEE DWG. 9-M-0025
84°

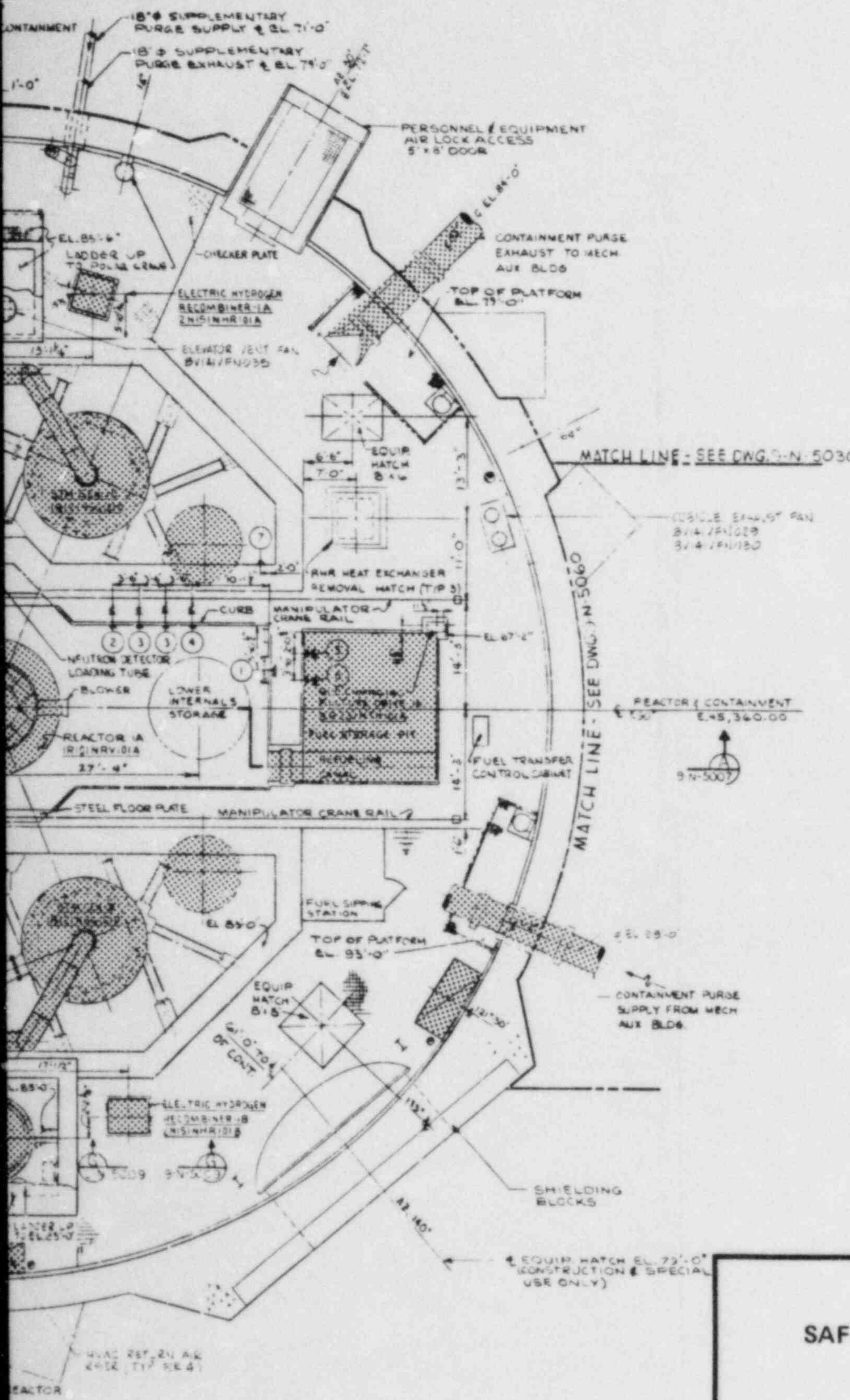


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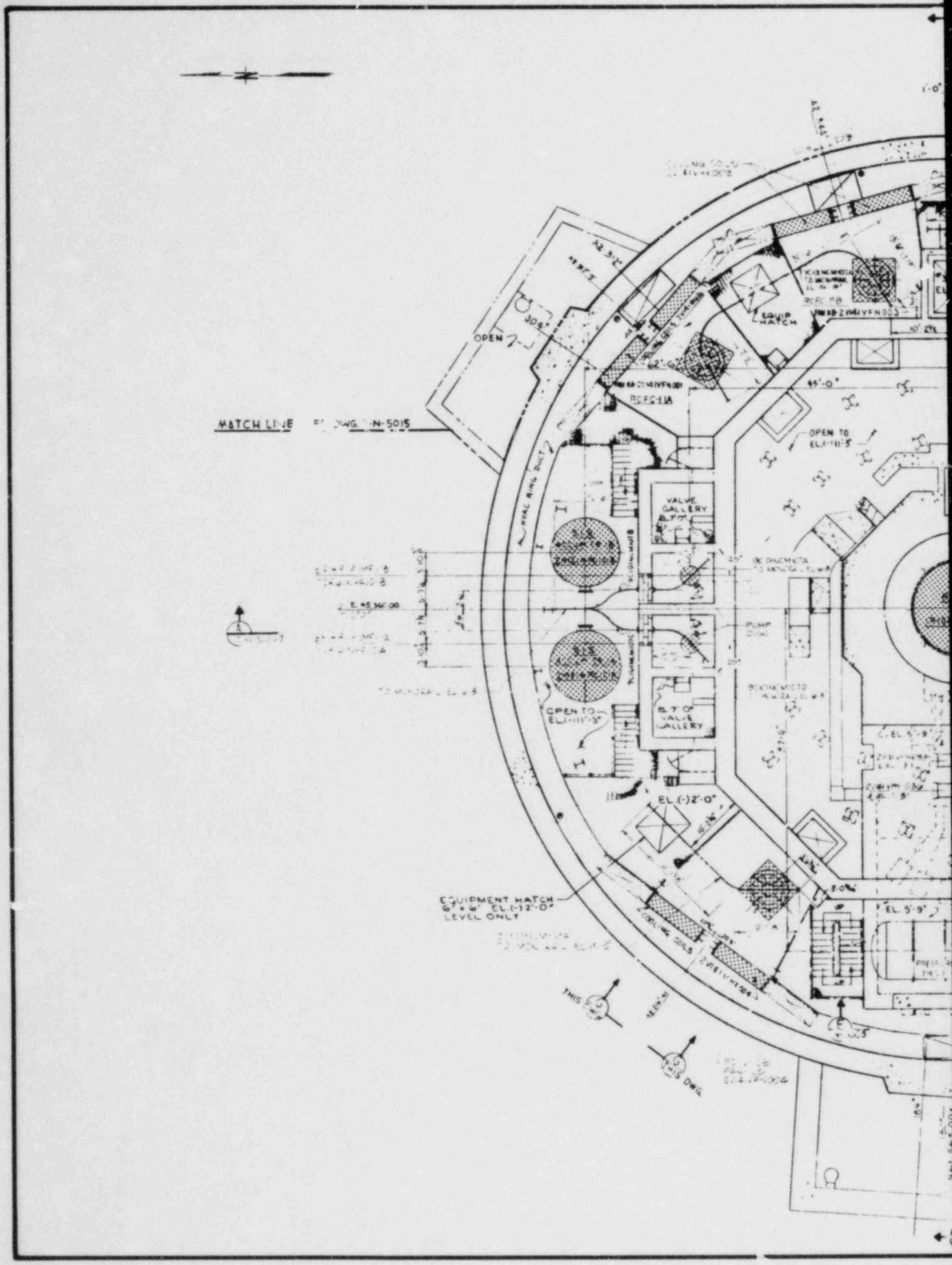
Figure 16
SAFETY RELATED EQUIPMENT,
SPENT FUEL IN RCB,
EL. 68'

DWG. 6C-18-9-N-5006

8411010420 -22



MATCH LINE
OPEN
EQUIP HATCH
VALVE GALLERY
PUMP DISC
OPEN TO EL.(+)11'-3"
EL. 7'-0" VALVE GALLERY
EL.(-)2'-0"
EQUIPMENT HATCH 6' x 6' EL.(-)2'-0" LEVEL ONLY
COOLING COILS
EL. 5'-9"
45'-0"
THIS DWG

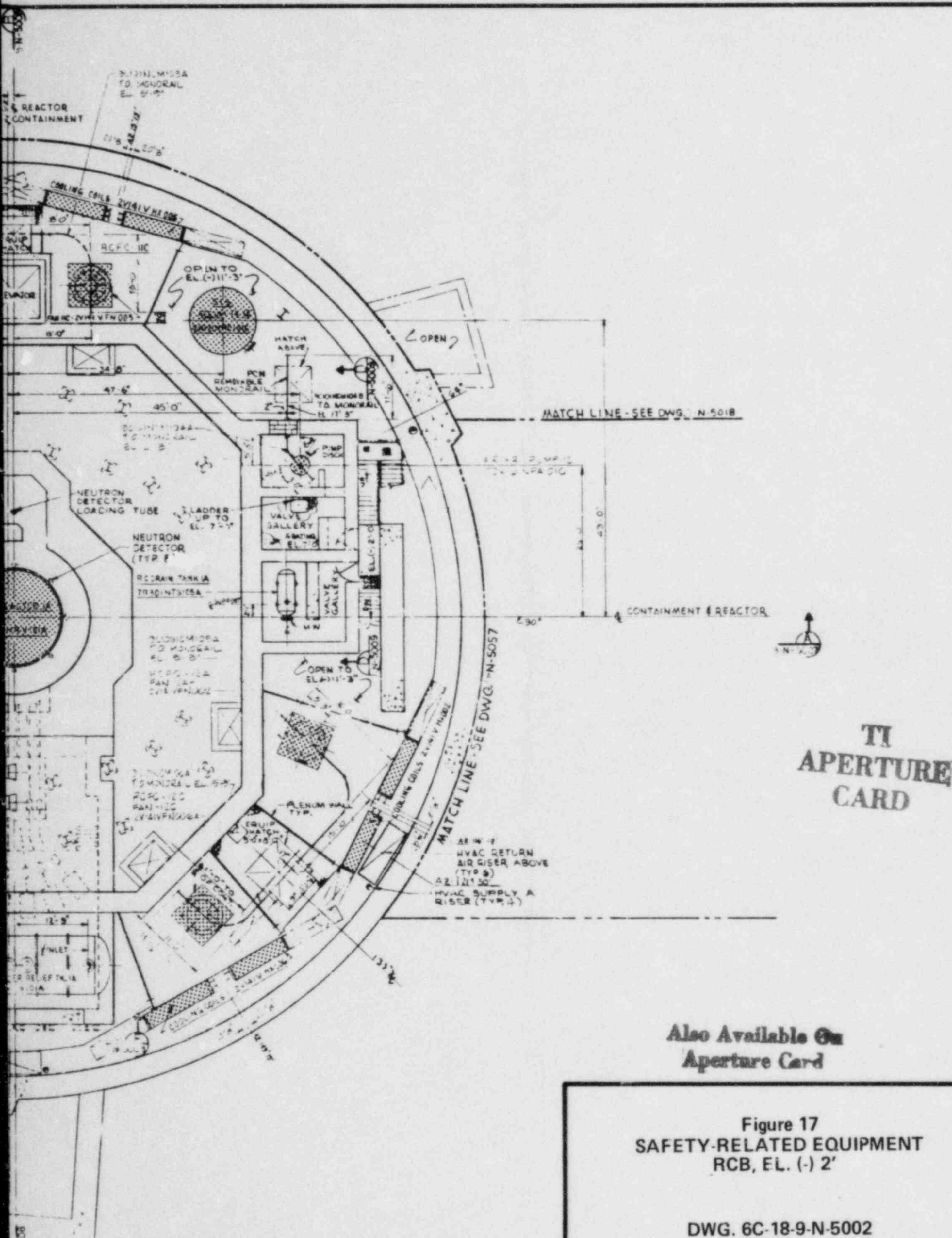
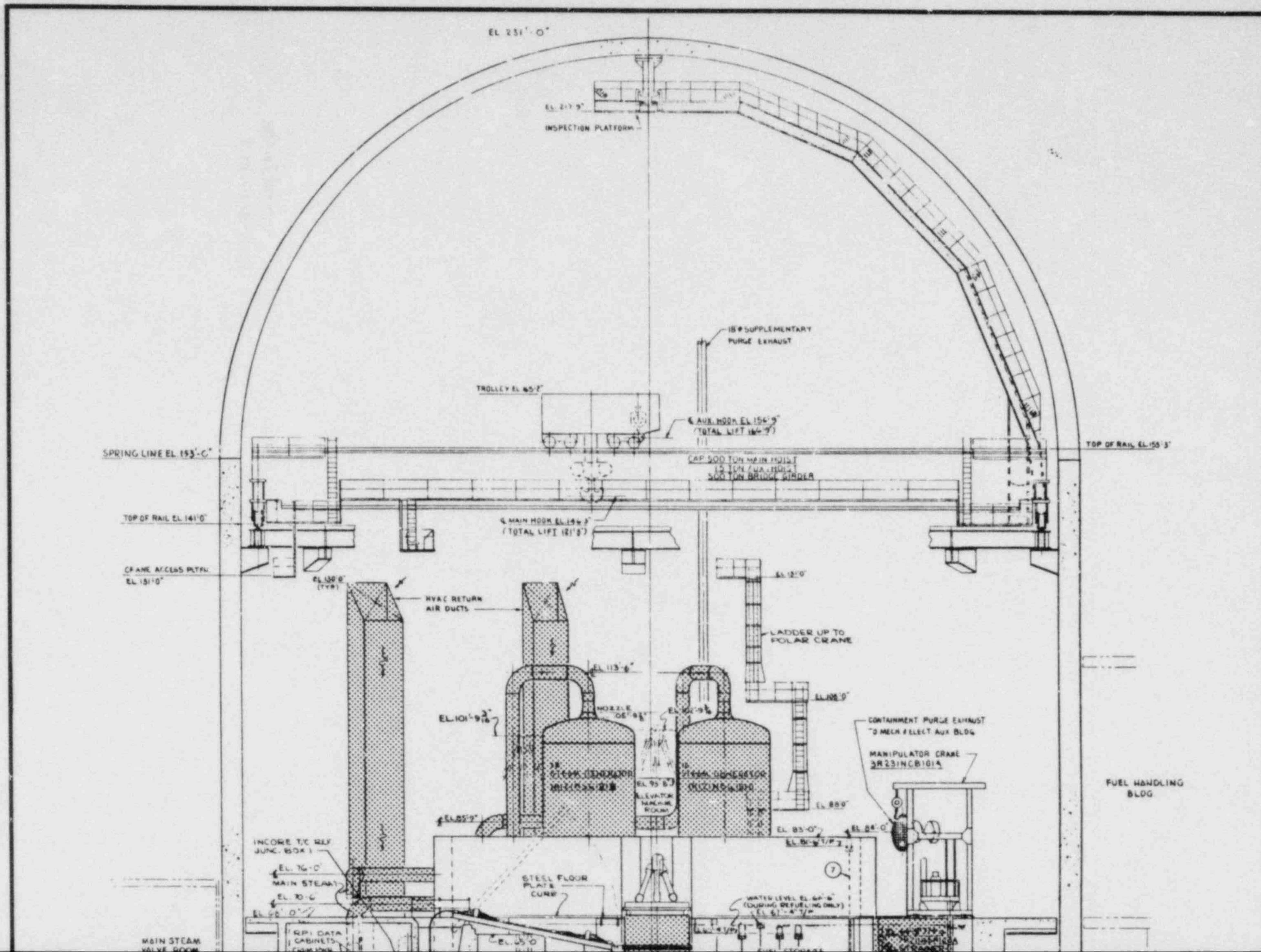


Figure 17
SAFETY-RELATED EQUIPMENT
RCB, EL. (-) 2'

DWG. 6C-18-9-N-5002


EL 231'-0"
EL 217'9"
INSPECTION PLATFORM
18" SUPPLEMENTARY PURGE EXHAUST
TROLLEY EL 165'7"
AUX HOOK EL 154'9" (TOTAL LIFT 164'9")
SPRING LINE EL 153'-0"
TOP OF RAIL EL 155'3"
CAP 500 TON MAIN HOIST 15 TON AUX HOIST 500 TON BRIDGE GIRDER
TOP OF RAIL EL 141'0"
MAIN HOOK EL 146'3" (TOTAL LIFT 121'8")
CRANE ACCESS PLTFM. EL 131'0"
EL 130'0" (TYP)
HVAC RETURN AIR DUCTS
LADDER UP TO POLAR CRANE
EL 113'-6"
EL 108'0"
NOZZLE
EL 101'-9"
CONTAINMENT PURGE EXHAUST TO MECH & ELECT AUX BLDG
MANIPULATOR CRANE 3R23INCB1014
FUEL HANDLING BLDG
STEAM GENERATOR
ELEVATOR MACHINE ROOM
EL 95'6"
EL 88'0"
EL 85'0"
EL 83'-0"
EL 84'-0"
INCORE T/C REF. JUNC. BOX
EL 76'-0"
MAIN STEAM
EL 70'-6"
STEEL FLOOR PLATE CURB
WATER LEVEL EL 64'-6" (DURING REFUELING ONLY)
RPI DATA CABINETS
MAIN STEAM VALVE ROOM

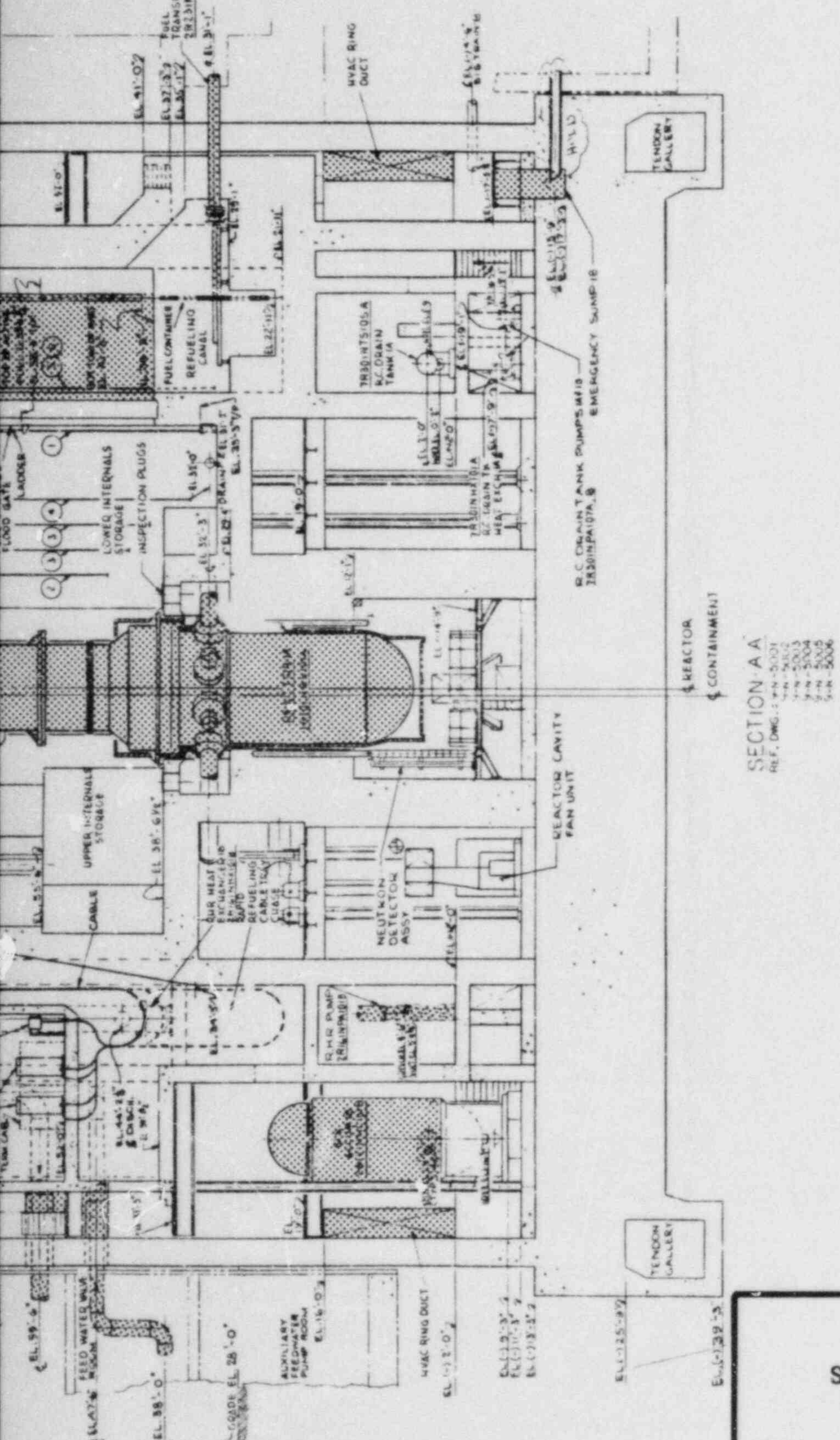


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Figure 18
SAFETY-RELATED EQUIPMENT,
SPENT FUEL IN
RCB, SECTION AA

DWG. 6C-18-9-N-5007

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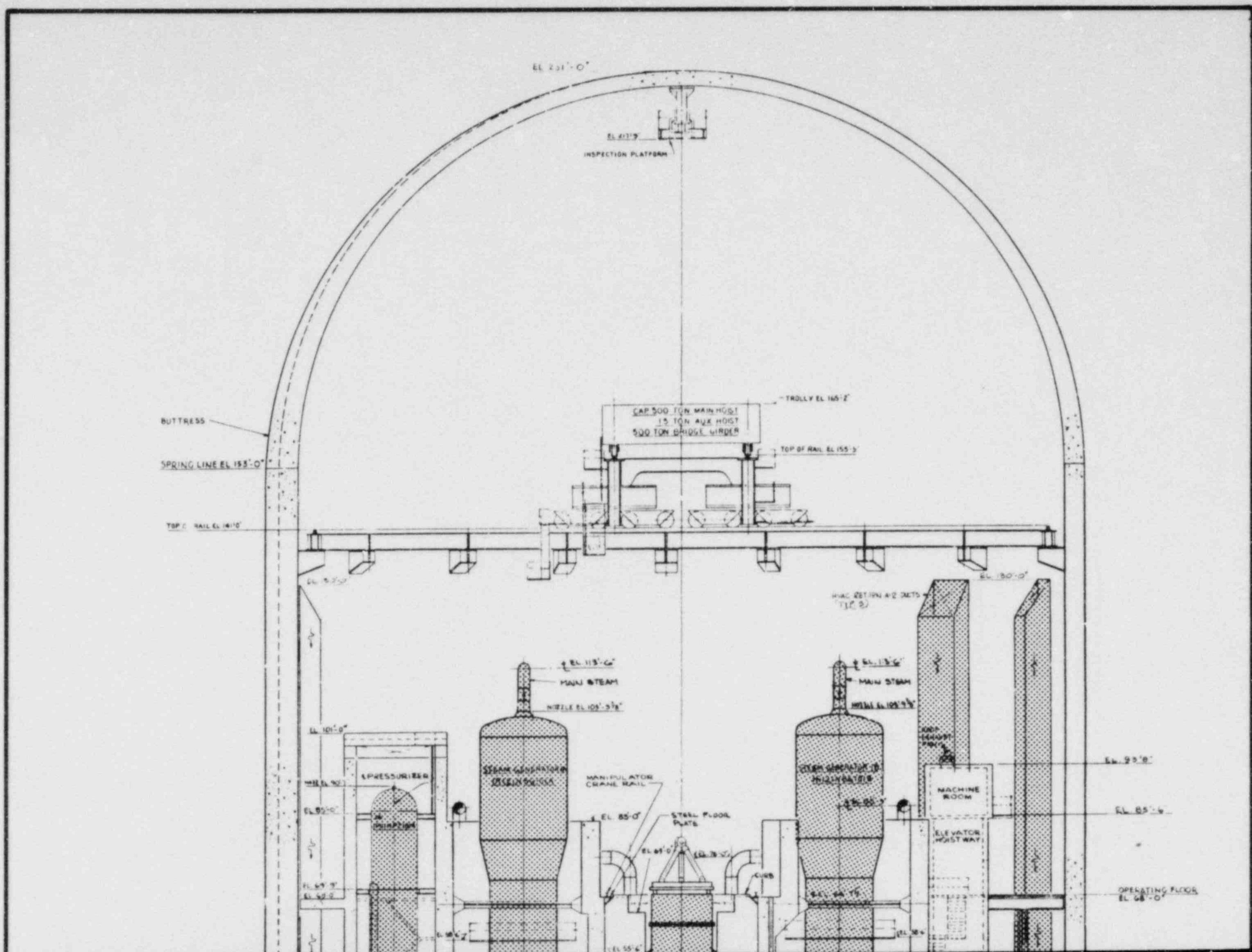
EL 231'-0"
INSPECTION PLATFORM
CAP 500 TON MAIN HOIST
15 TON AUX HOIST
500 TON BRIDGE GIRDER
TROLLY EL 165'-2"
TOP OF RAIL EL 155'-3"
BUTTRESS
SPRING LINE EL 153'-0"
EL 130'-0"
HVAC RETURN AIR DUCTS
MAIN STEAM
PRESSURIZER
MANIPULATOR CRANE RAIL
STEEL FLOOR PLATE
EL 85'-0"
CURB
MACHINE ROOM
ELEVATOR HOISTWAY
EL 95'-8"
EL 85'-6"
OPERATING FLOOR
EL 68'-0"
EL 101'-0"

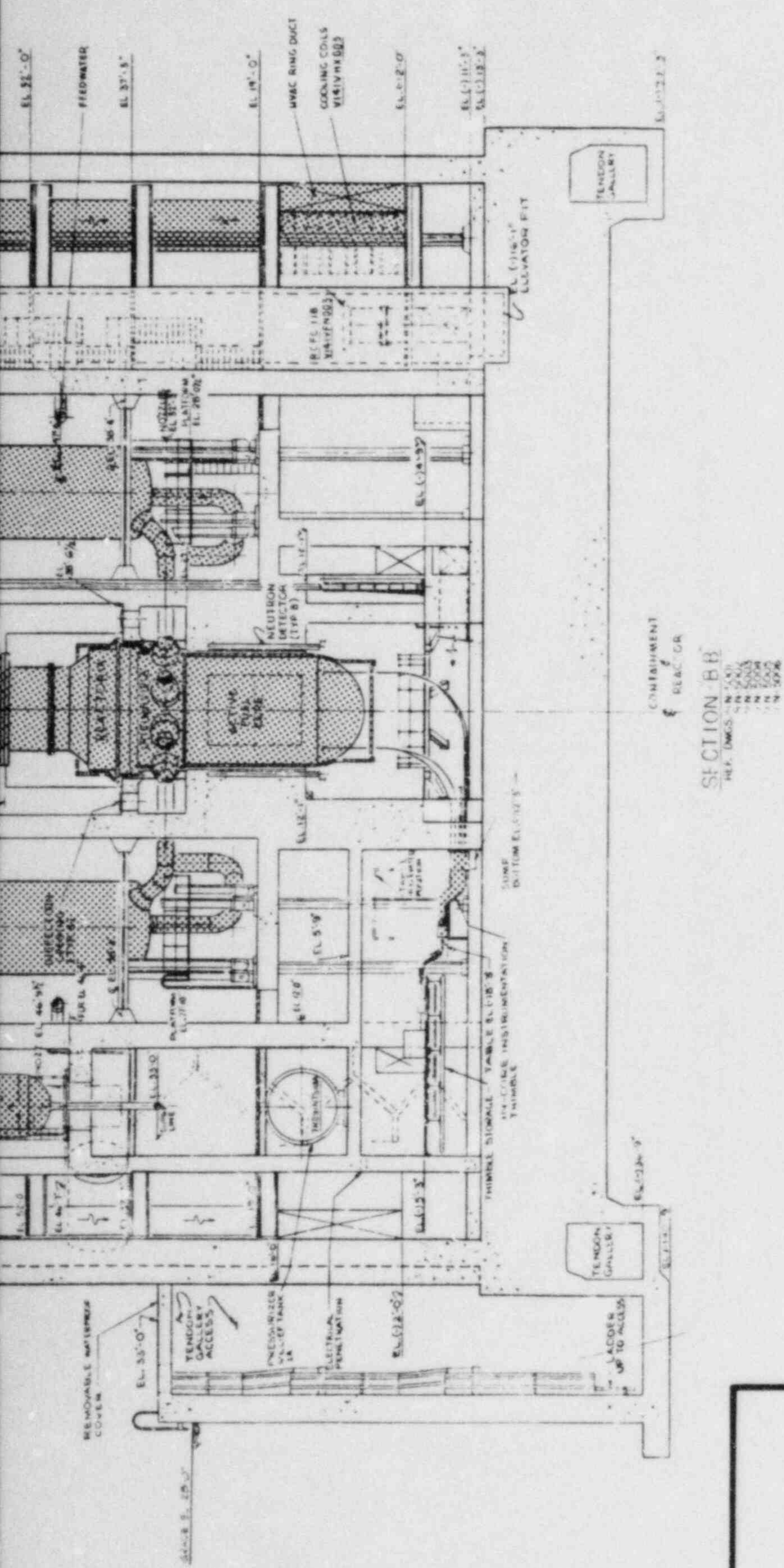

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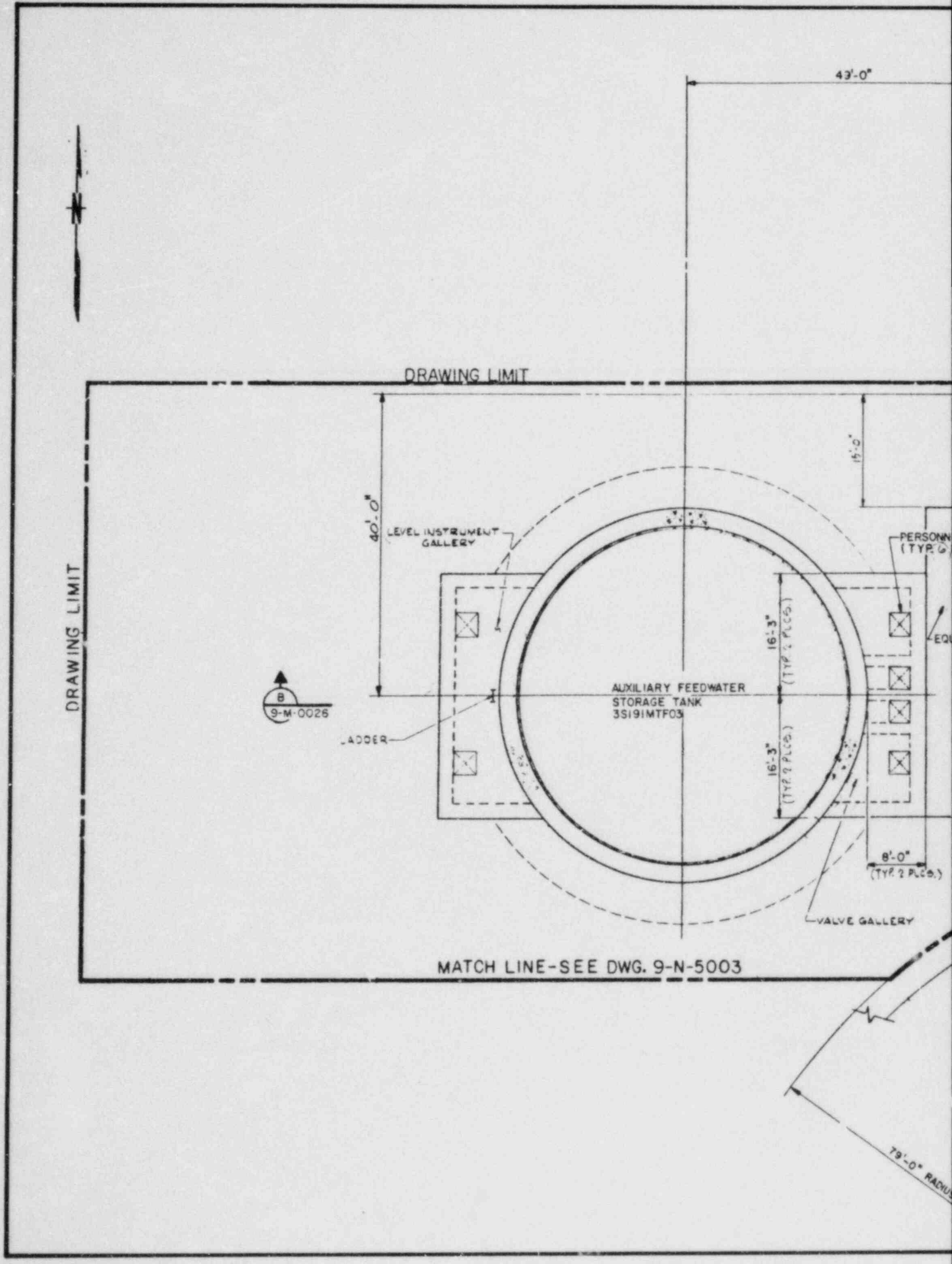
Figure 19
SAFETY-RELATED EQUIPMENT,
SPENT FUEL IN RCB, SECTION BB

DWG. 6C-18-9-N-5008

8411010420 25



43'-0"
DRAWING LIMIT
DRAWING LIMIT
40'-0"
15'-0"
LEVEL INSTRUMENT GALLERY
PERSONN
(TYP. 6)
EQU
16'-3"
(TYP. 2 PLCS.)
16'-3"
(TYP. 2 PLCS.)
AUXILIARY FEEDWATER
STORAGE TANK
3S191MTF03
B
9-M-0026
LADDER
8'-0"
(TYP. 2 PLCS.)
VALVE GALLERY
MATCH LINE-SEE DWG. 9-N-5003
79'-0" RADIUS

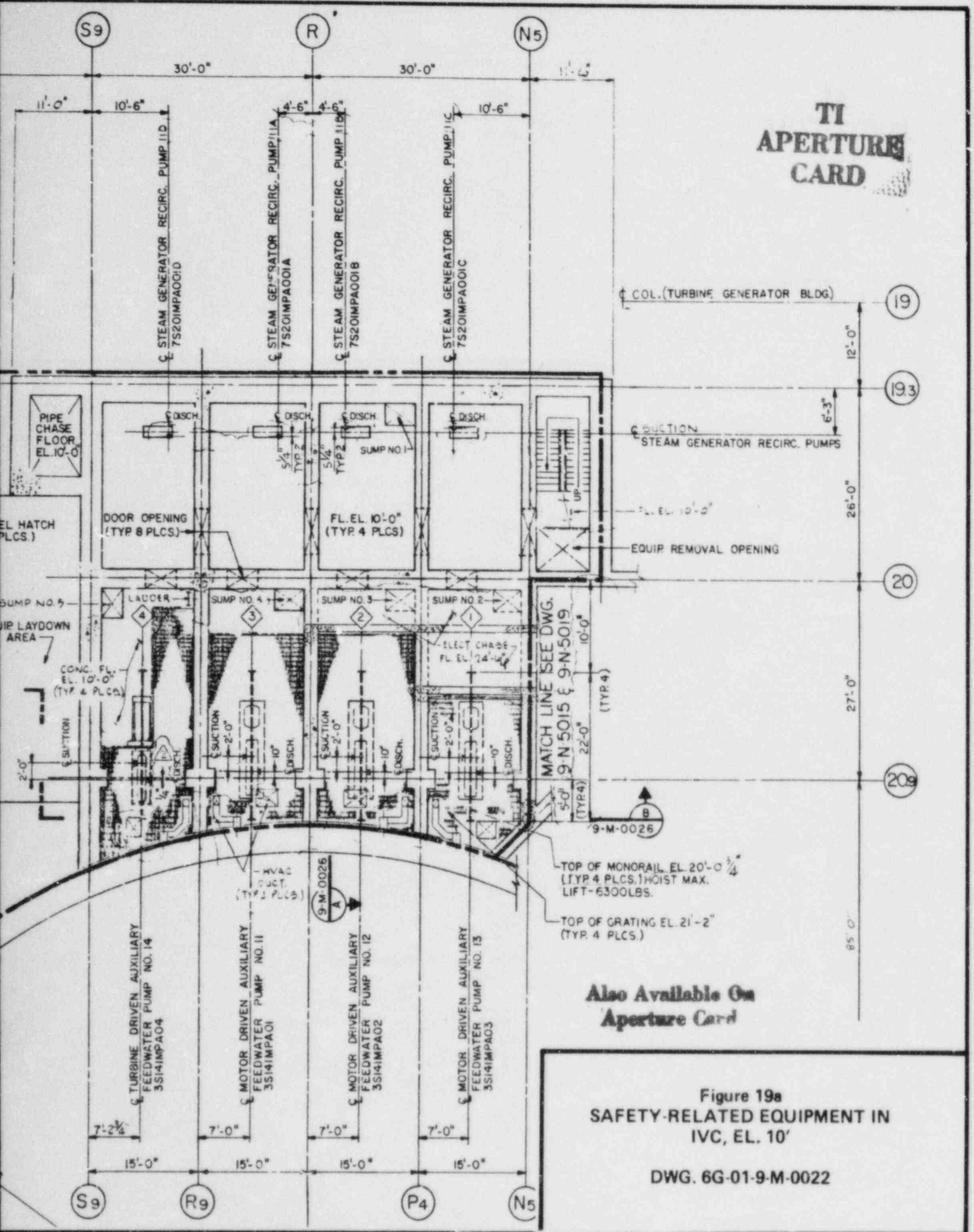
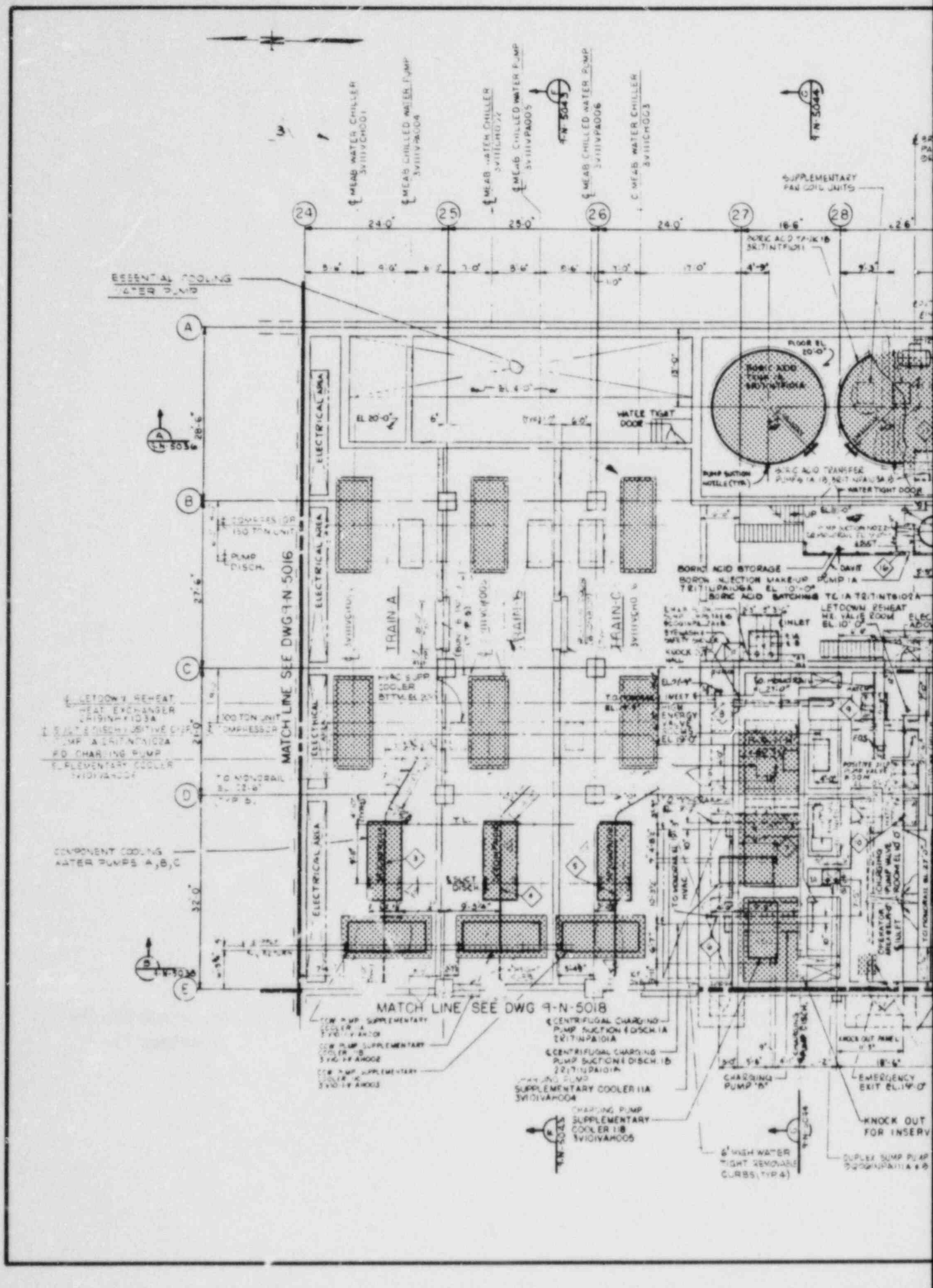


Figure 19a
SAFETY-RELATED EQUIPMENT IN
IVC, EL. 10'

DWG. 6G-01-9-M-0022



ESSENTIAL COOLING WATER PUMP
SUPPLEMENTARY FAN COIL UNITS
MATCH LINE SEE DWG 9-N-5016
MATCH LINE SEE DWG 9-N-5018
TRAIN A
TRAIN C
ELECTRICAL AREA
WATER TIGHT DOOR
BORIC ACID STORAGE
LETDOWN REHEAT
COMPONENT COOLING WATER PUMPS A, B, C
CHARGING PUMP "B"
EMERGENCY EXIT EL. 19'-0"
KNOCK OUT
FOR INSERV
6' HIGH WATER TIGHT REMOVABLE CURBS (TYP 4)
CHARGING PUMP SUPPLEMENTARY COOLER 1B 3VIOIVAH005
SUPPLEMENTARY COOLER 1IA 3VIOIVAH004
24
25
26
27
28
A
B
C
D
E

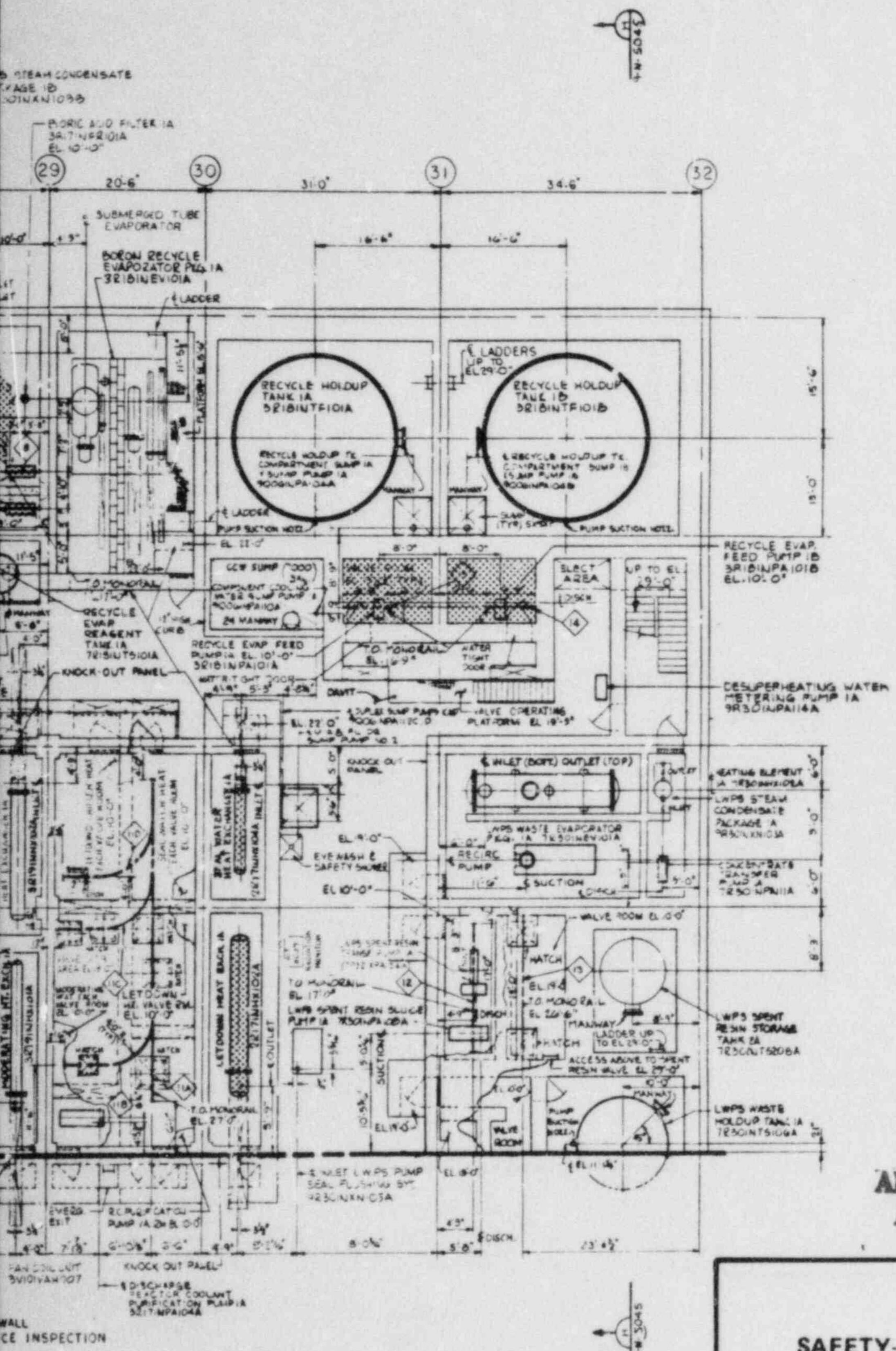


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Figure 20
SAFETY-RELATED EQUIPMENT IN MEAB, EL 10', AREA K

DWG. 6M-18-9-N-5017

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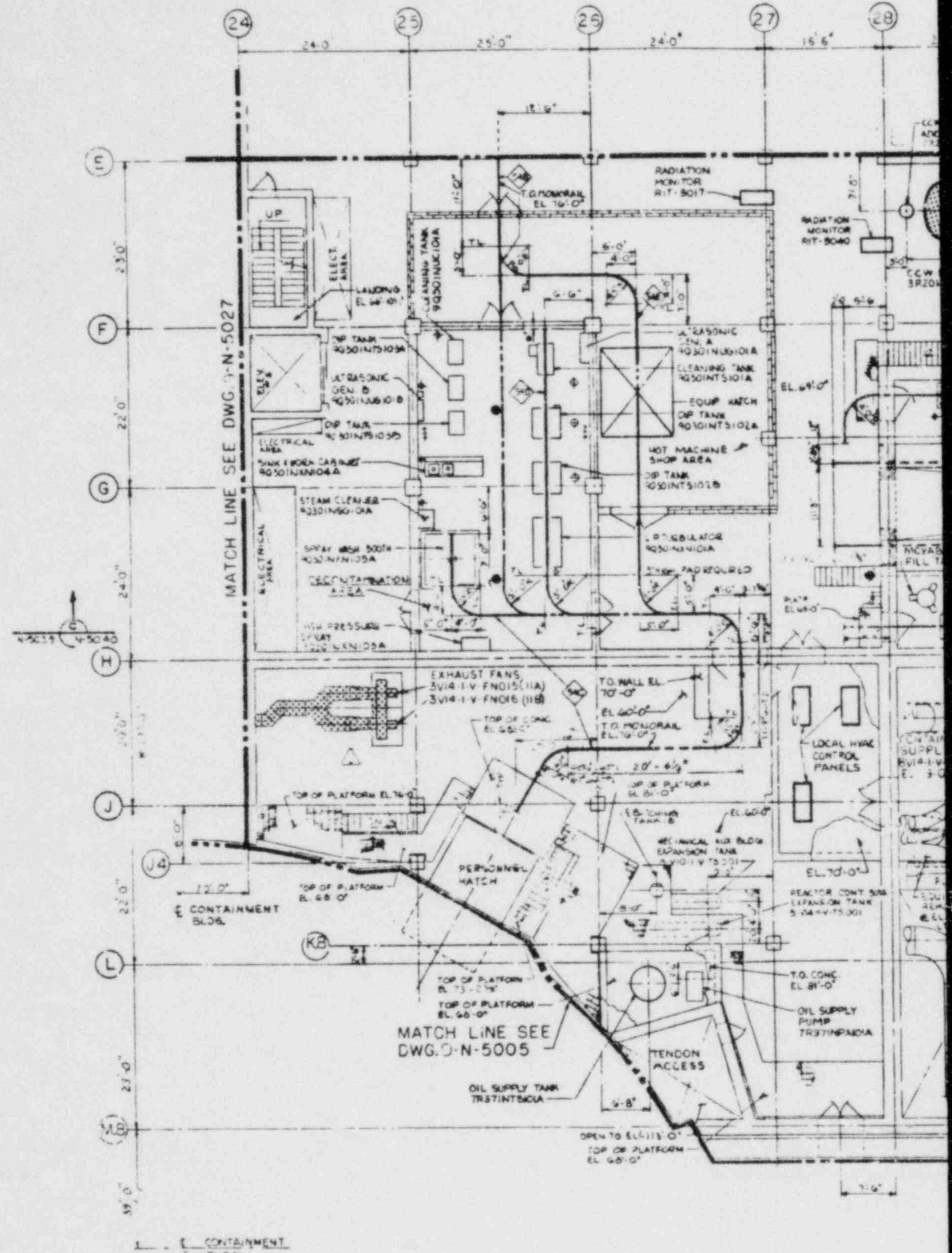
27



MATCH LINE SEE DWG. 9-N-5027
MATCH LINE SEE DWG. 9-N-5005
RADIATION MONITOR RIT-5017
RADIATION MONITOR RIT-5040
T.O. MONORAIL EL. 76'-0"
CLEANING TANK 9Q501NJK101A
ULTRASONIC GEN. A 9Q501NUG101A
EQUIP HATCH
HOT MACHINE SHOP AREA
DECONTAMINATION AREA
STEAM CLEANER
ELECTRICAL AREA
ELEV
UP
EXHAUST FANS 3V14-1-V-FN015(11A) 3V14-1-V-FN016(11B)
T.O. WALL EL. 70'-0"
EL. 60'-0"
LOCAL HVAC CONTROL PANELS
PERSONNEL HATCH
TOP OF PLATFORM EL. 68'-0"
℄ CONTAINMENT BLDG.
TENDON ACCESS
OIL SUPPLY TANK
OIL SUPPLY PUMP
T.O. CONC. EL. 81'-0"
EL. 70'-0"

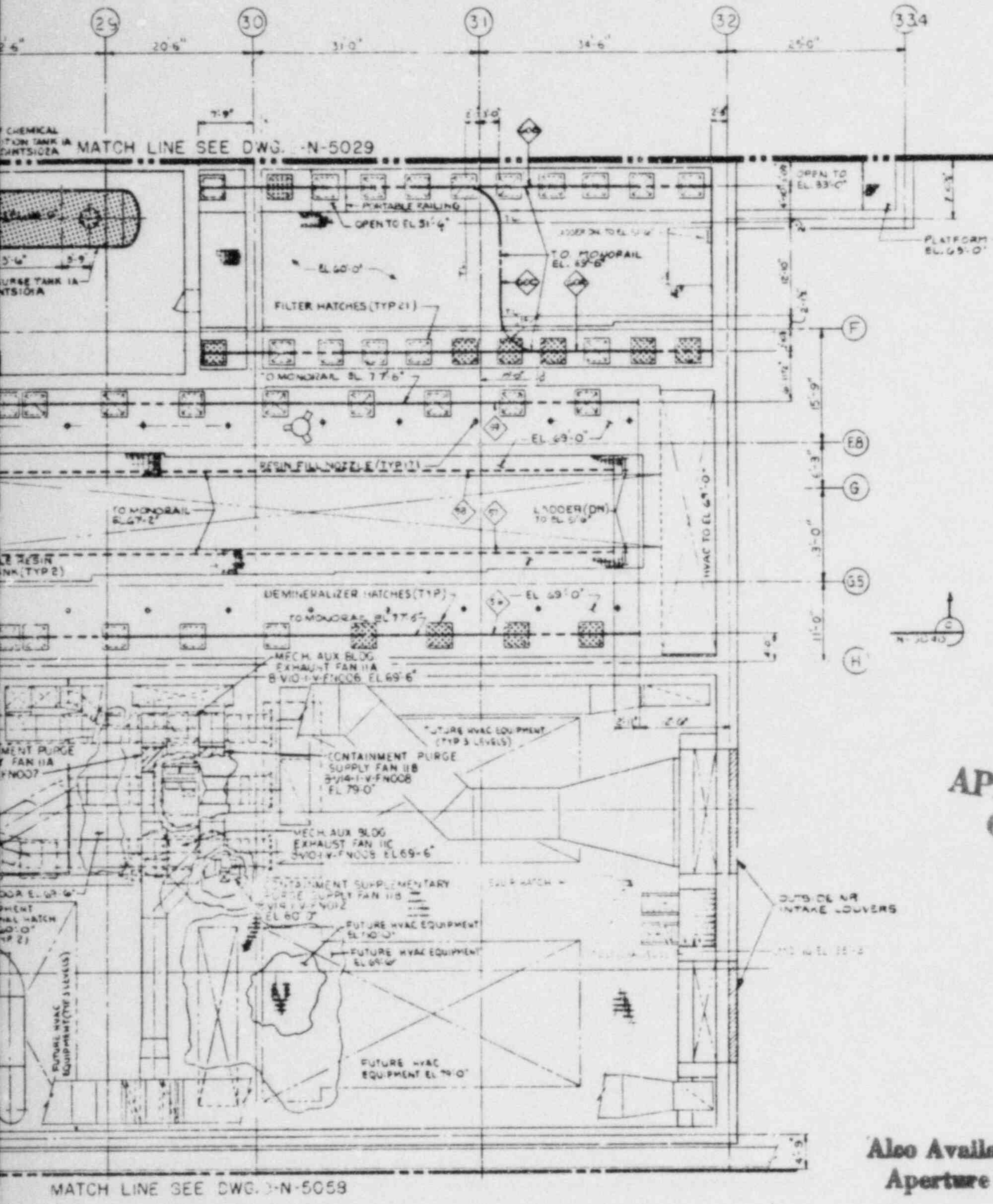
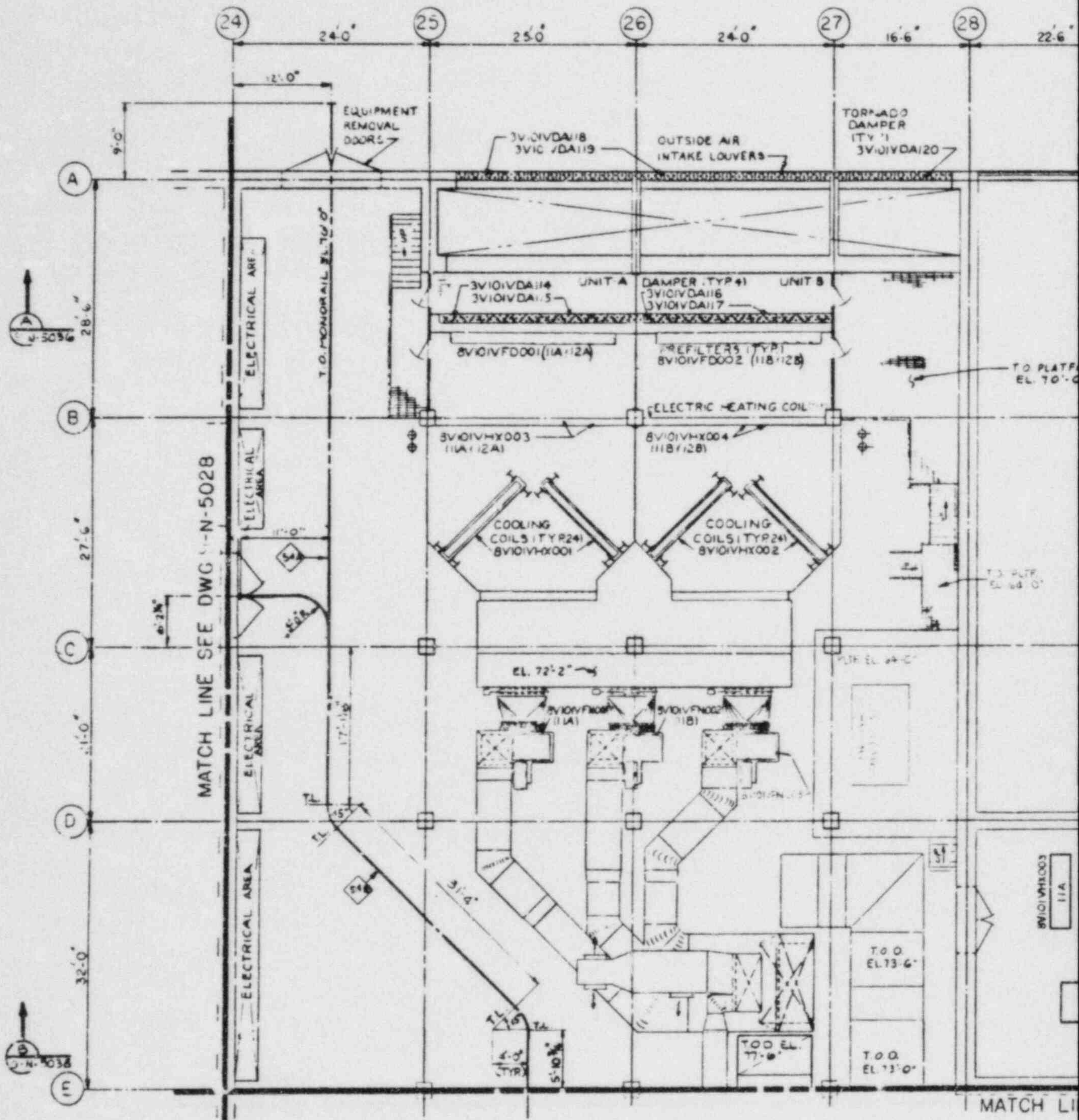


Figure 21
SAFETY-RELATED EQUIPMENT
MEAB, EL. 60′, AREA L

DWG. 6C-18-9-N-5030


24
25
26
27
28
24'-0"
25'-0"
24'-0"
16'-6"
22'-6"
12'-0"
9'-0"
EQUIPMENT
REMOVAL
DOORS
OUTSIDE AIR
INTAKE LOUVERS
TORNADO
DAMPER
3V101VDA120
A
B
C
D
E
28'-6"
27'-6"
32'-0"
ELECTRICAL AREA
T.O. MONORAIL
UNIT A
UNIT B
3V101VDA114
3V101VDA115
3V101VDA116
3V101VDA117
8V101VFD001 (11A-12A)
8V101VFD002 (11B-12B)
8V101VHX003
8V101VHX004
11'-0"
COOLING
COILS (TYP 2)
8V101VHX001
8V101VHX002
MATCH LINE SEE DWG
EL. 72'-2"
T.O.O.
EL. 73'-6"
T.O.O. EL.
77'-0"
T.O.O.
EL. 73'-0"
4'-0"
(TYP)
31'-4"
12'-6"
MATCH LI

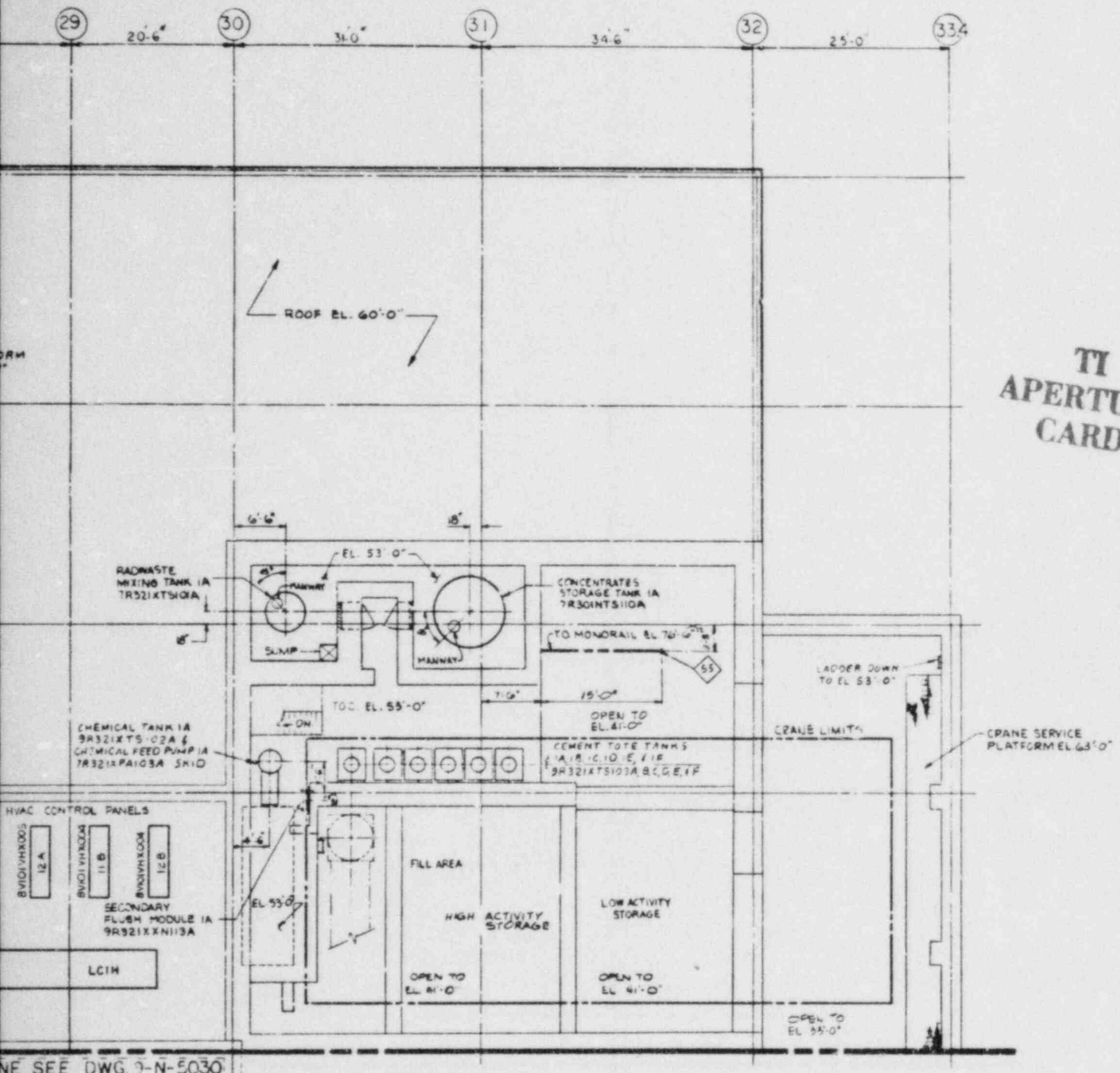
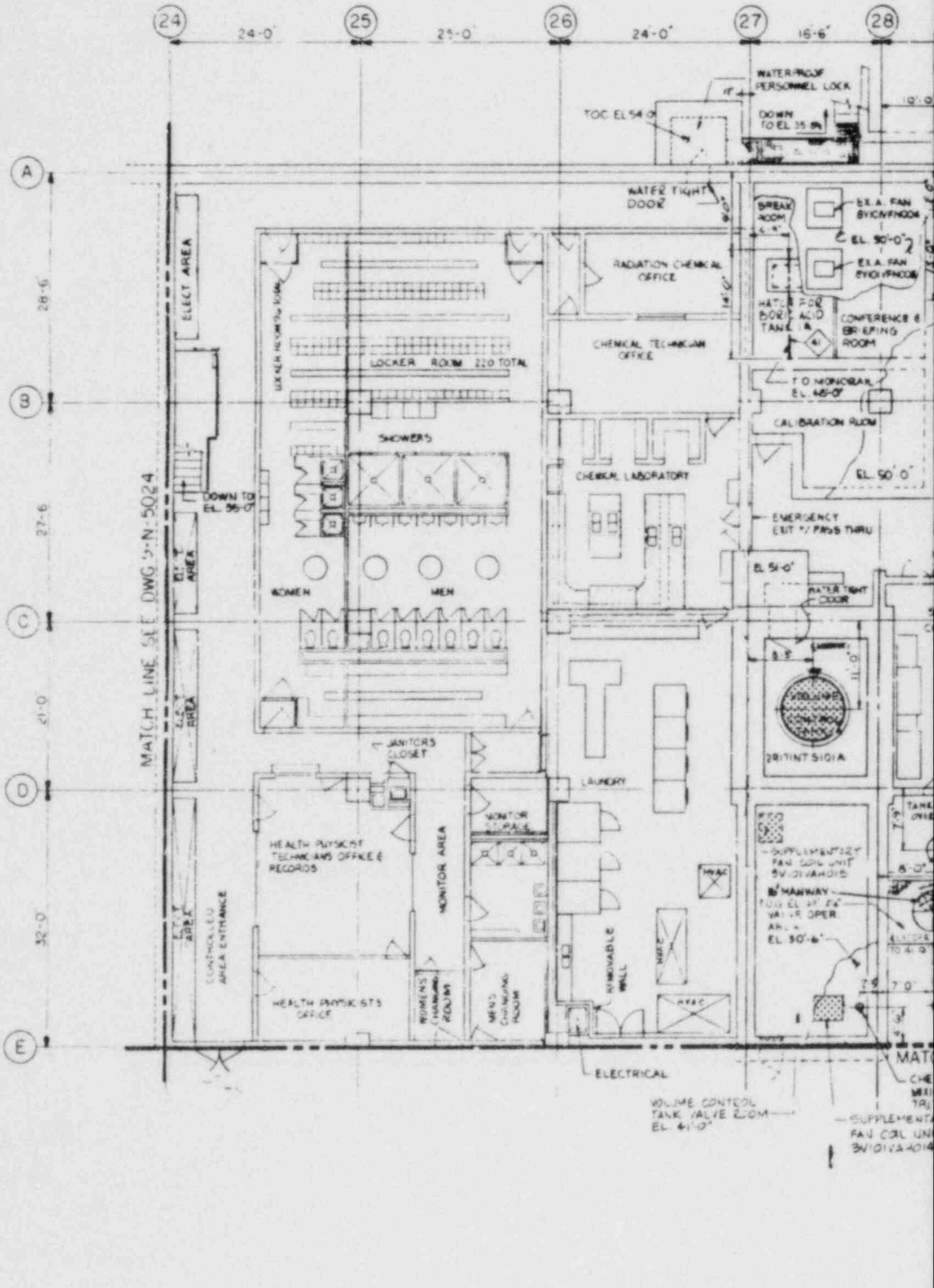


Figure 22
SAFETY-RELATED EQUIPMENT IN MEAB EL. 60', AREA K

DWG. 6M-18-9-N-5029


24
25
26
27
28
24-0
25-0
24-0
16-6
A
B
C
D
E
28-6
27-6
21-0
32-0
MATCH LINE SEE DWG 5-N-5024
WATERPROOF PERSONNEL LOCK
DOWN TO EL 35
TOC EL 54-0
WATER TIGHT DOOR
BREAK ROOM
EX.A. FAN
EL. 50'-0"
RADIATION CHEMICAL OFFICE
CONFERENCE & BRIEFING ROOM
CHEMICAL TECHNICIAN OFFICE
ELECT AREA
LOCKER ROOM 220 TOTAL
SHOWERS
T.O MONORAIL EL. 48'-0"
CALIBRATION ROOM
EL. 50'-0"
CHEMICAL LABORATORY
DOWN TO EL. 55-0"
EMERGENCY EXIT W/ PASS THRU
EL. 51-0"
WATER TIGHT DOOR
WOMEN
MEN
JANITORS CLOSET
LAUNDRY
HEALTH PHYSICIST TECHNICIANS OFFICE & RECORDS
MONITOR AREA
SUPPLEMENTARY FAN COIL UNIT
MANWAY
REMOVABLE WALL
CONTROLLED AREA ENTRANCE
HEALTH PHYSICISTS OFFICE
WOMENS CHANGING ROOM
MENS CHANGING ROOM
EL. 50'-6"
ELECTRICAL
VOLUME CONTROL TANK VALVE ROOM EL. 41'-0"

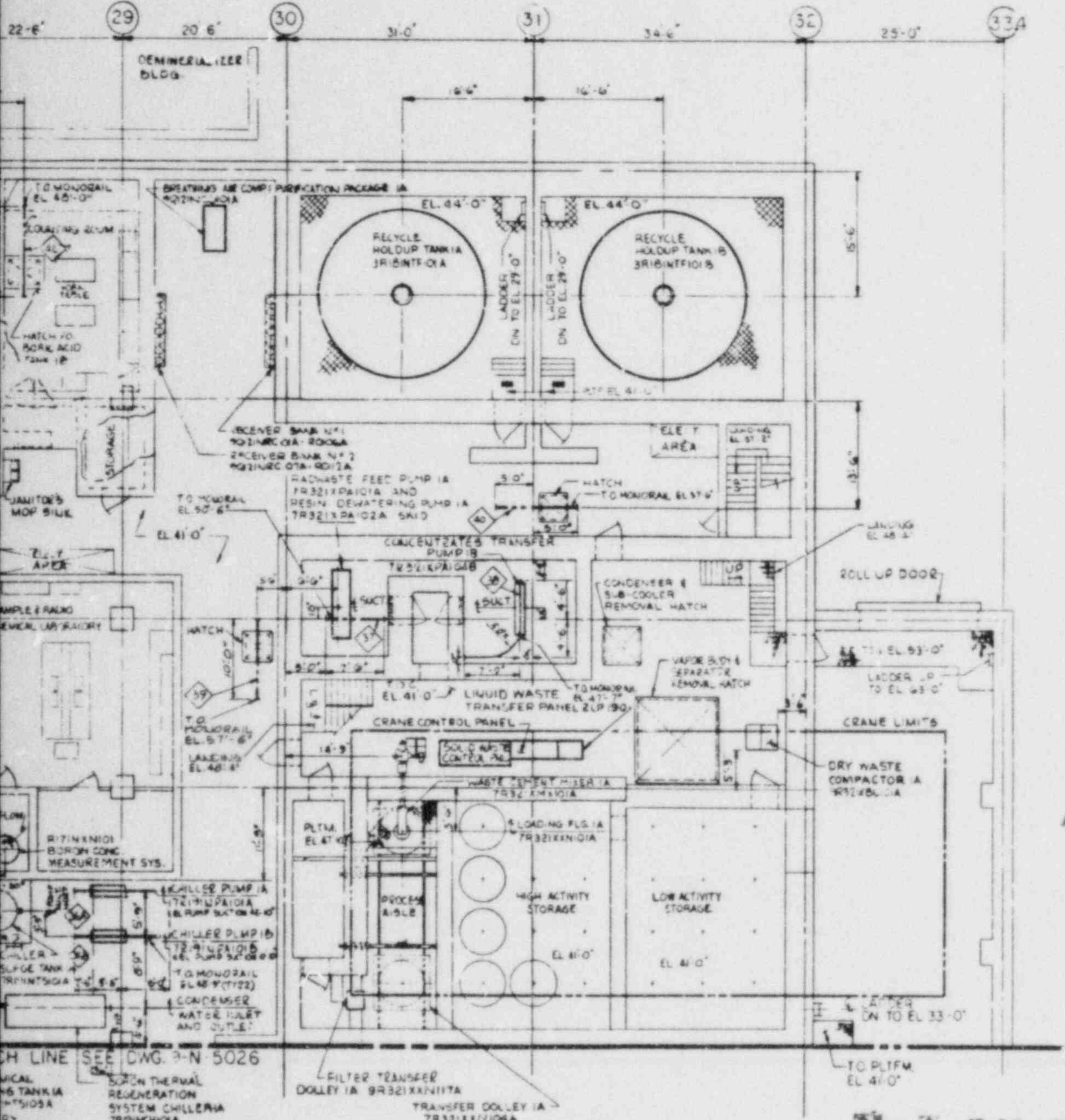
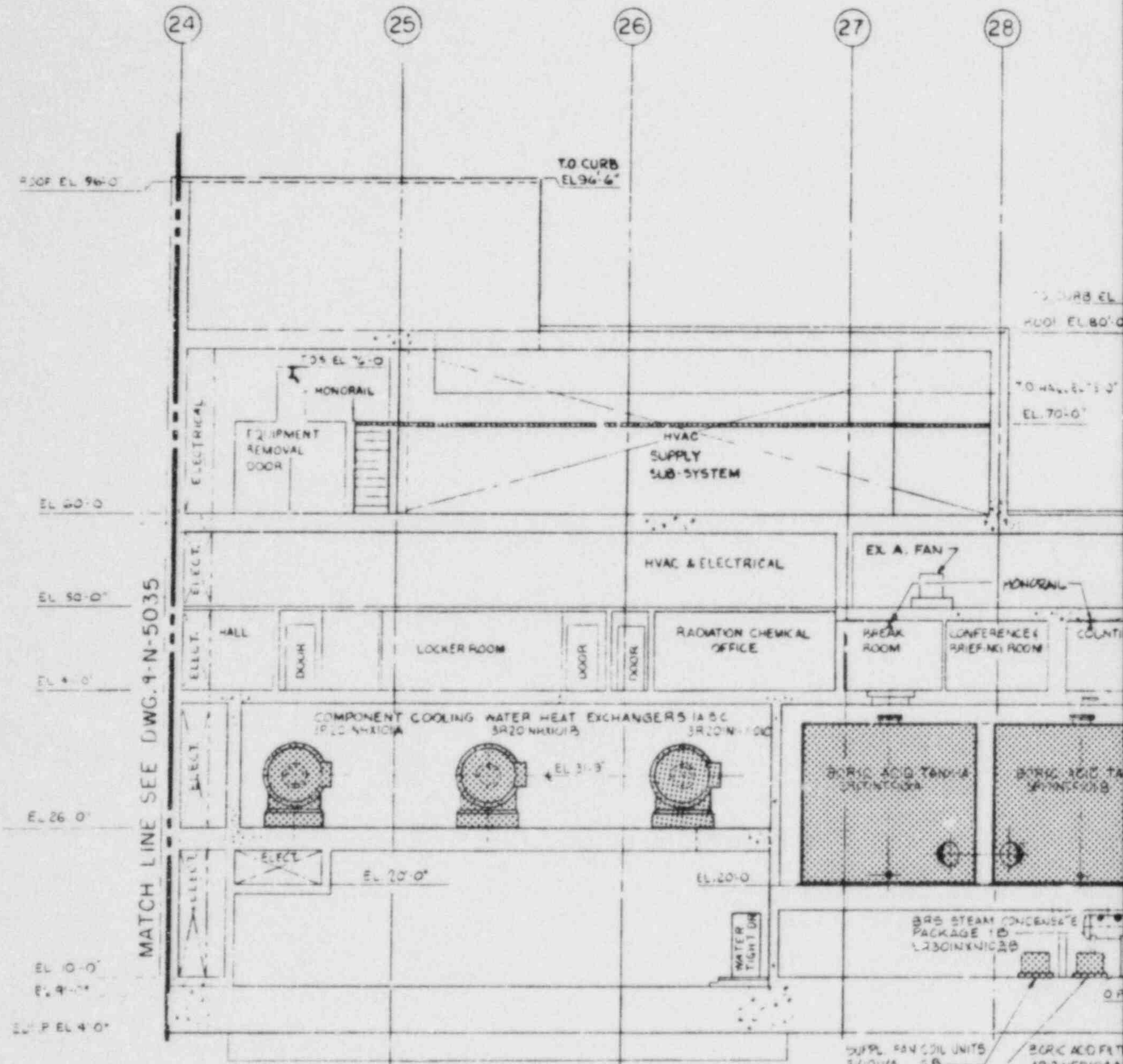


Figure 23
SAFETY-RELATED EQUIPMENT IN
MEAB, EL. 41', AREA M

DWG. 6M-18-9-N-50 .



SECTION

REF DWG 9-N-
9-N-
9-N-
9-N-
9-N-

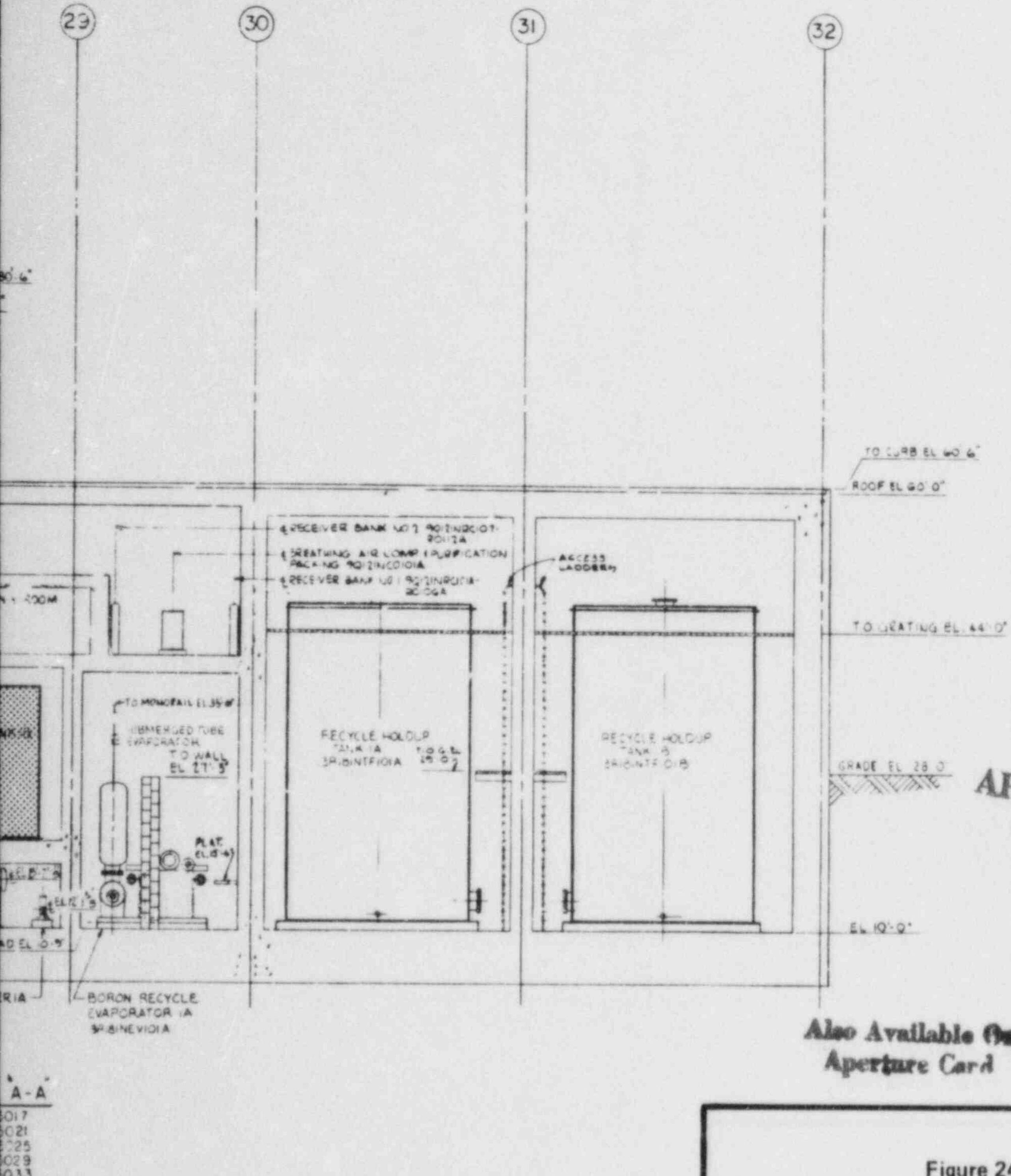
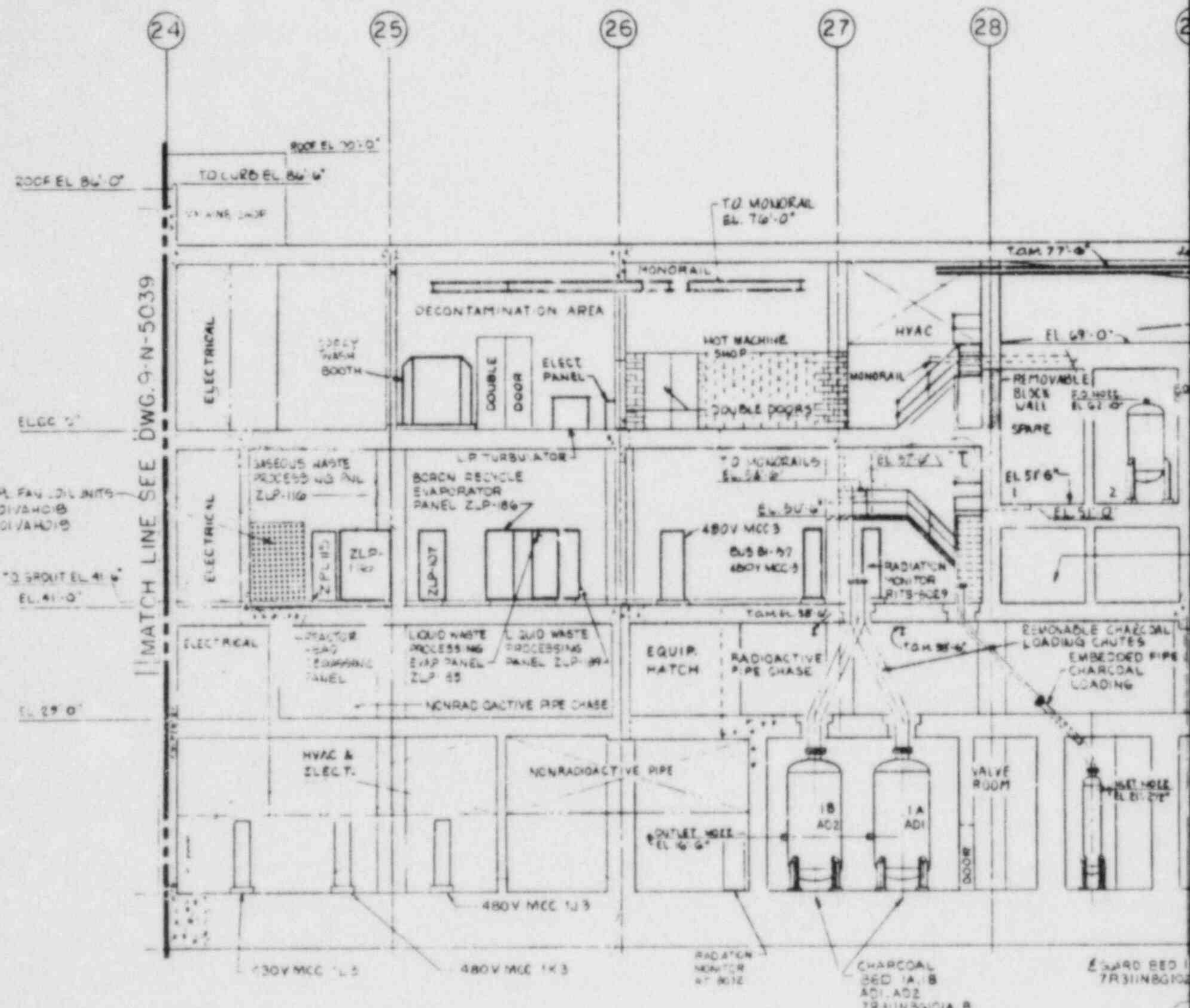


Figure 24
SAFETY-RELATED EQUIPMENT IN
MEAB, SECTION AA, AREA K

DWG. 6M-18-9-N-5036



SECTION "C

REF. DWG. 9N-
9N-
9N-
9N-
9N-

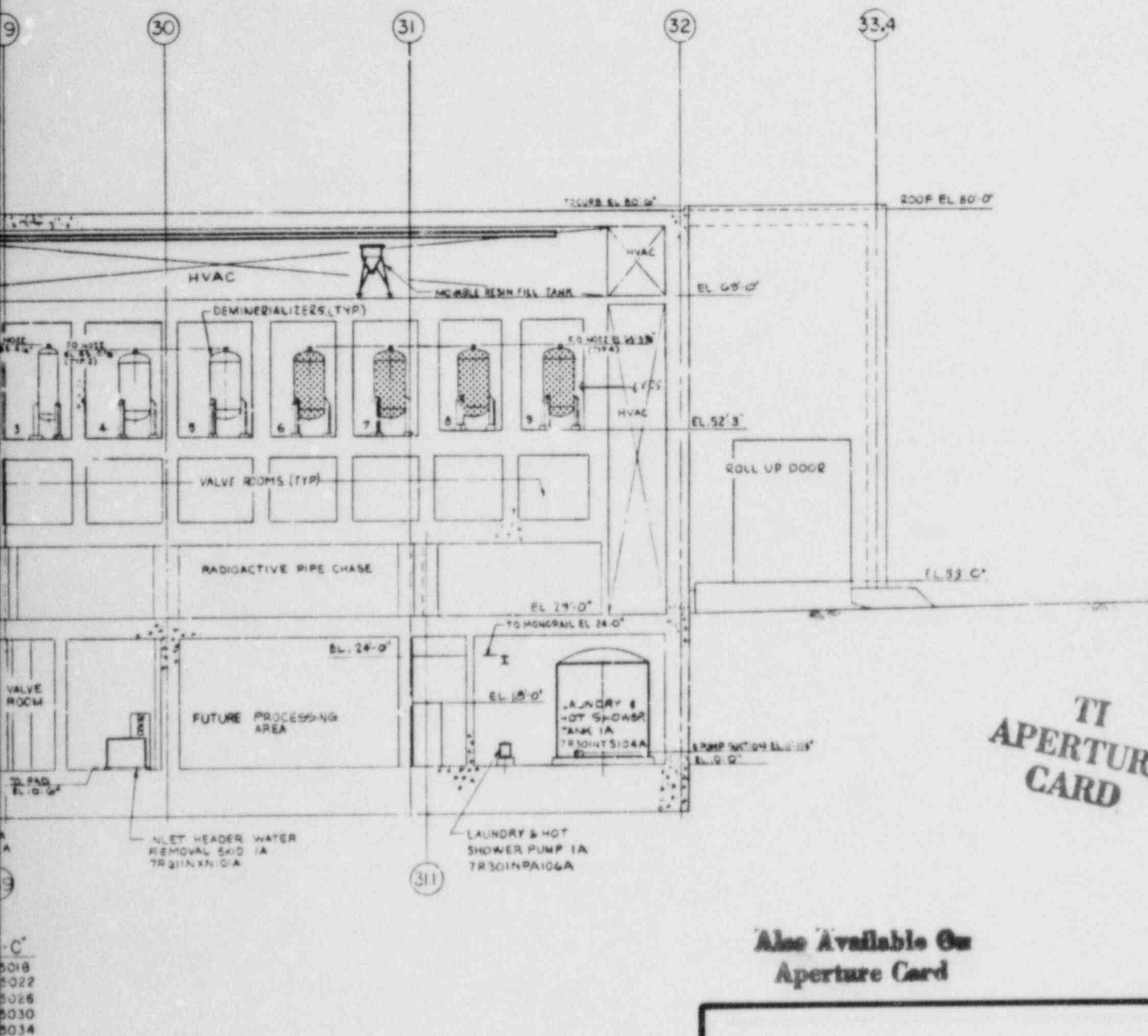
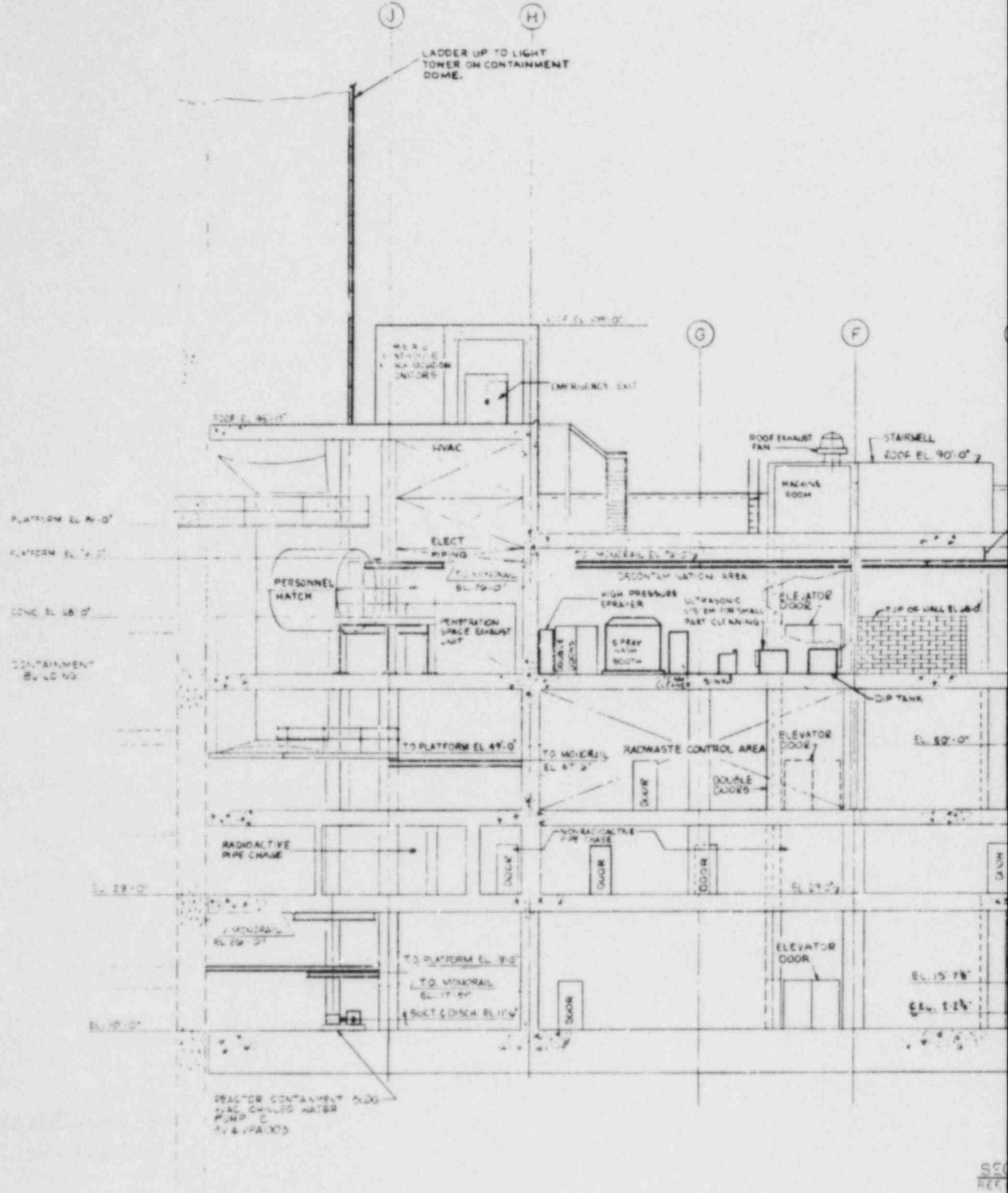


Figure 25
SAFETY-RELATED EQUIPMENT
IN MEAB
SECTION C-C, AREA L

DWG. 6M-18-9-N-5040



LADDER UP TO LIGHT TOWER ON CONTAINMENT DOME.
EMERGENCY EXIT
HVAC
ROOF EXHAUST FAN
STAIRWELL
MACHINE ROOM
ELECT PIPING
PERSONNEL HATCH
DECONTAMINATION AREA
HIGH PRESSURE SPRAYER
ELEVATOR DOOR
PENETRATION SPACE EXHAUST UNIT
SPRAY BOOTH
CONTAINMENT BUILDING
DIP TANK
RADWASTE CONTROL AREA
TO PLATFORM EL. 49'-0"
DOUBLE DOORS
EL. 50'-0"
RADIOACTIVE PIPE CHASE
DOOR
ELEVATOR DOOR
SUCT & DISCH. EL 11'
EL. 15'7"
REACTOR CONTAINMENT BLDG HVAC CHILLED WATER PUMP C

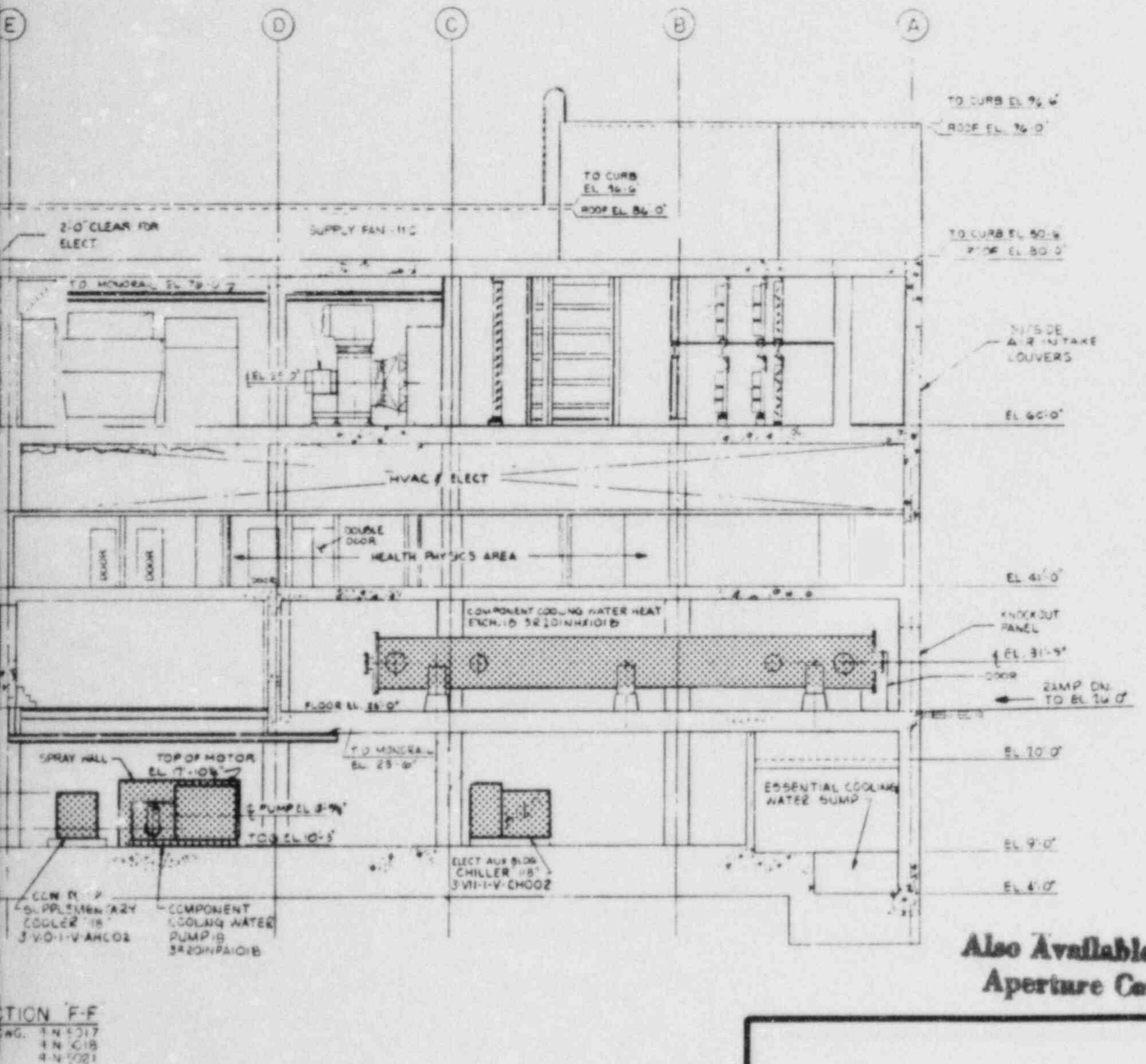


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Figure 26
SAFETY-RELATED EQUIPMENT IN MEAB, SECTION FF, AREAS K&L

DWG. 6M-18-9-N-5043

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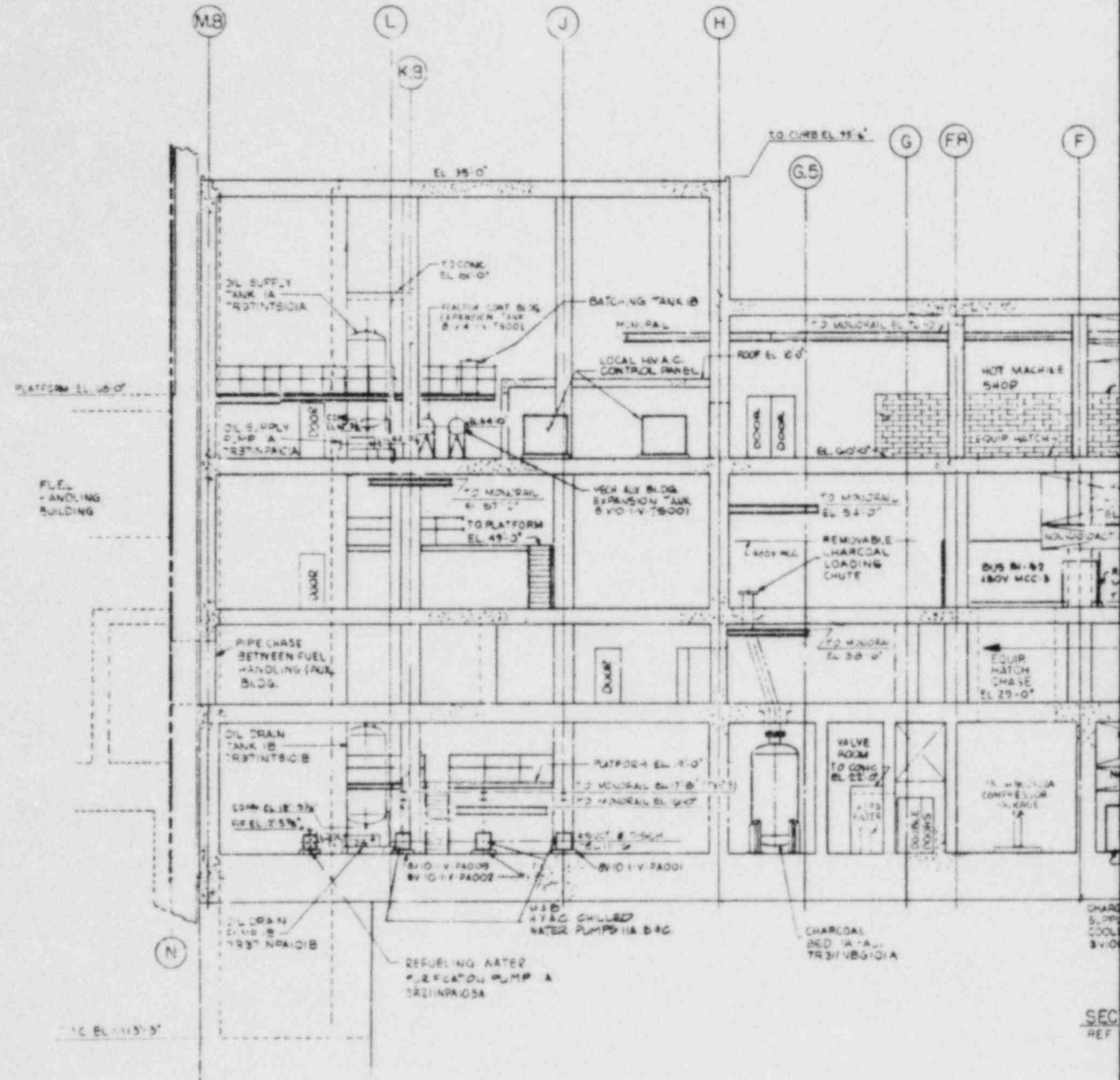
M.8
L
K.9
J
H
G.5
G
F.8
F
N
EL 35'-0"
TO CURB EL 95'-6"
OIL SUPPLY TANK IA
TO CONC EL 61'-0"
BATCHING TANK IB
MONORAIL
LOCAL HVAC CONTROL PANEL
ROOF EL 10'-0"
HOT MACHINE SHOP
PLATFORM EL 48'-0"
OIL SUPPLY PUMP A
DOOR
EQUIP HATCH
FUEL HANDLING BUILDING
TO MONORAIL
TO PLATFORM EL 49'-0"
MECH AUX BLDG EXPANSION TANK
REMOVABLE CHARCOAL LOADING CHUTE
PIPE CHASE BETWEEN FUEL HANDLING (AUX) BLDG.
EQUIP HATCH CHASE EL 29'-0"
OIL DRAIN TANK IB
PLATFORM EL 19'-0"
VALVE ROOM
DOUBLE DOORS
OIL DRAIN PUMP IB
H&D HVAC CHILLED WATER PUMPS IIA, B & C
REFUELING WATER PURIFICATION PUMP A
CHARCOAL BED IA-A
SEC
REF

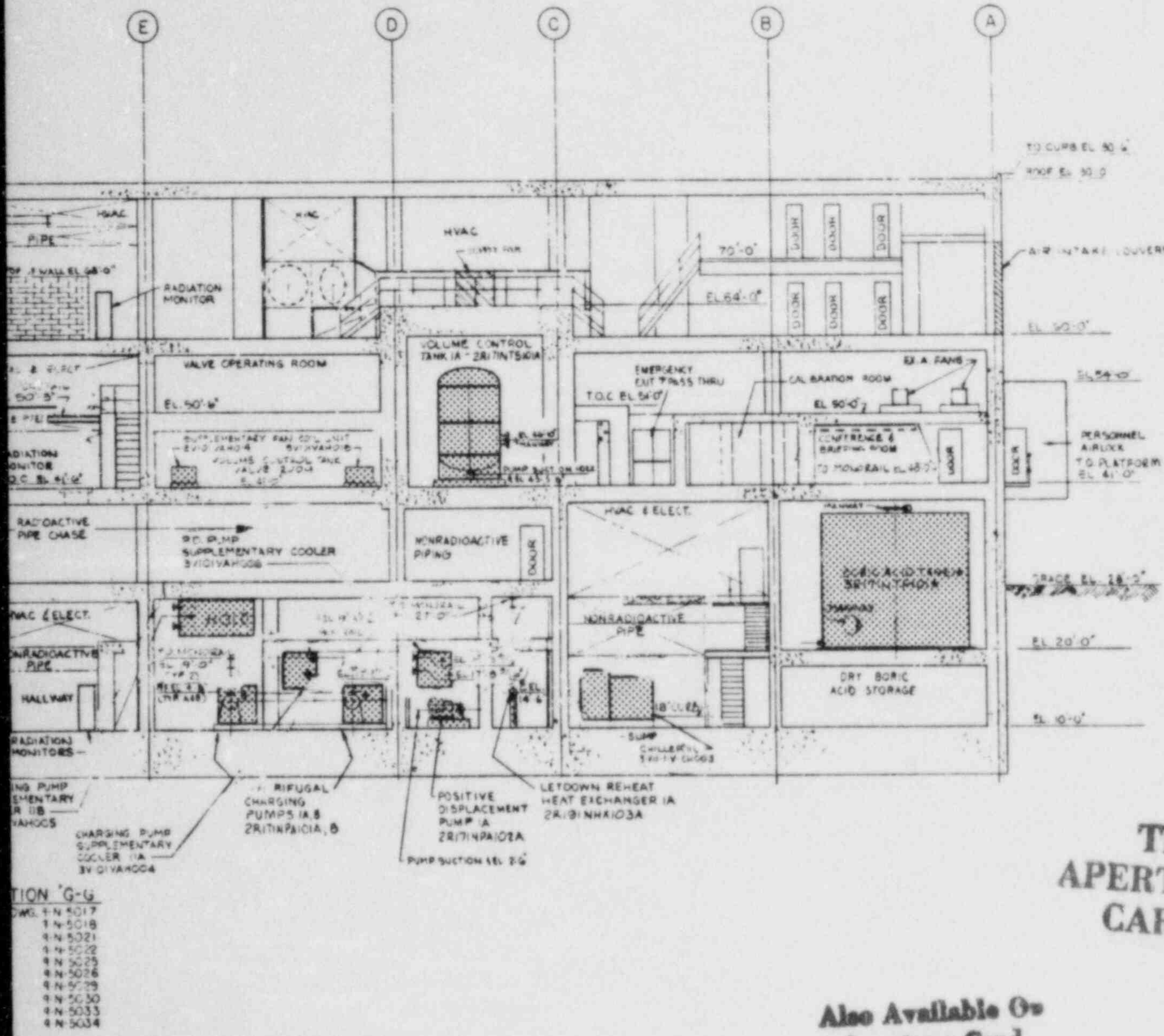

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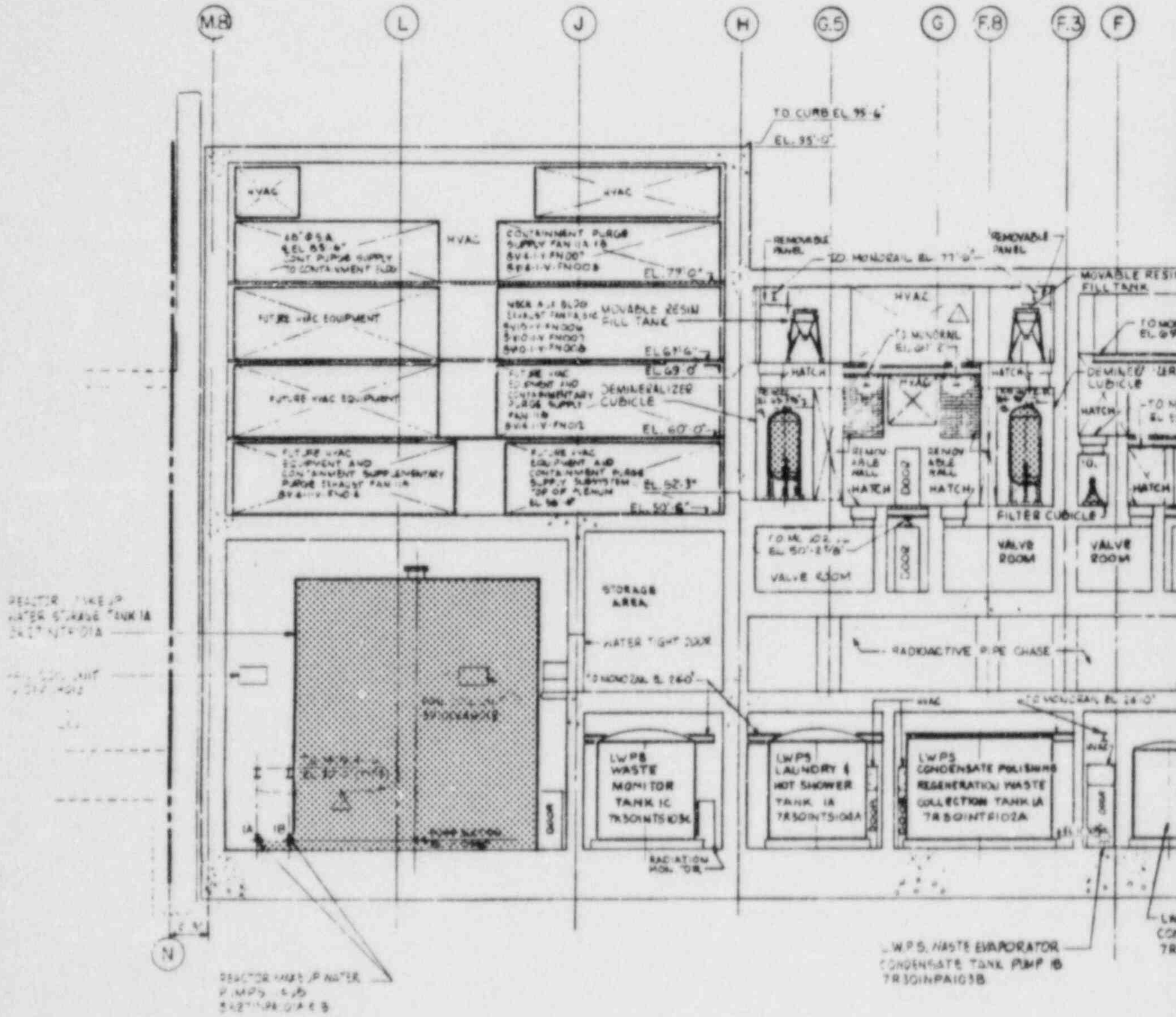
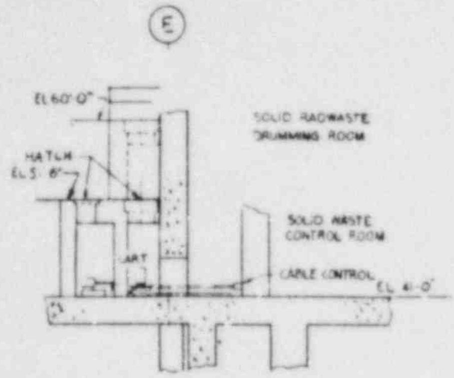
Figure 27
SAFETY-RELATED EQUIPMENT
IN MEAB
SECTION GG, AREAS K&L

DWG. 6M-18-9-N-5044

8411010420



M.8
L
J
H
G.5
G
F.8
F.3
F
N
TO CURB EL 95'-6"
EL. 95'-0"
HVAC
CONTAINMENT PURGE SUPPLY FAN
EL. 77'-0"
REMOVABLE PANEL
TO MONORAIL EL. 77'-0"
MOVABLE RESIN FILL TANK
FUTURE HVAC EQUIPMENT
EL. 69'-0"
DEMINERALIZER CUBICLE
EL. 60'-0"
HATCH
FILTER CUBICLE
EL. 52'-3"
EL. 50'-6"
VALVE ROOM
STORAGE AREA
WATER TIGHT DOOR
RADIOACTIVE PIPE CHASE
TO MONORAIL EL. 26'-0"
LWPS WASTE MONITOR TANK 1C 7R30INTS103C
LWPS LAUNDRY & HOT SHOWER TANK 1A 7R30INTS106A
LWPS CONDENSATE POLISHING REGENERATION WASTE COLLECTION TANK 1A 7R30INTF102A
RADIATION MONITOR
DOOR
L.W.P.S. WASTE EVAPORATOR CONDENSATE TANK PUMP 1B 7R30INPA103B
REACTOR MAKEUP WATER PUMPS



SECTION 'J-J'
REF DWG 9-N-5026

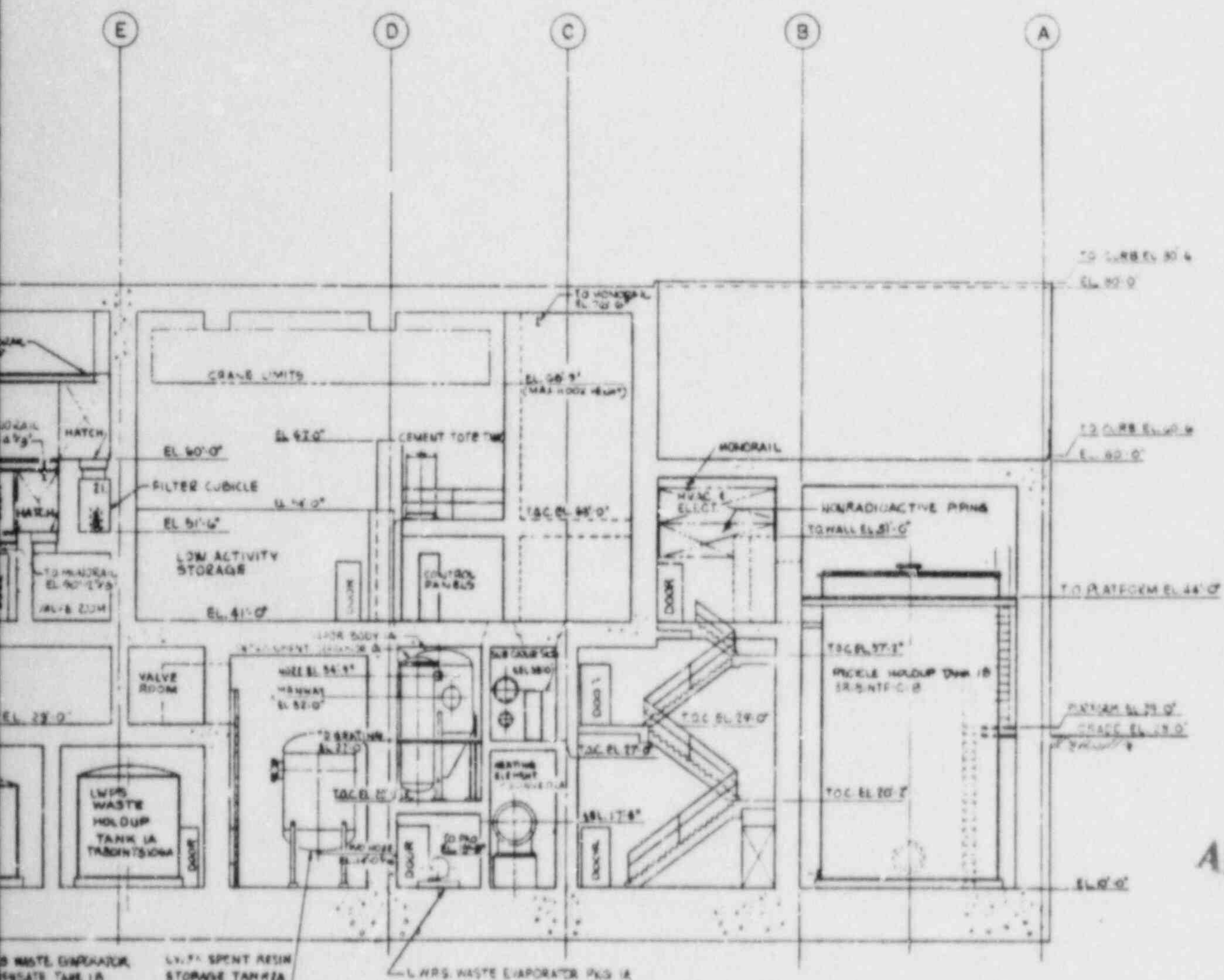
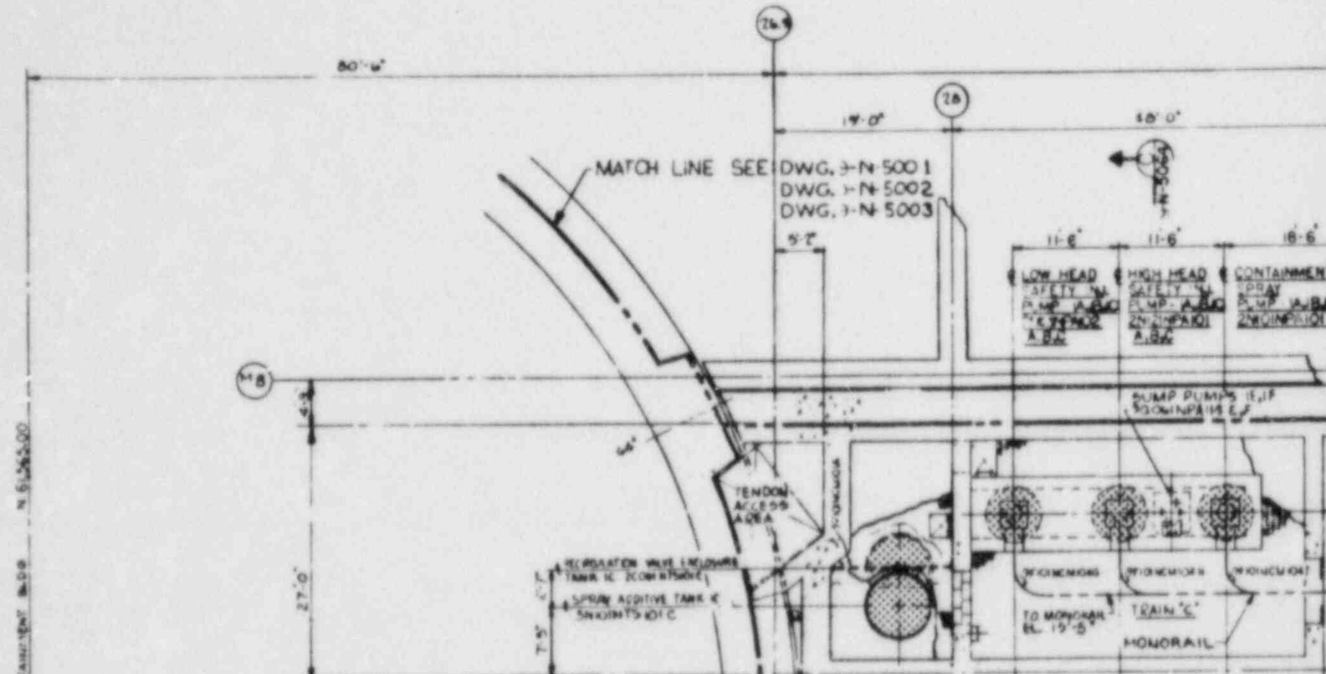


Figure 28
SAFETY-RELATED EQUIPMENT IN
MEAB, SECTION HH, AREAS K&L

DWG. 6M-18-9-N-5045



80'-6"
14'-0"
48'-0"
MATCH LINE SEE DWG. 3-N-5001
DWG. 3-N-5002
DWG. 3-N-5003
11'-6"
11'-6"
18'-6"
LOW HEAD SAFETY INJ. PUMP
HIGH HEAD SAFETY INJ. PUMP
CONTAINMENT SPRAY PUMP
SUMP PUMPS
TENDON ACCESS AREA
TRAIN "C"
MONORAIL
TRAIN "B"
TRAIN "A"
REACTOR & CONTAINMENT BLDG.
E 45,360.00
27'-0"
15'-0"
(TYP)
3-N-5063
3-N-5062
TO GRATING
KNOCK OUT PANEL (TYP)

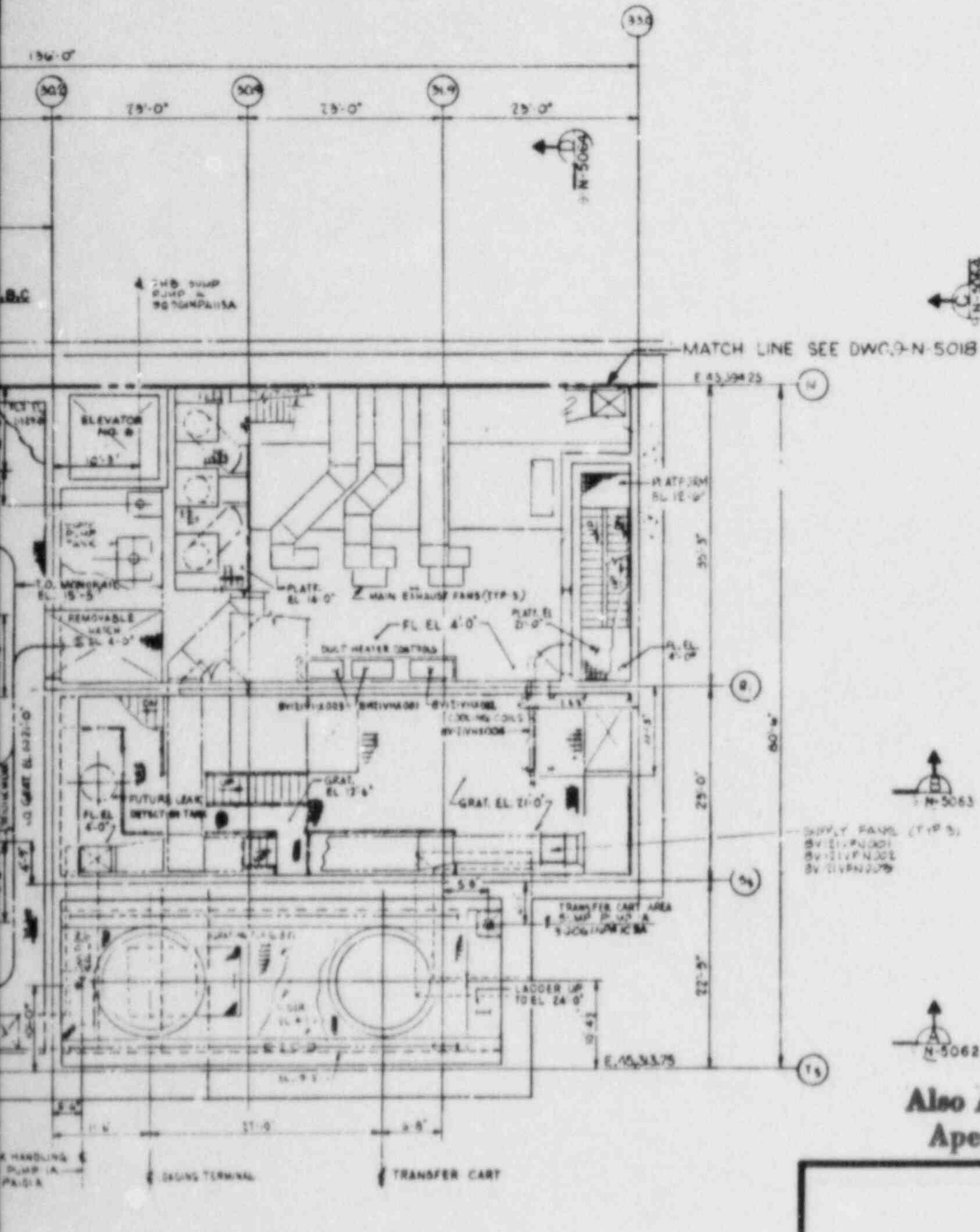


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Figure 29

SAFETY-RELATED EQUIPMENT IN FHB EL. 4' AND (-) 29, AREA M

DWG. 6F-18-9-N-5057

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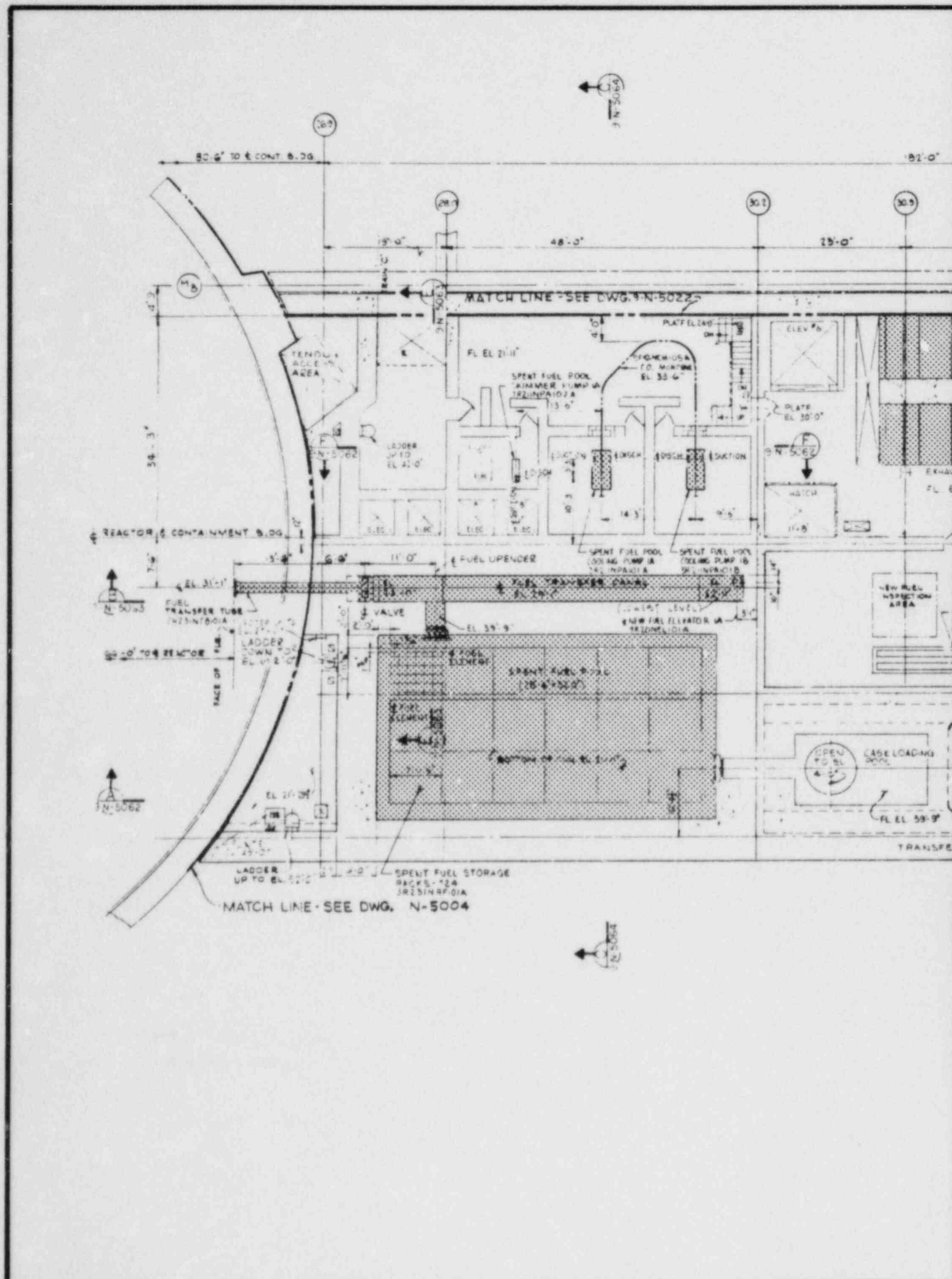
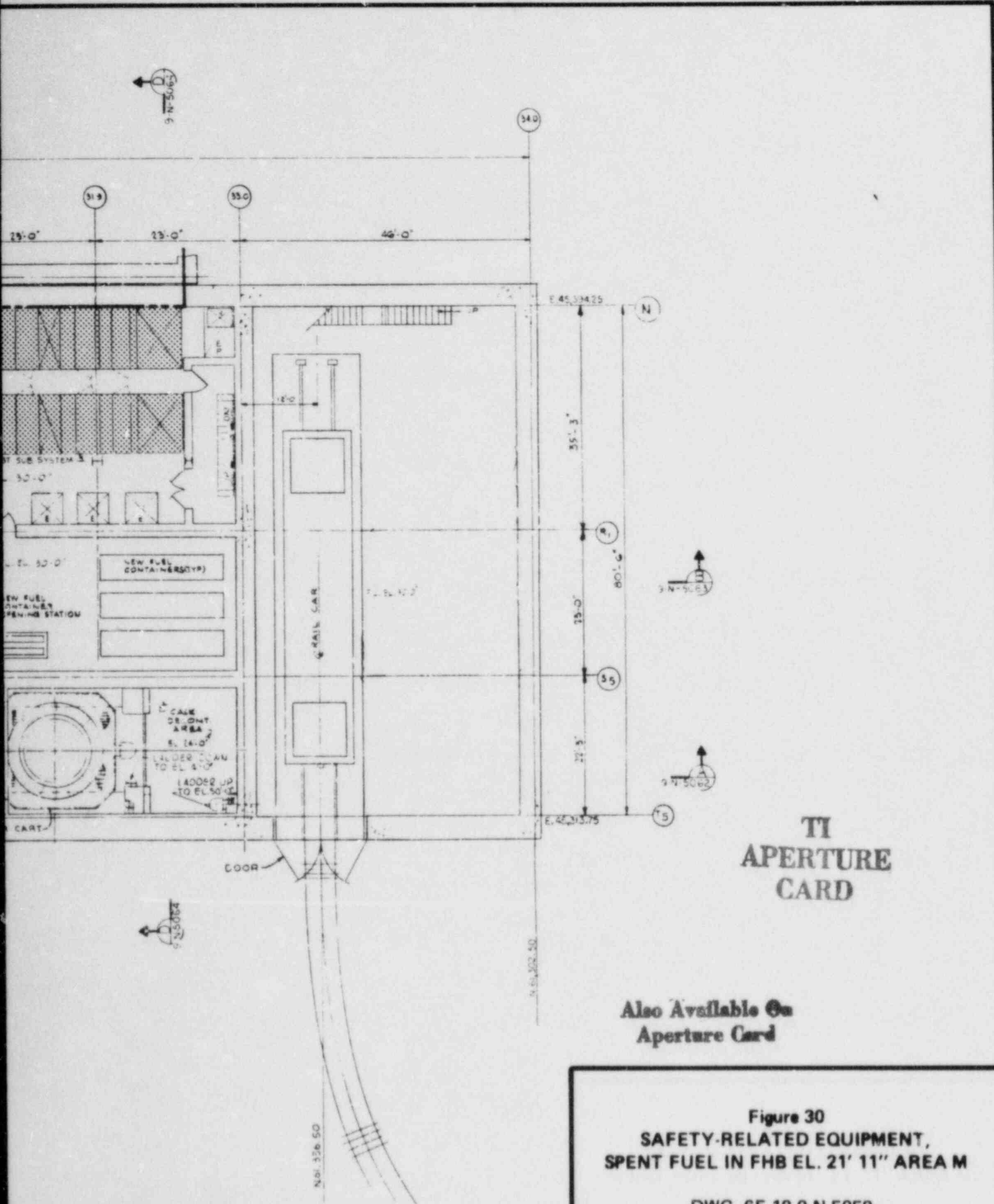
36



80'-6" TO ℄ CONT. B.DG.
82'-0"
19'-0"
48'-0"
25'-0"
MATCH LINE - SEE DWG. 9-N-5022
TENDON ACCESS AREA
FL EL 21'-11"
SPENT FUEL POOL SKIMMER PUMP 1A
SPENT FUEL POOL COOLING PUMP 1A
SPENT FUEL POOL COOLING PUMP 1B
ELEV #6
PLATE EL 30'-0"
HATCH
FUEL UPENDER
FUEL TRANSFER CANAL
FUEL TRANSFER TUBE
VALVE
NEW FUEL ELEVATOR 1A
NEW FUEL INSPECTION AREA
SPENT FUEL POOL
EL 39'-9"
CASK LOADING POOL
FL EL 39'-9"
℄ REACTOR & CONTAINMENT B.DG.
LADDER UP TO EL. 52'-0"
SPENT FUEL STORAGE RACKS
MATCH LINE - SEE DWG. N-5004
TRANSFER



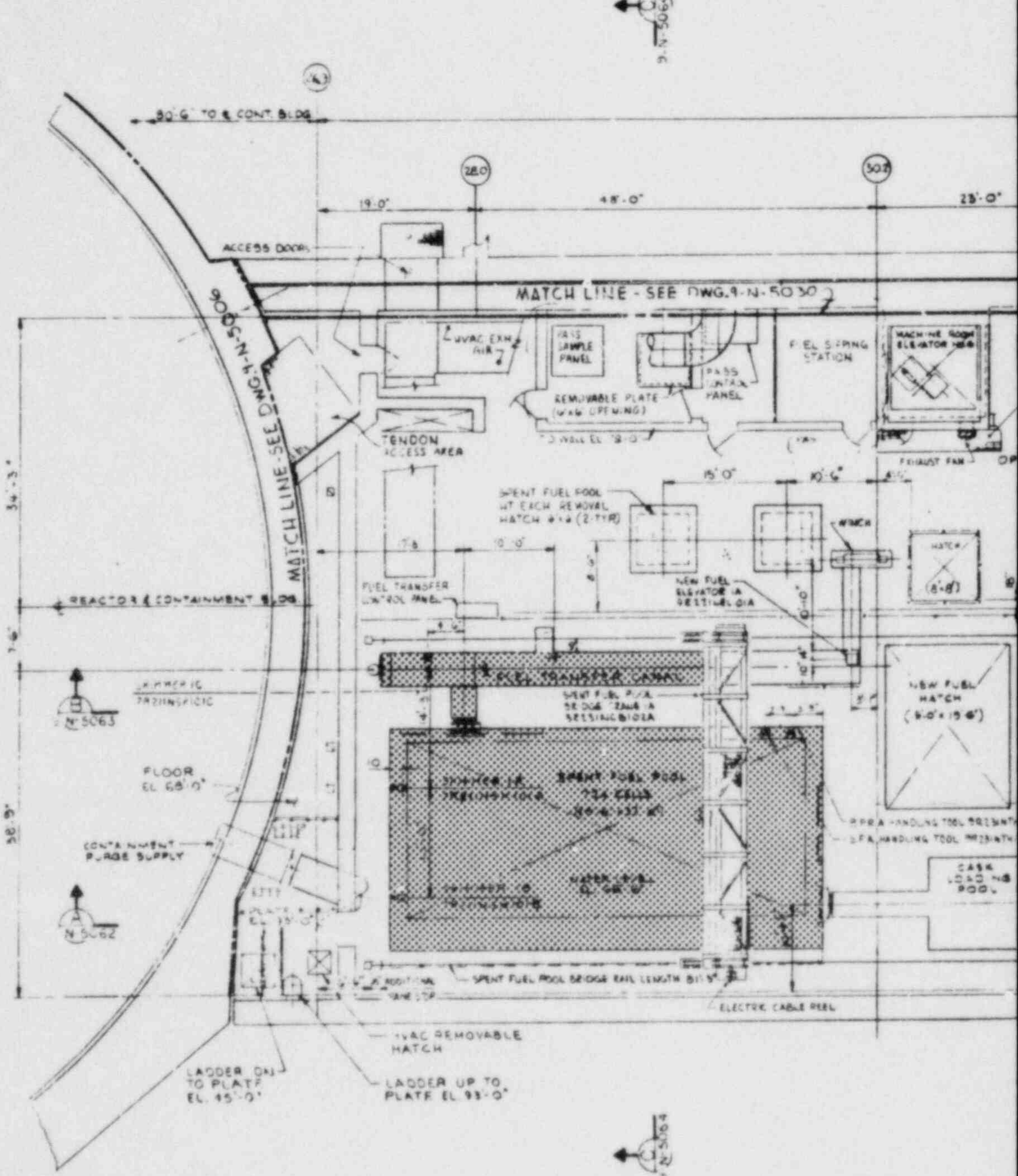
TI APERTURE CARD

Also Available On Aperture Card

Figure 30
SAFETY-RELATED EQUIPMENT, SPENT FUEL IN FHB EL. 21' 11" AREA M

DWG. 6F-18-9-N-5058

8411010420 -37



9-N-5064
30'-6" TO ℄ CONT. BLDG
28.0
19'-0"
48'-0"
23'-0"
ACCESS DOORS
MATCH LINE - SEE DWG.9-N-5030
MATCH LINE - SEE DWG.9-N-5006
HVAC EXH AIR
PASS SAMPLE PANEL
REMOVABLE PLATE (HVAC OPENING)
PASS CONTROL PANEL
FUEL SIPPING STATION
TENDON ACCESS AREA
EXHAUST FAN
15'-0"
10'-0"
FUEL TRANSFER CONTROL PANEL
REACTOR & CONTAINMENT BLDG
FUEL TRANSFER CANAL
NEW FUEL HATCH
SPENT FUEL POOL
9-N-5063
FLOOR EL. 68'-0"
CONTAINMENT PURGE SUPPLY
N-5062
CASK LOADING POOL
ELECTRIC CABLE REEL
HVAC REMOVABLE HATCH
LADDER DN TO PLATF EL. 95'-0"
LADDER UP TO PLATF EL. 93'-0"
9-N-5064

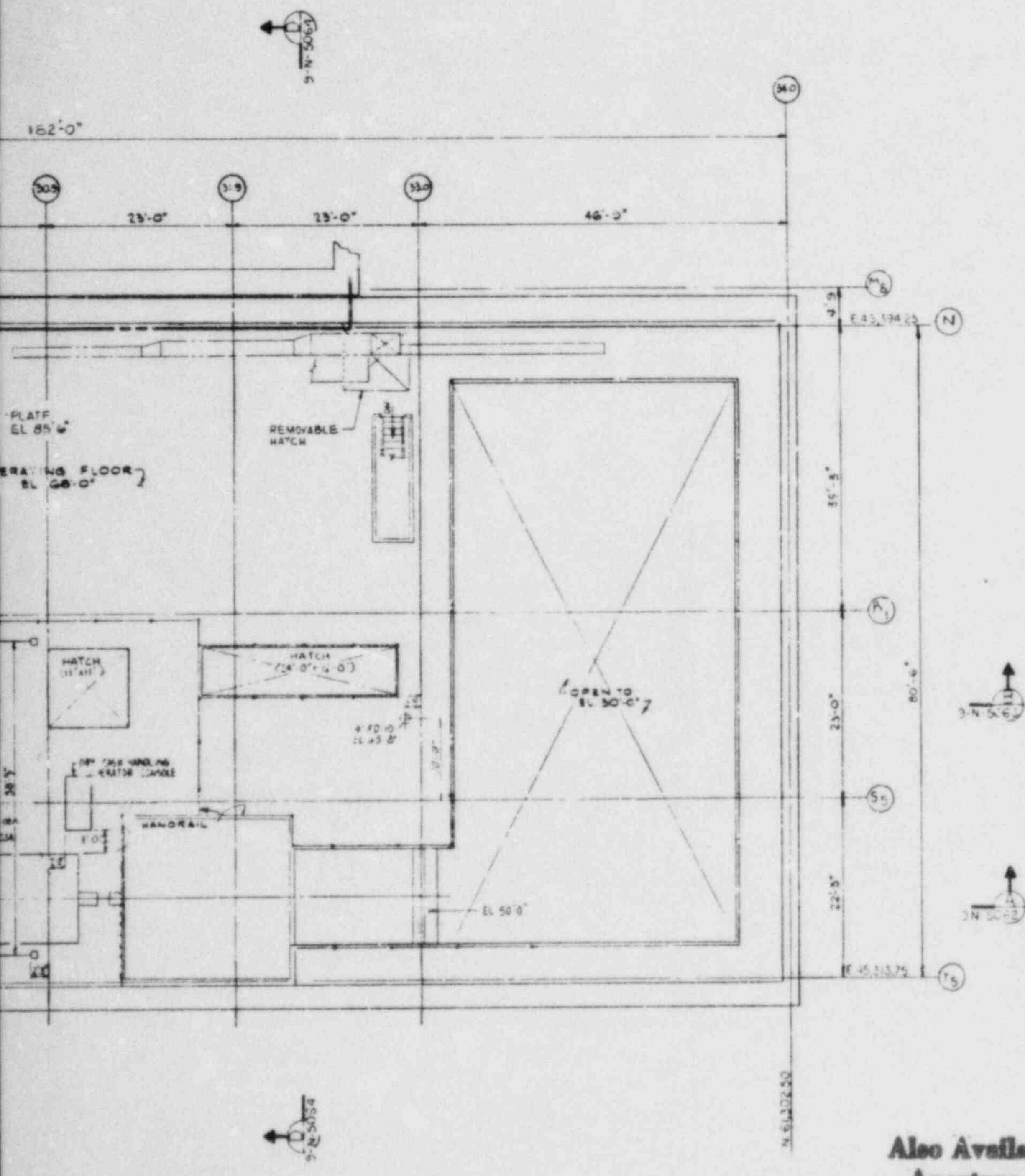
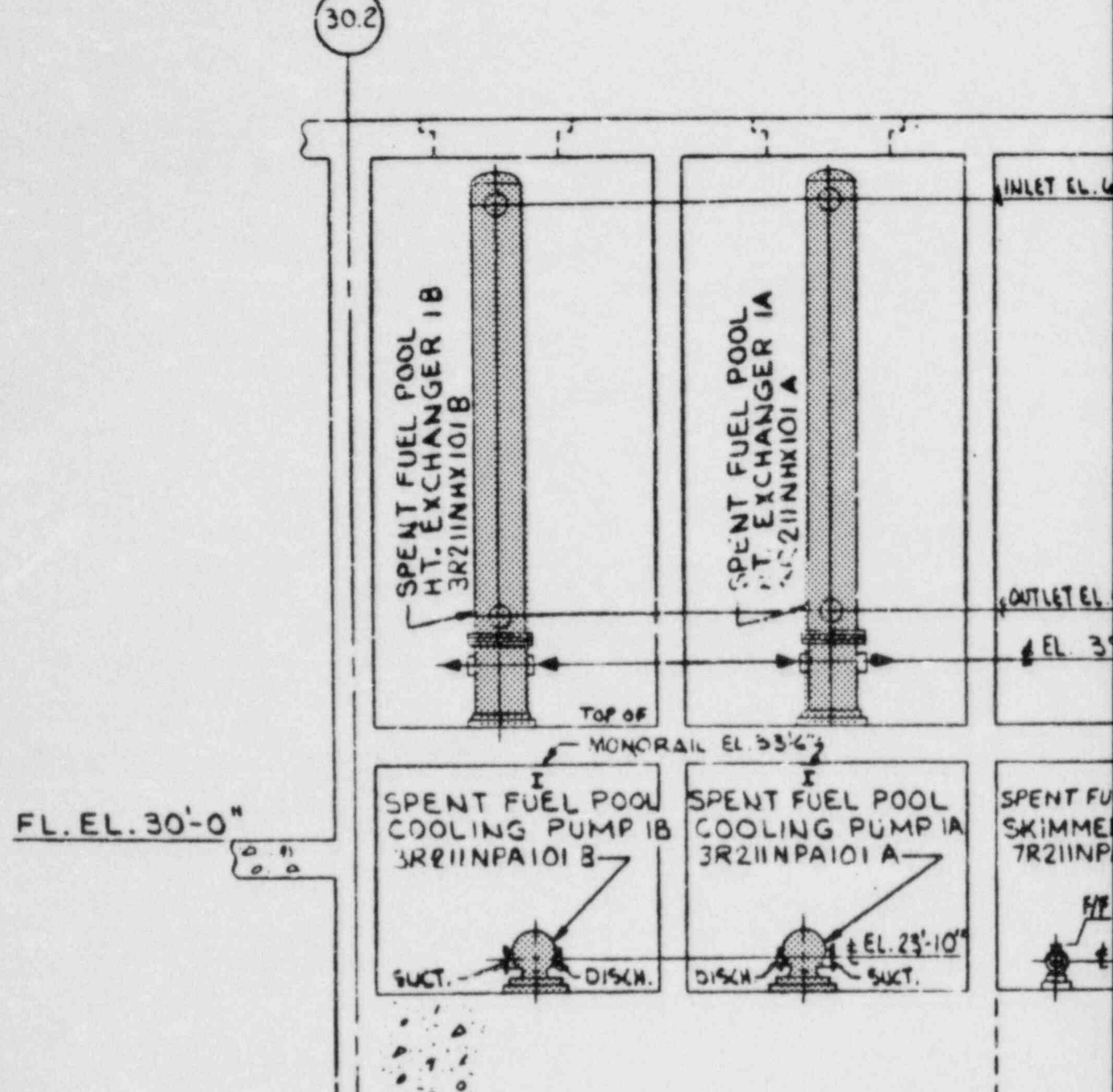


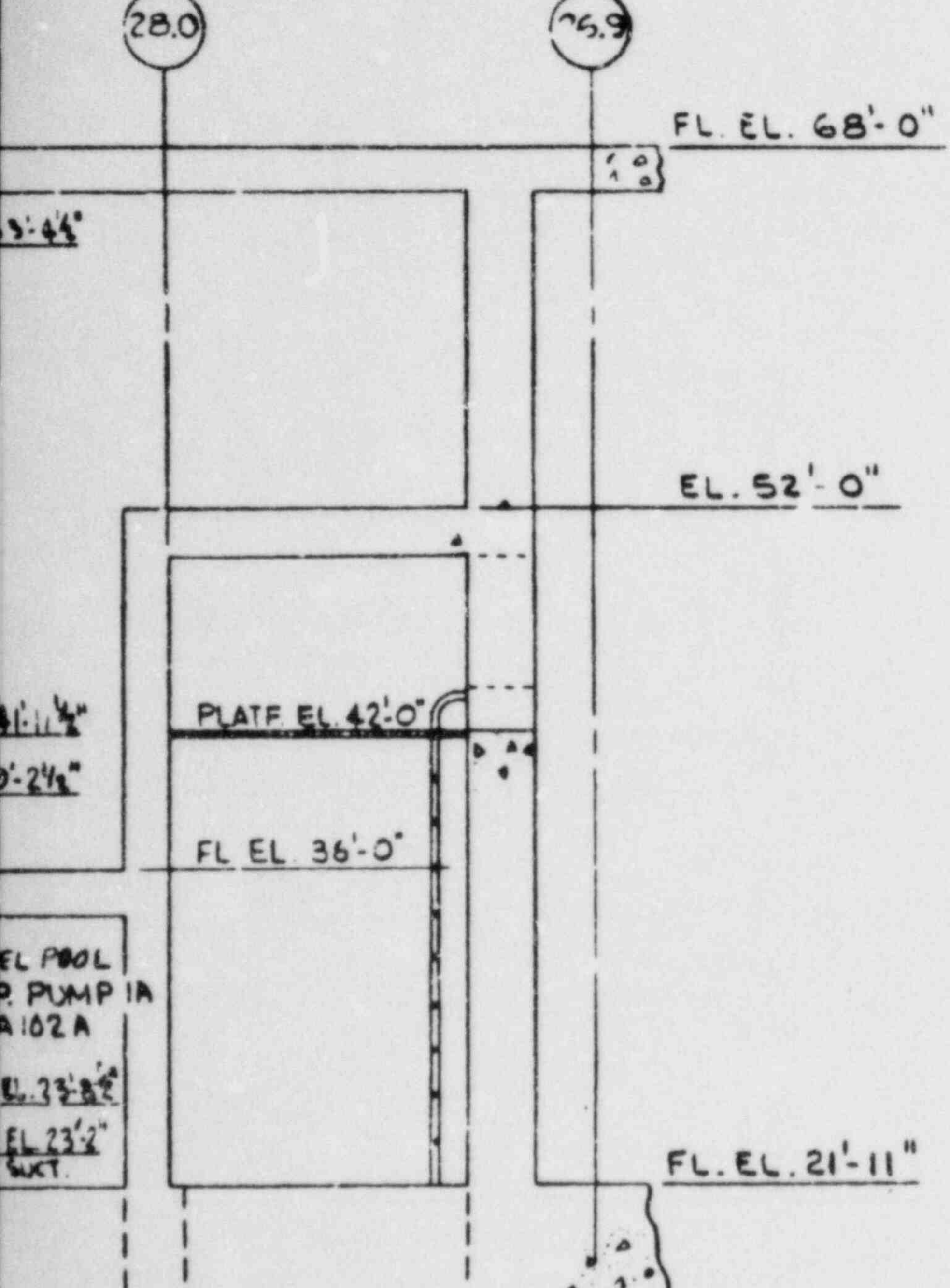
Figure 31
SPENT FUEL IN FHB,
EL. 68', AREA M

DWG. 6F-18-9-N-5060



SECTION "F-F"

REF. DWG. 9-N-5058
9-N-5059



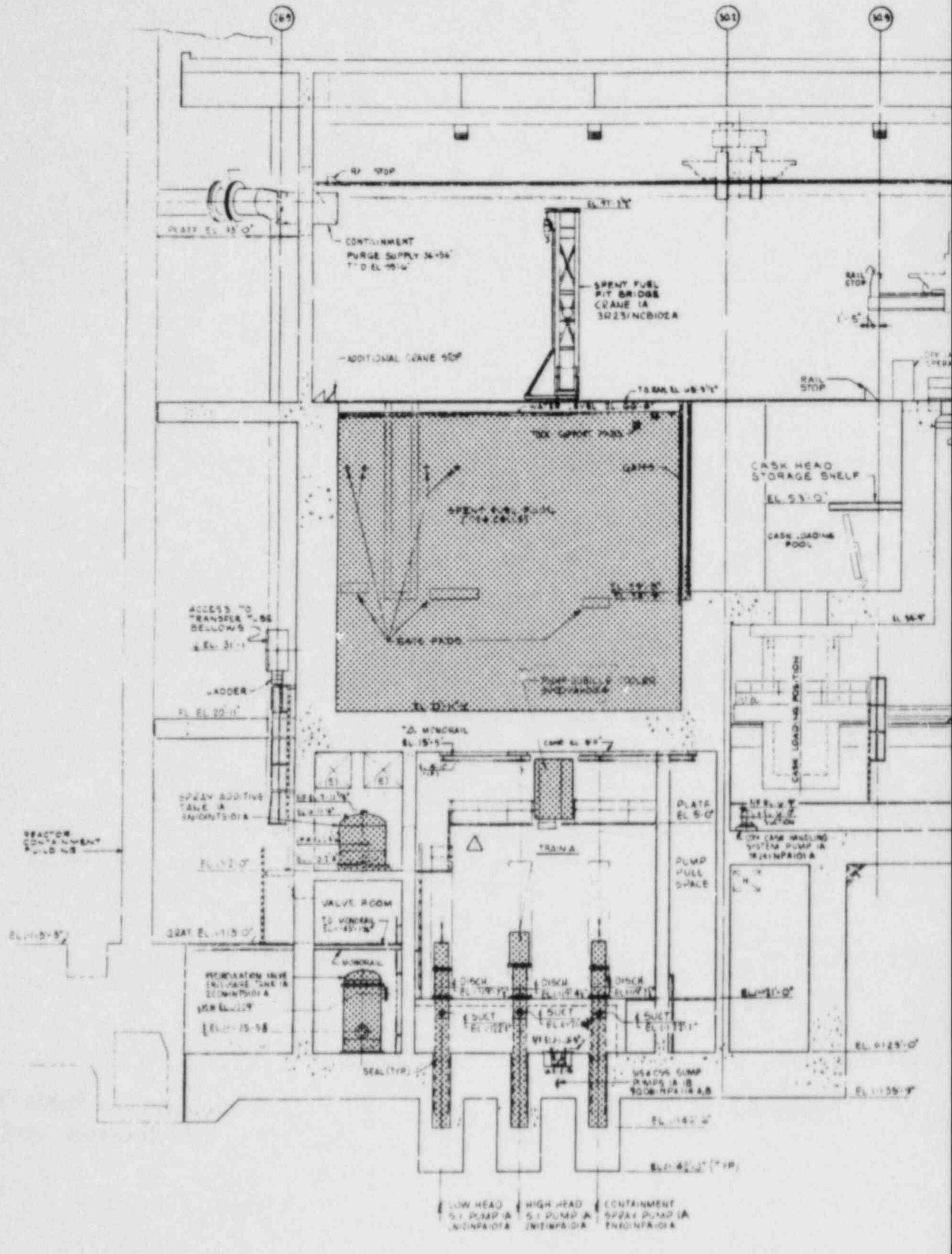
TI APERTURE CARD

Also Available On Aperture Card

Figure 32
SAFETY-RELATED EQUIPMENT, SPENT FUEL IN FHB, SECTION FF, AREA M

DWG. 6F-18-9-N-5062

8411010420 -39



SECTION "A-A"

REF. DWG 4-N-5057
4-N-5058
4-N-5059
4-N-5060

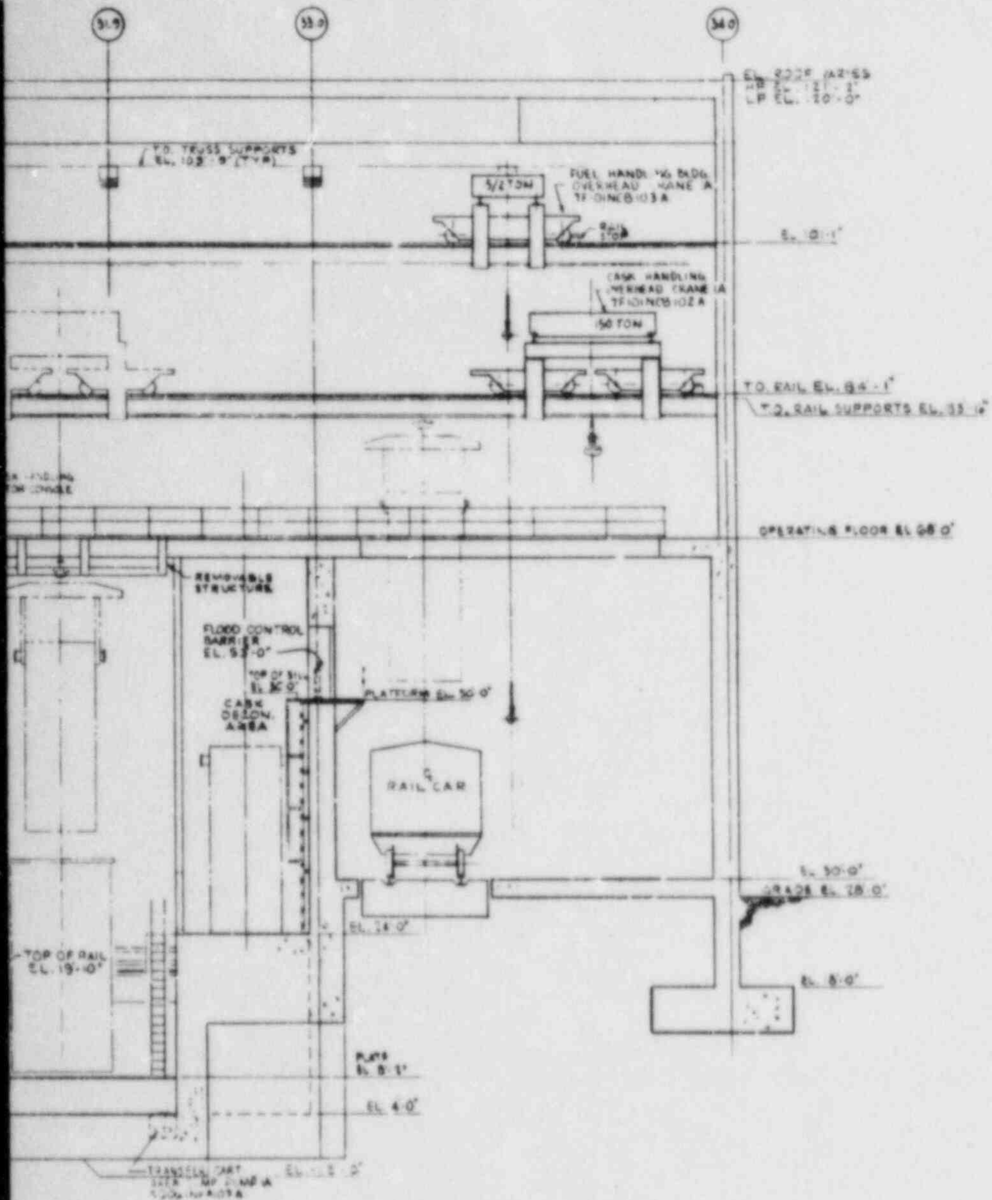
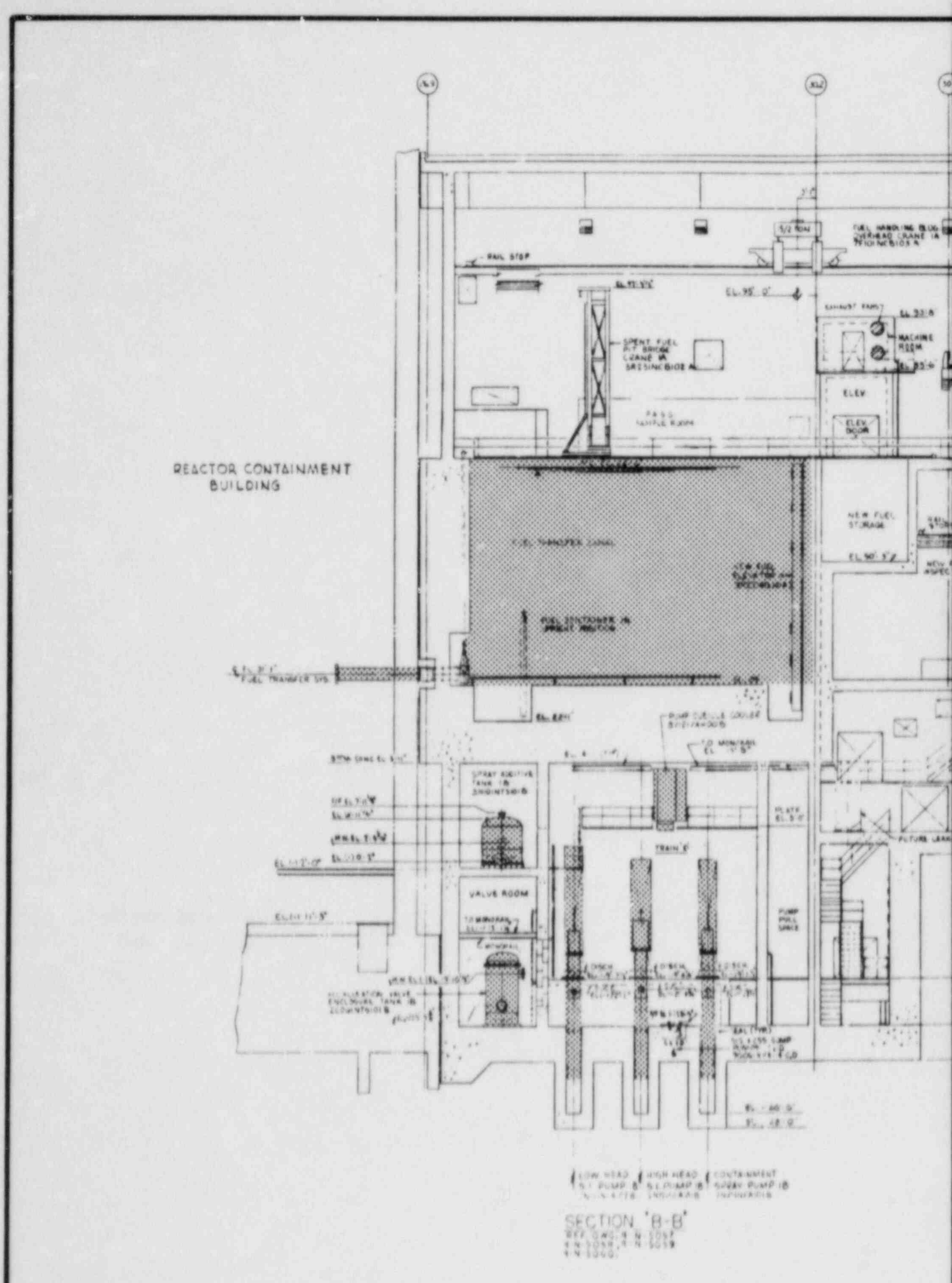
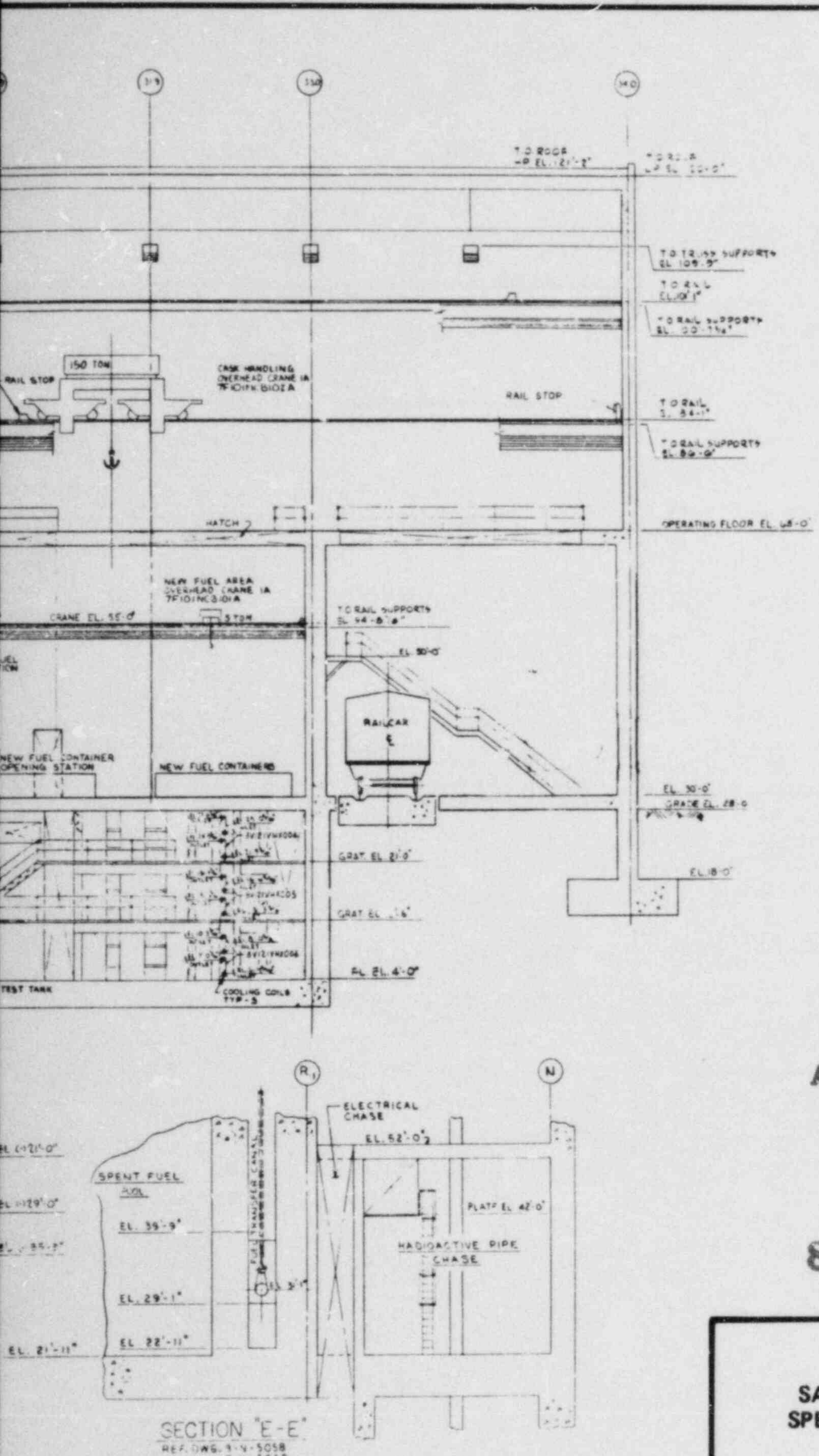


Figure 33
SAFETY-RELATED EQUIPMENT IN FHB, SECTION FF, AREA M

DWG. 6F-18-9-N-5062



REACTOR CONTAINMENT BUILDING
RAIL STOP
SPENT FUEL PIT BRIDGE CRANE
MACHINE ROOM
ELEV
ELEV DOOR
NEW FUEL STORAGE
FUEL TRANSFER CANAL
SPRAY ADDITIVE TANK 1B
VALVE ROOM
TRAIN 'B'
PUMP PULL SPACE
LOW HEAD S.I. PUMP 'B'
HIGH HEAD S.I. PUMP 'B'
CONTAINMENT SPRAY PUMP 1B
SECTION 'B-B'



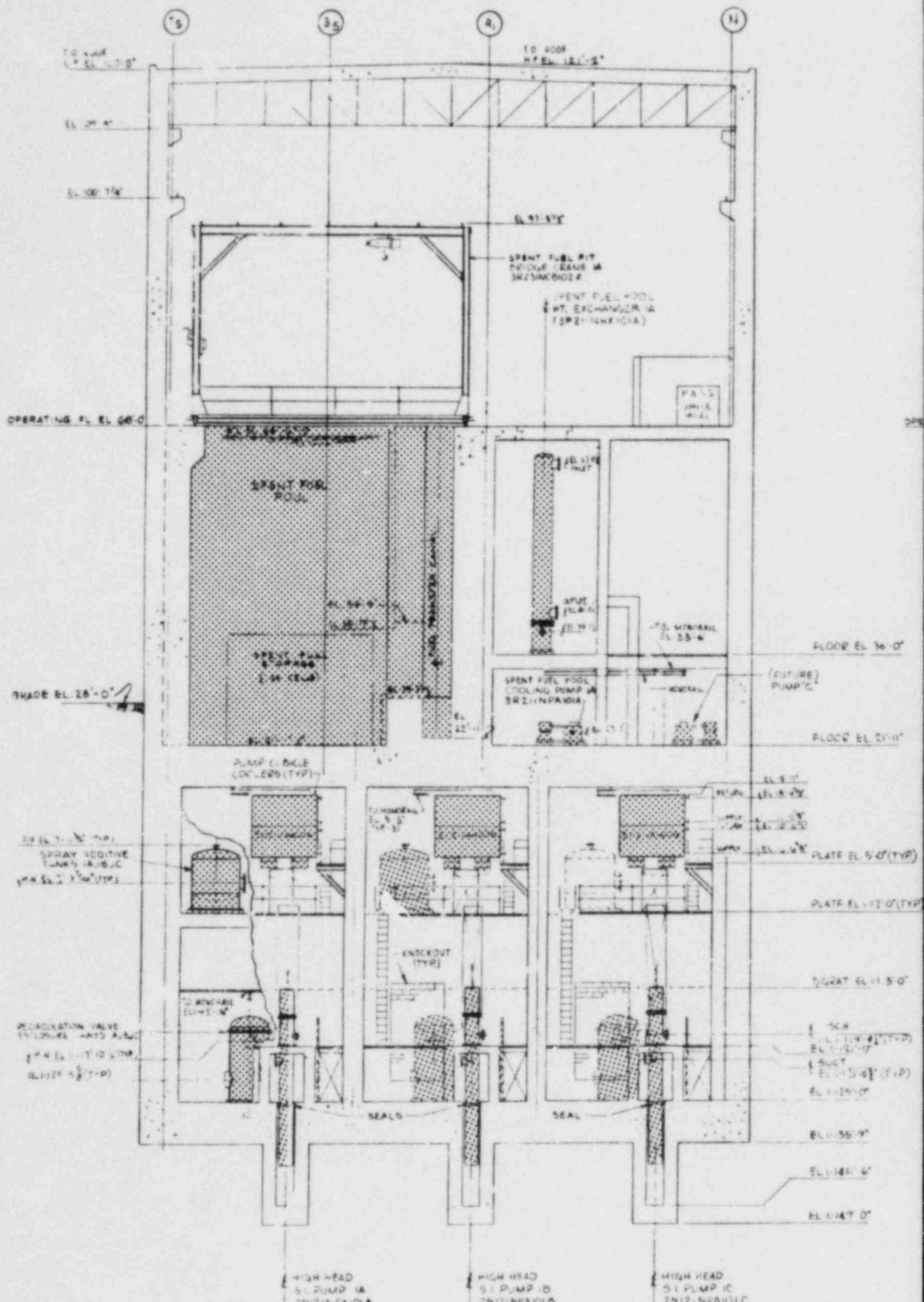
TI APERTURE CARD

Also Available On Aperture Card

8411010420 -41

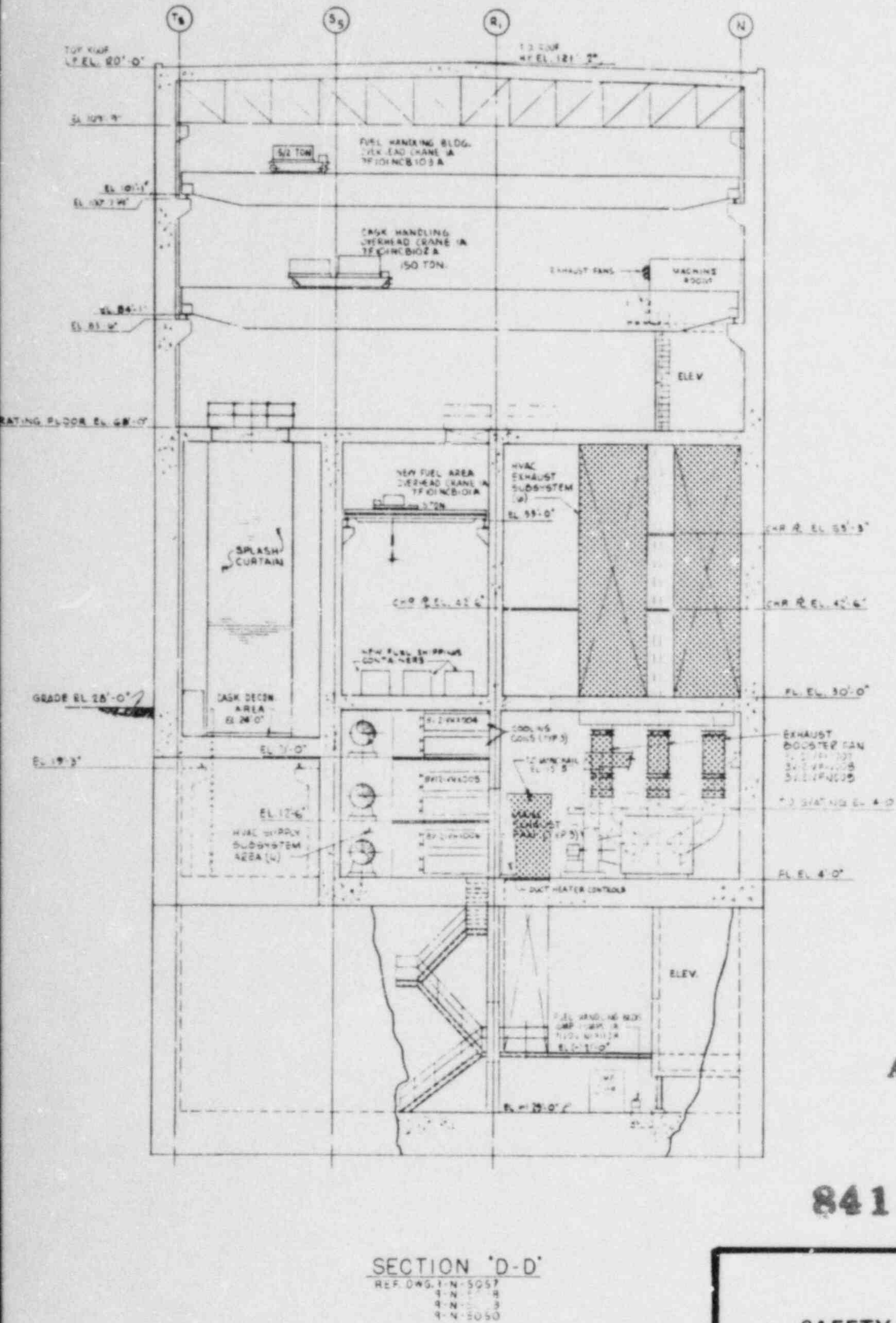
Figure 34
SAFETY-RELATED EQUIPMENT, SPENT FUEL IN FHB, SECTION BB, AREA M

DWG. 6F-18-9-N-5063



SECTION "C-C"

REF. DWG. 9-N-5057
9-N-5058
9-N-5059
9-N-5060



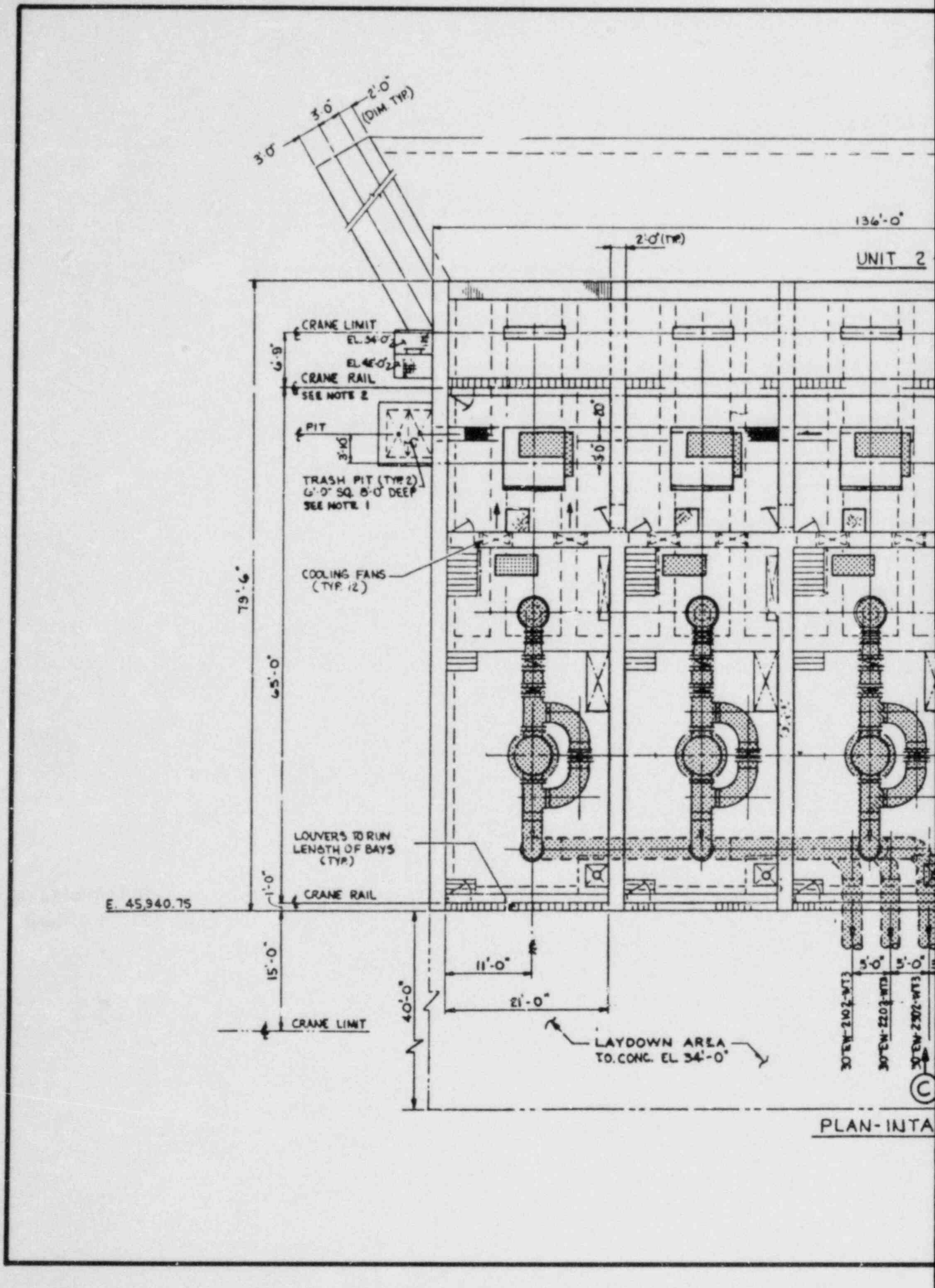
TI APERTURE CARD

Also Available On Aperture Card

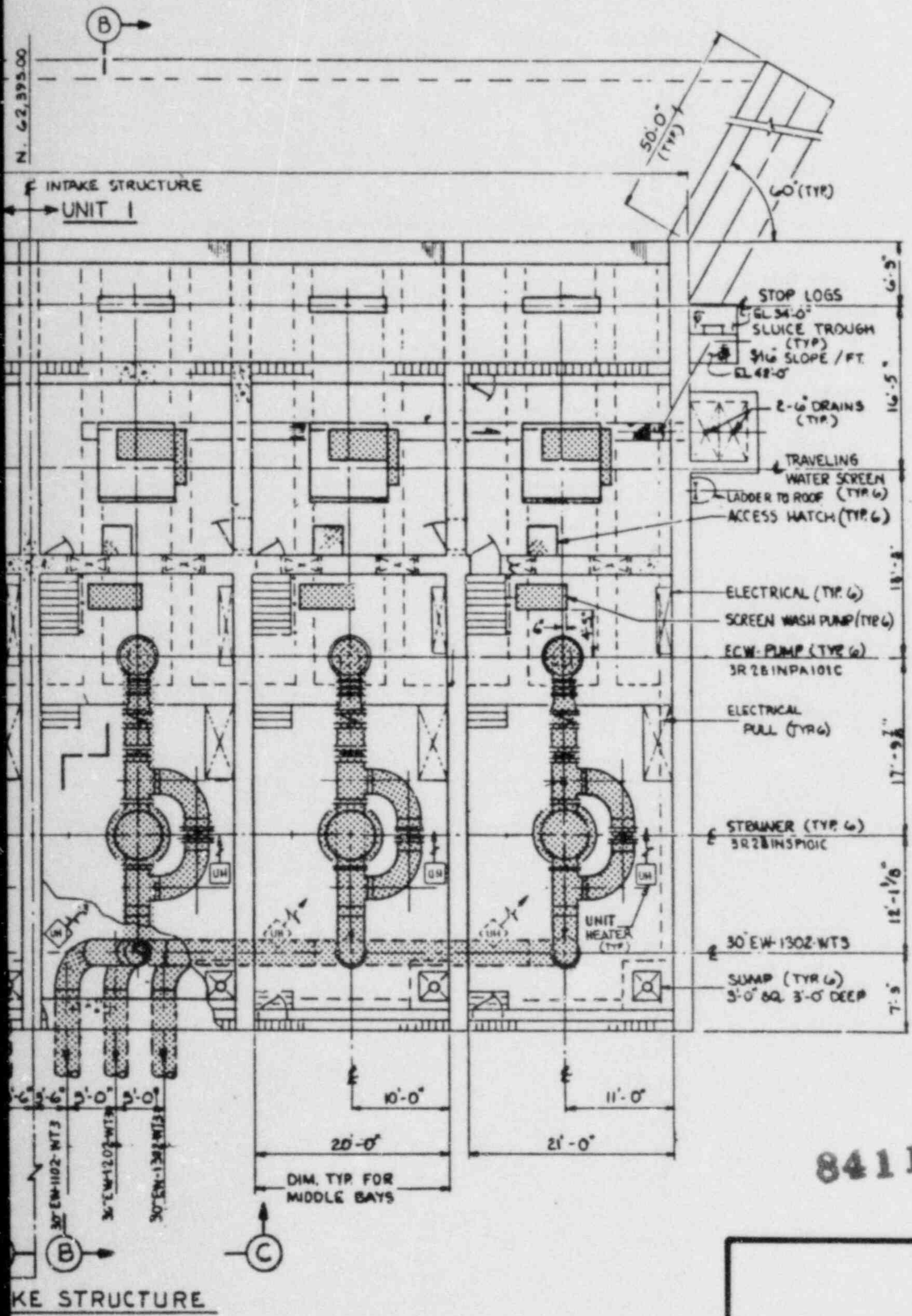
8411010420 -42

Figure 35
SAFETY-RELATED EQUIPMENT,
SPENT FUEL IN FHB, SECTION CC,
AREA M

DWG. 6F-18-9-N-5064



3'-0"
3'-0"
2'-0"
(DIM. TYP.)
136'-0"
2'-0"(TYP.)
UNIT 2
CRANE LIMIT
EL. 34'-0"
EL. 45'-0"
6'-9"
CRANE RAIL
SEE NOTE 2
PIT
3'-10"
20'
13'-0"
TRASH PIT (TYP. 2)
6'-0" SQ. 8'-0" DEEP
SEE NOTE 1
COOLING FANS
(TYP. 12)
79'-6"
65'-0"
LOUVERS TO RUN
LENGTH OF BAYS
(TYP.)
1'-0"
CRANE RAIL
E. 45,940.75
15'-0"
40'-0"
11'-0"
21'-0"
CRANE LIMIT
LAYDOWN AREA
TO. CONC. EL 34'-0"
5'-0"
5'-0"
30"EW-2102-WT3
30"EW-2202-WT3
30"EW-2302-WT3
C
PLAN-INTA



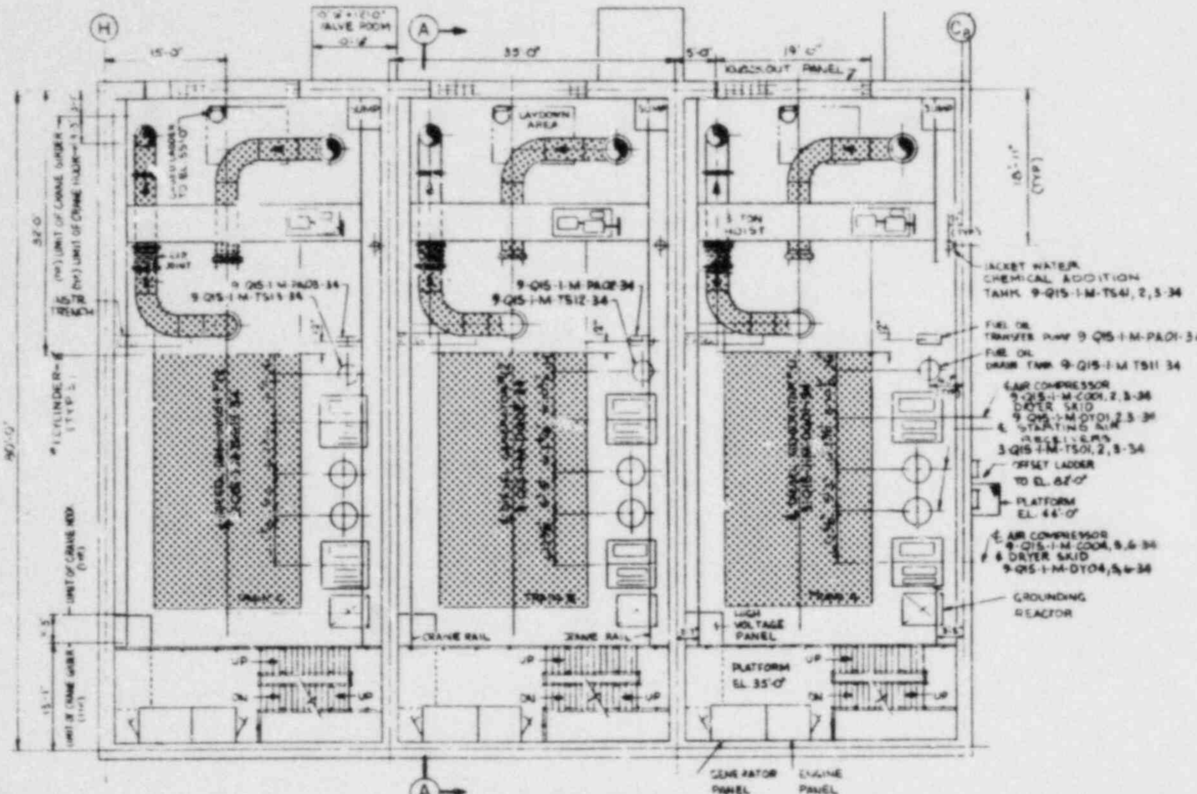
TI APERTURE CARD

Also Available On Aperture Card

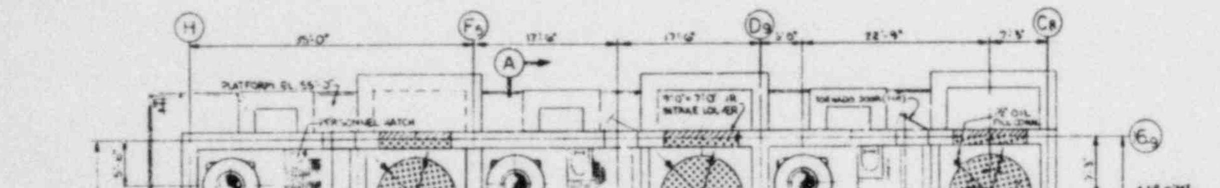
8411010420 - 43

Figure 36
SAFETY-RELATED EQUIPMENT IN ECW INTAKE STRUCTURE

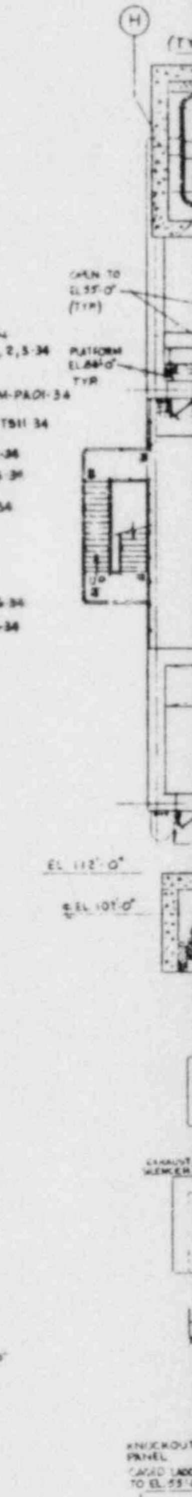
DWG. 6P-20-0-M-0031



PLAN AT EL. 25'-0"



PLAN AT EL. 55'-0"



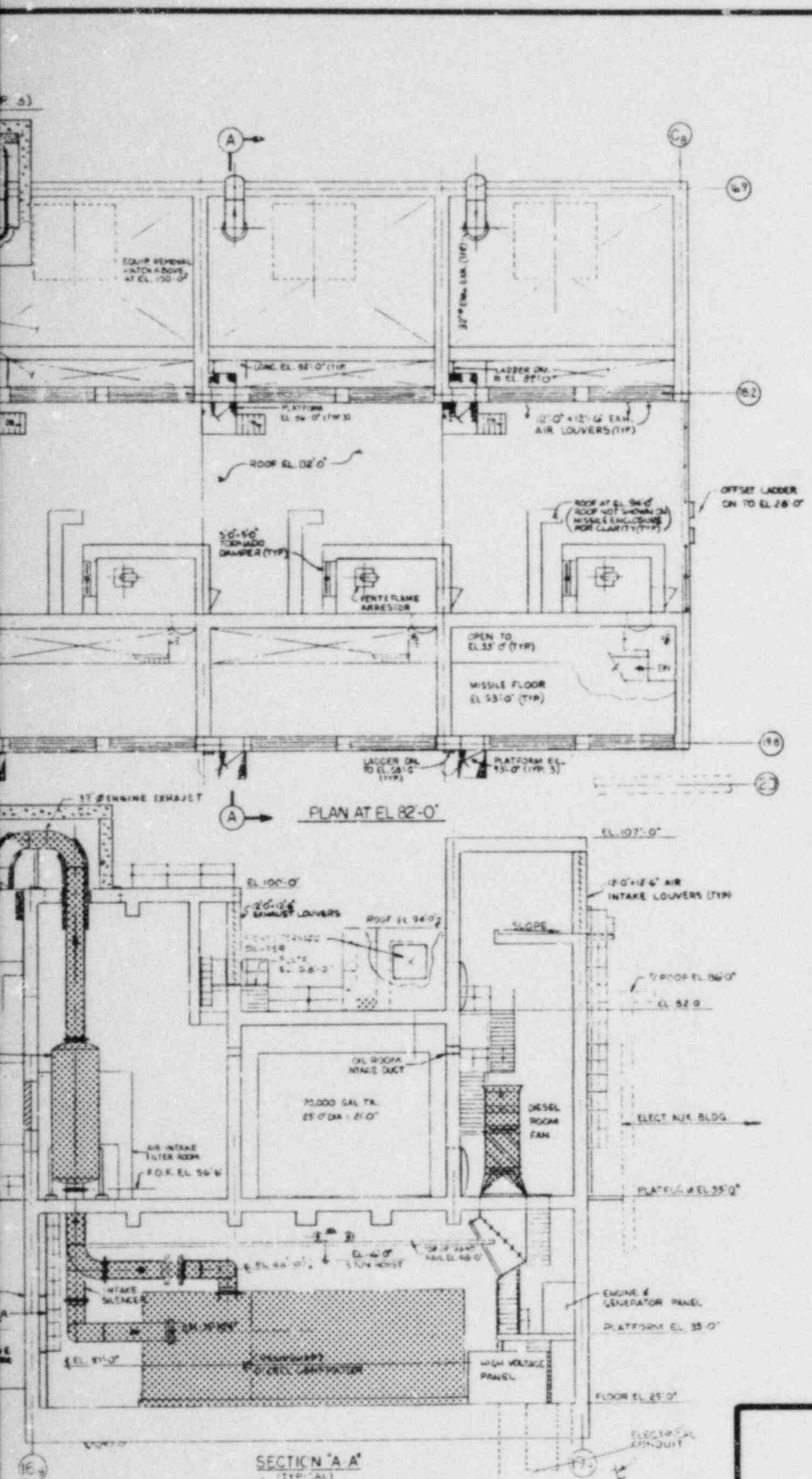
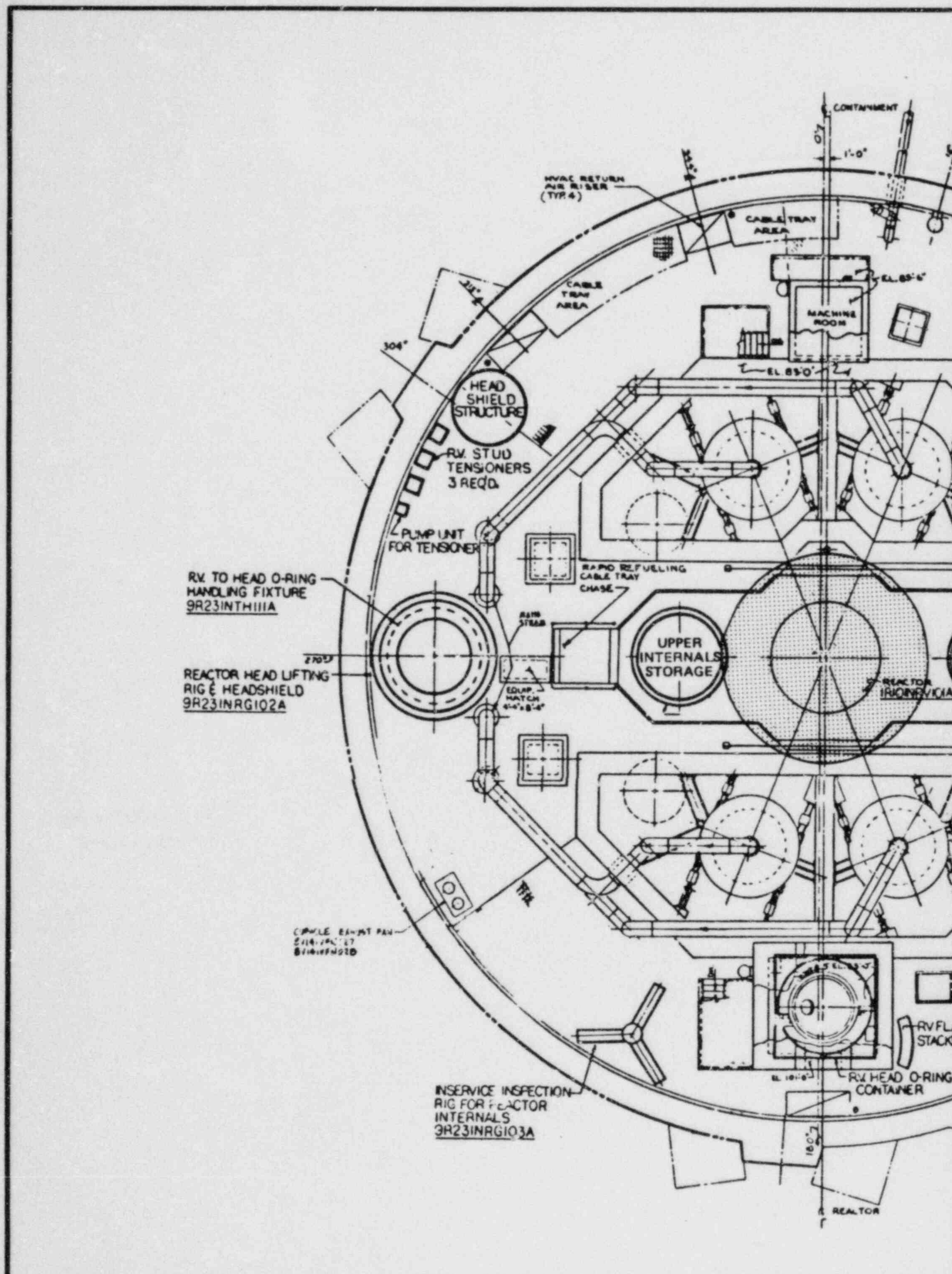
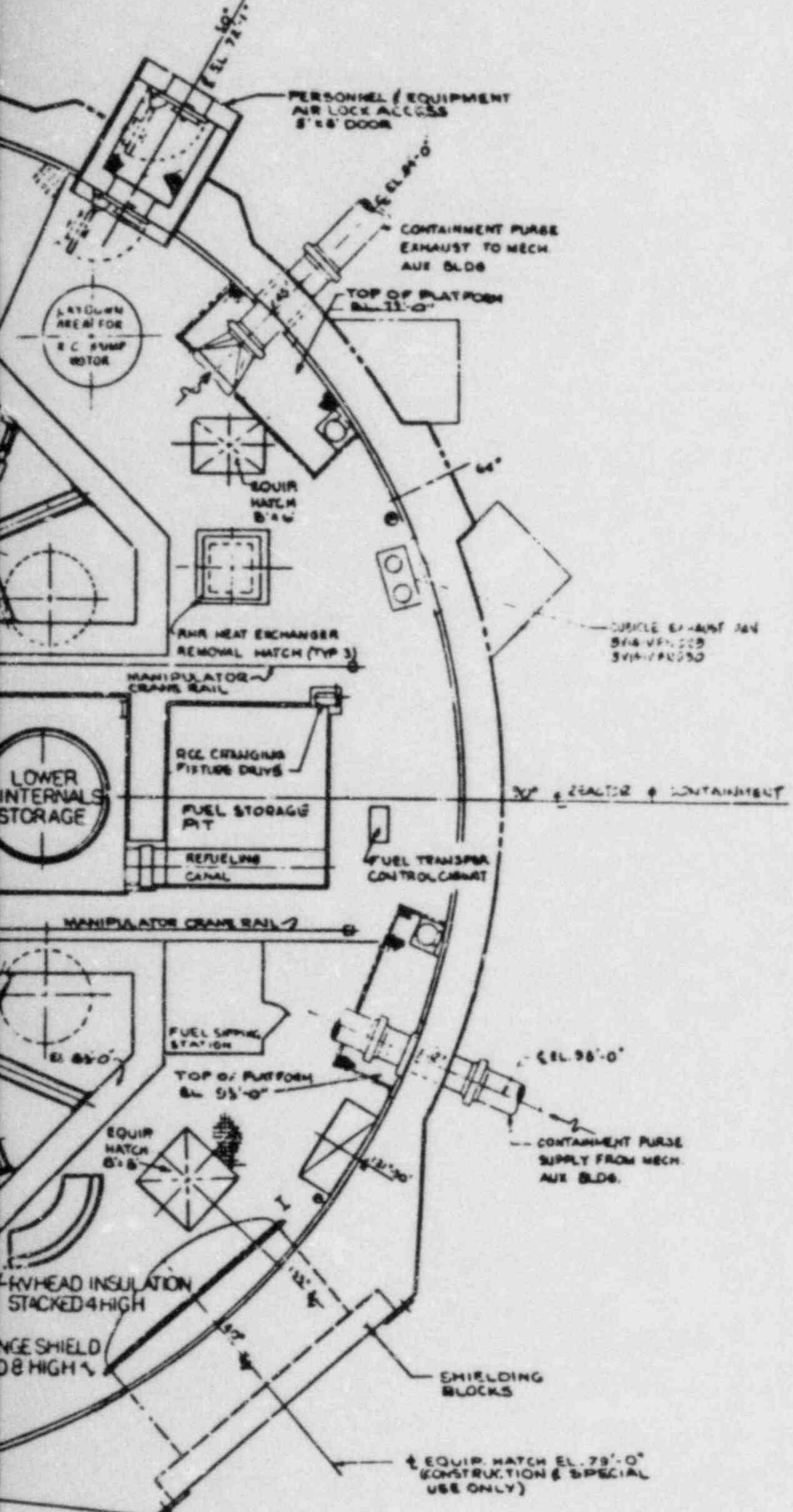


Figure 37
SAFETY-RELATED EQUIPMENT IN DGB

DWG. 6D-01-9-M-0020


CONTAINMENT
1'-0"
HVAC RETURN AIR RISER (TYP.4)
CABLE TRAY AREA
CABLE TRAY AREA
MACHINE ROOM
EL. 83'-6"
EL. 83'-0"
304°
HEAD SHIELD STRUCTURE
R.V. STUD TENSIONERS 3 REQ'D.
PUMP UNIT FOR TENSIONER
R.V. TO HEAD O-RING HANDLING FIXTURE 9R23INTH111A
270°
REACTOR HEAD LIFTING RIG & HEADSHIELD 9R23INRG102A
RAPID REFUELING CABLE TRAY CHASE
EQUIP. HATCH
UPPER INTERNALS STORAGE
R.V. HEAD O-RING CONTAINER
INSERVICE INSPECTION RIG FOR REACTOR INTERNALS 9R23INRG103A
180°



SOUTH TEXAS PROJECT
UNITS 1 & 2

Figure 38
REACTOR VESSEL INTERLOCK
RCB, EL. 68'

DWG. NO. 6C-18-8-N-5010

ATTACHMENT A

SAFE LOAD PATHS

A description of the safe load paths for loads identified in Table 1 is identified below:

Reactor Containment Polar Crane

Reactor Vessel Internals Lift Rig
(see Figure 1)

The internals lift rig is stored on the head laydown area. It is used to change the O-rings during any refueling operation. During non-rapid refueling the rig is used to lift the vessel internals to their storage areas. (Removal of vessel internals is covered in item 2). The rig is lifted vertically from the head laydown area and is moved clockwise, around the perimeter of the containment, to the fuel storage pit. It is then moved north to the vessel for O-ring removal or replacement. The same path is followed for return.

Lower Internals
(see Figure 2)

The internals lift rig together with the load cell linkage on the main hoist is used to move the lower internals. The load is moved a short distance directly south of the vessel to the lower internals storage area.

Upper Internals
(see Figure 2)

During non-rapid refueling the upper internals may be removed and moved to their storage stand (North of the vessel) using the main hoist, the load cell linkage and the internals lift rig.

Load Cell Linkage

The load cell linkage is used to monitor loads being lifted by the polar crane main hoist. It follows the path of the particular load being moved and no separate safe load path was developed.

Containment Fuel Pool Gate
(see Figure 3)

The polar crane is used to lift the fuel pool gate vertically 30 feet and place it in the storage area on the south side of the refueling cavity. For repair, the gate will be placed on the deck.

Reactor Coolant Pump Flywheel, Motor and Rotor
(see Figure 4)

The RCP components will be lifted by the main hoist during refueling operations. Some HVAC ducting will be removed to lift these components. Each load will be raised to clear the top of the secondary shield wall (elevation 83') and will be moved south past the fuel pool. From this point the load will be moved along the perimeter in:

a) a counter clockwise direction to the laydown area adjacent to the personnel hatch, or
b) a clockwise direction to the equipment hatch.

The components are returned by the same path.

Inservice Inspection Rig
(see Figure 3)

The inservice inspection rig will be used three times in a ten year period. Some of its components will be leased, brought in through the equipment hatch, and transported counter clockwise around containment to an assembly/storage area near the pressurizer. This move is completed prior to head removal. The main hoist is used. The assembled rig is moved clockwise to a point before the head laydown area, lifted to clear elevation 76', moved along the top of the secondary shield wall until even with the vessel. The same path is followed for return.

RHR Pump Components
(see Figures 5 and 6)

The two pumps on the north side of the building will be moved by cart (elevation - 11') to an area accessible by polar crane through the 8' X 6' equipment hatch. All pump components will be lifted through the hatch to the 68' level and transported counter-clockwise to the personnel hatch.

RHR Heat Exchanger Components
(see Figure 6)

These components are lifted by the main hoist through the heat exchanger removal hatches at level 68', moved to perimeter of containment, and transported in a clockwise direction to the equipment hatch.

Studs, Nuts, Washers and Stud Tensioners
(see Figure 8)

The stud, nut, and washer carriers are moved from their laydown area along the wall of the north side of containment to a point near the head laydown area (the internals lift rig will be on the head laydown area), raised to clear main steam piping and moved south to the cavity floor, as close as possible to the flange. Studs, nuts, and washers are placed 12 to a carrier (36 total) and moved to the operating deck.

The stud tensioners follow a similar path from the east side of the head laydown area.

Hatch Covers
(see Figure 1)

Hatch covers are lifted only enough to clear the hatch and are placed on the deck adjacent to the hatch. The Northeast hatch will be moved North over the main steam line since the area closest to it is to be used for the reactor cavity filtration system.

RCB Monorails

Fan
(see Figures 17)

The fan follows the monorail path to the 6 X 6 hatch.

RHR Pump Components
(See Figure 5)

RHR pump components follow the monorail path and are placed on carts.

IVC Monorails

AFW Pump Components
(See Figure 8a, 8c)

These components are lifted by monorails, transported by cart (el. 10') to the area below the equipment removal hatch. They are then lifted by monorail (roof) and moved to the equipment laydown area.

MSIV Components, Main Steam Safety Valve Components
(See Figure 8b, 8c)

These components are lifted by monorail (el. 58') and moved under the equipment hatches. They are then lifted by monorail (roof) and transported to the equipment laydown area.

FWIV Components
(Figure 8c)

These components are removed by special devices and placed under the equipment hatch for lift by monorail (roof).

MEAB Monorails

CCW Pump Components
(see Figure 9, 10, 11)

These components are lifted by monorails and then transported (El 10') by cart to area below equipment hatch in Area L, elevation 60'. They are then lifted by monorail (figure 10) and moved (figures 10 & 11) to the equipment removal doors in Area K, elevation 60'.

Charging Pump Components and Supplementary Coolers
(see Figures 9, 10, 11)

These components are lifted by monorails, placed on carts and follow the same path as CCW components.

Hatch Covers - Boric Acid Tanks
(see Figure 12)

The hatch covers will be raised to clear the hatch and placed adjacent to the hatch

Hatch Covers
(see Figure 10)

The Demineralizer hatch covers are lifted to clear the hatch and placed next to the hatch. Hatches closest to grid line #28 will be moved to the laydown area for the adjacent hatch. This will provide clearance for the access doors.

The filter hatch covers will be removed and placed on top of another hatch where they will not restrict monorail movement.

FHB Monorails

Containment Spray Pump Components
Safety Injection Pump Components
(see Figure 13)

These components are moved by the indicated monorails to an area below the removable hatch. The components can then be accessed by the FHB overhead crane.

FHB Overhead Crane

Spent Fuel Pool (SFP) Heat Exchangers
Low Head Safety Injection Pump Components
High Head Safety Injection Pump Components
Containment Spray Pump Components
(See Figure 13a)

These components are lifted through the removable hatch to the elevation 68' operating floor and moved to the railcar area where they can be laid down or removed for repair.

SFP Gates
(See Figure 13b)

The gates will be lifted, moved along the perimeter of the pool and stored in the storage slots located on the sides of the pool, or laid on the operating deck for repair.

Hatches
(See Figure 13b)

Hatches will be lifted and moved to the laydown area as indicated.

Shipping Cask Head
(See Figure 13c)

The head will be moved from the railcar area to the cask loading pool and laid down on a storage shelf.

New Fuel Containers
(See Figure 13c)

New Fuel containers are lifted from the railcar area and may be moved to either the 68' operating level or into the New Fuel Handling Area on the 30' level.

ECW Intake Grantry Crane

Essential Cooling Water Components
(see Figure 14)

These loads will be moved as indicated to the laydown area at the end of the structure.

Diesel Generator Building Overhead Crane

Miscellaneous Loads
(see Figure 15)

Small loads on the lower level of the DGB will be moved to the north end of the building to an area under the equipment hatch. Large loads will removed through a knockout panel at the north end of the building.

ATTACHMENT B

SUMMARY OF RESULTS OF STRESS CALCULATIONS FOR LIFTING DEVICES FOR STP

Tables B-1 and B-2 summarize the stresses on each of the parts which make up the reactor vessel head lift rig assembly, load cell and load cell linkage and the internals lift rig. In general, the tensile and shear stresses, meet the design criteria of section 3.2.1.1 of ANSI N14.6, requiring application of stress design factors of three and five with accompanying allowable stress limits of yield and ultimate strength, respectively. In addition, the tensile and shear stresses met the requirement of not exceeding the allowables of the AISC(5) code. Additional details are provided below.

1.1 DISCUSSION OF RESULTS

1.1.1 Application of ANSI N14.6 Criteria

Both the reactor vessel head lift rig assembly, internals lift rig, load cell and linkage, were originally designed to the requirement that all the resulting stresses in the load carrying members, when subjected to the total combined lifting weight, should not exceed the allowable stresses specified in the AISC(5) code.

The design criteria of section 3.2.1.1 of ANSI N14.6, requiring application of stress design factors of three and five with the accompanying allowable stresses, are to be used for evaluating load bearing members of a special lifting device when subjected to loading conditions resulting in shear or tensile stresses. Reference 11 discusses compliance with ANSI N14.6 and AISC criteria in greater detail.

1.1.2 Parts Exceeding the 3W Criterion

The rod housing (Table B-2 Item 14) of the reactor vessel internals lift rig does not meet the ANSI N14.6 criteria of 3W when analyzed for tensile stresses. This stress (32,400 psi) exceeds the minimum allowable yield stress (30,000 psi). However, since the actual mechanical properties for this item list the yield strength as 41,500 psi and the ultimate strength criterion of 5W is met, this item is considered acceptable.

The guide sleeve (Table B-2 Item 15) of the reactor vessel internals lift rig does not meet the ANSI N14.6 criteria of 3W when analyzed for tensile stresses. This stress (31,800 psi) exceeds the allowable yield stress (30,000 psi). However, since the actual properties for this item list the yield strength as 35,000 psi and the ultimate strength criteria of 5W is met, this item is considered acceptable.

2.0 CONCLUSION

Application of the ANSI N14.6 stress design criteria to these special lifting devices results in acceptable stress limits for tensile and shear stresses.

3.0 REFERENCES

1. George, H., Control of Heavy Loads at Nuclear Power Plants Resolution of Generic Technical Activity A-36, NUREG 0612, July, 1980.

2. ANSI N14.6-1978, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500kg) or More for Nuclear Material," American National Standards Institute, New York, 1978.

3. WCAP-9942, Stress Report 4XLR Integrated Head Package CRDM Seismic Support Assembly for Houston Lighting and Power, South Texas Units 1 and 2.

References (Cont'd)

4. ANSI N18.2 - Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plant.

5. Manual of Steel Construction, Seventh Edition, American Institute of Steel Construction.

6. Westinghouse Drawing 7011747 - Upper Head Package General Assembly.

7. Westinghouse Drawing J?17E10 - TGX/THX South Texas Internals Lifting Rig and O-Ring Change Fixture - General Assembly.

8. Lin, C. W., "Approximate Evaluation of Dynamic Load Factors for Certain Types of Load Factors for Certain Types of Loading," ASME Paper 70-WA/NE-2.

9. Biggs, J. M., Introduction to Structural Dynamics, McGraw-Hill, New York, 1964.

10. Gwinn, Jr., J. T., "Stop Over-Designing for Impact Loads," Machine Design, 33, pp. 105-113 (1961).

11. WCAP-10215, Evaluation of Acceptability of the Reactor Vessel Head Lift Rig Assembly, Reactor Vessel Internals Lift Rig, Load Cell, and Load Cell Linkage to the Requirements of NUREG 0612 for Houston Lighting & Power, South Texas Units 1 and 2.

TABLE B-1

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y [c]	S_{ult} [d]
1	Lifting Block ASTM A508 Class 4	Tension @ 8" Dia. Hole	6.5	19.5	32.5	85	105
		Shear @ 8" Dia. Hole	6.5	19.5	32.5		
2	Lug ASTM A508	Tension @ 5" Dia. Hole	5.5	16.5	27.5	85	105
		Shear @ 5" Dia. Hole	5.5	16.5	27.5		
		Tension @ Weld	1.0	3.0	5.0		
		Shear @ Weld	1.9	5.7	9.5		

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y [c]	S_{ult} [d]
3	Upper Pin ASTM A434 Class BD AISI 4340	Shear	4.9	14.7	24.5	105	135
4	Upper Clevis ASTM A668 Class M AISI 4340	Tension @ 5" Dia. Hole	6.4	19.2	32.0	110	135
		Shear Tear Out	6.4	19.2	32.0		
		Thread Shear	4.2	12.6	21.0		

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
5	Lifting Leg	Tension @ Threads	10.8	32.4	54.0	85	110
	ASTM A434	Thread Shear	4.2	12.6	21.0		
	Class BC						
	AISI 4340						
6	Lower Clevis	Thread Shear	4.2	12.6	21.0	110	135
	ASTM A688	Shear Tear Out	7.1	23.1	38.5		
	Class M	Tension @ Thread Relief	6.4	19.2	32.0		
	AISI 4340						

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value $W^{(b)}$	3W	5W	Material Allowable (ksi) S_y (c)	S_{ult} (d)
7	Lower Pin ASTM A434 Class BD AISI 4340	Shear	4.9	14.7	24.5	105	135
8	Lift Lug ASTM A508 Class 2	Shear @ Pin Hole	3.6	10.8	18.0	50	80
		Tension @ Base of Lug Ear	2.7	8.1	13.5		
		Shear @ Base of Lug Ear	1.4	4.2	7.0		
		Shear @ Lug Ledge	3.6	10.8	18.0		
		Tension @ Base of Lug Ear	6.2	18.6	31.0		
		Shear in Top Weld	5.1	15.3	25.5		
		Shear in Bottom Weld	7.1	21.3	35.5		

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
9	Missile	Axial @ Lug Edge	0.3	0.9	1.5	50	80
	Shield	Shearing @ Lug Edge	2.1	6.3	10.5		
	ASME	Shear @ Lift Nut	0.9	2.7	4.5		
	SA A533						
	Type B						
	Class 1						
10	Lift Nuts	Shear	3.1	9.3	15.5	50	80
	ASME	Thread Shear	2.6	7.5	12.5		
	SA A533						
	Type B						
	Class 1						

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
11	Lift Rods	Tension	7.2	21.6	36.0	85	110
	ASTM A434	Shear @ End	12.0	36.0	60.0		
	Class BC	Thread Shear	2.4	7.2	12.0		
	AISI 4340						
12	Crank Handle	Thread Shear	1.8	8.4	9.0	30	75
	Nut						
	ASME SA-479						
	Type 304						

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-1 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL HEAD LIFT RIG

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
13	Upper Internals Lift Rod ASME SA-479 Type 304	Tension @ 3.50" Dia. Section	4.9	14.7	24.5	30	75
		Thread Shear On ACME Thd.	1.8	5.4	9.0		
		Thread Shear On "V" THD	4.9	14.7	24.5		
		Tension @ 3.6" Dia. Section	9.6	28.8	48.0		
14	Nut ASME SA-479 Type 304	Thread Shear	4.9	14.7	24.5	30	75

(a) See figure B-1 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y [c]	S_{ult} [d]
1	Lifting Block ASTM A350 Grade LF2	Tensile Stress @ 8" Dia. Hole	3.6	10.8	18.0	36	70
		Shear Tear-out @ 8" Dia. Hole	3.6	10.8	18.0		
		Tensile Stress @ Central Cylinder	5.8	17.4	29.0		

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
2	Lifting Block Lug ASTM A516 Grade 70	Tensile Stress @ 4.015" Dia. Hole	4.0	12.0	20.0	38	70
		Tension @ Lug Root Weld	1.2	3.6	6.0		
		Shear Tear-out @ 4.015" Dia. Hole	4.0	12.0	20.0		
		Shear @ Lug Root Weld	1.9	5.7	9.5		

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value $W^{(b)}$	3W	5W	Material Allowable (ksi) S_y (c)	S_{ult} (d)
3	Upper Clevis Pin Shear ASTM A564 Type 630 17-4 pH H1150		4.5	13.6	22.5	105	135
4	Upper Clevis ASTM A471 Class 3	Tension @ 4.015" Dia. Hole	4.5	13.5	22.5	95	110
		Shear Tear-out @ 4.015" Dia. Hole	4.5	13.5	22.5		
		Thread Shear	4.7	14.1	23.5		

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
5	Sling Rod	Thread Shear	4.7	14.1	23.5	85 or 46*	110 or 67**
	ASTM A434	Tension @ Thread Relief	10.2	30.6	51.0		
	Class BC	Tension @ Thread	10.8	32.4	54.0		
	AISI 4340 (or)						
	ASTM A588						
6	Lower	Tension @ 4.015"	4.5	13.5	22.5	95	110
	Clevis	Dia. Hole					
	ASTM A471	Thread Shear	4.7	14.1	23.5		
	Class 3						

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

* 85 for AISI 4340, 46 for ASTM A588

** 110 for AISI 4340, 67 for ASTM A588

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y [c]	S_{ult} [d]
7	Lower Clevis Pin ASTM A564 Type 630 17-4 pH H 1150	Shear	9.0	27.0	45.0	95	110
8	Spreader Lug ASTM A516 Grade 70	Tensile Stress	1.9	5.7	9.5	38	70

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y [c]	S_{ult} [d]
9	Spreader Arm ASTM A500 Grade B	Nominal Compression Stress	3.1	9.3	15.5	F_a=23* 46	58
10	Leg Lug ASTM A516 Grade 70	Tensile Stress @ 4.015" Dia. Hole	3.2	9.6	16	38	70

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

* F_a = allowable compression stress to prevent buckling in absense of bending moment

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value			Material Allowable (ksi)	
			W[b]	3W	5W	S_y (c)	S_{ult} (d)
11	Leg Channels ASTM A36	Tensile Stress	7.1	21.3	35.5	36	58
12	Mounting Block ASTM A350 LF1	Shear in Welds	1.8	5.4	9.0	30 18*	60
13	Load Nut ASTM A276 Type 304 Cond. A	Thread Shear	5.1	15.3	25.5	30	75

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

* Stress limit for fillet welds from ASME Boiler and Pressure Vessel Code, Section III, Division 1 - Subsection NF 1980 Edition, Table NF-3292.1-1, page 43.

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value $W^{(b)}$	3W	5W	Material Allowable (ksi) S_y (c)	S_{ult} (d)
14	Rod Housing	Tension @ Thread Relief	10.8	32.4	54.0	30	75
	ASTM A276	Thread Shear on Upper	5.1	15.3	25.5		
	Type 304	Threads					
	Cond. A	Lower Threads Shear	4.5	13.5	22.5	37*	81*
15	Guide Sleeve	Thread Shear	4.5	13.5	22.5	30	75
	ASTM A276	Tension @ Thread Relief	10.6	31.8	53.0	35*	81*
	Type 304						
	Cond. A						

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

* These are actual S_y and S_{ult} taken from material certifications.

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y [c]	S_{ult} [d]
16	Rotolock Stud ASTM A564 Type 630 17-4 pH H 1100	Tensile Stress @ Cross-Section	19.0	57.0	95.0	115	150
		Shear Stress on Land Root	10.7	32.1	33.5		
17	Clevis Pin (Load Sensing) ASTM A564 Type XM12	Shear	7.3	21.9	36.5	105	135

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

TABLE B-2 (Cont'd)

SUMMARY OF RESULTS

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

Item[a] No.	Part Name And Material	Designation	Calculated Stresses (ksi)[e] Value W[b]	3W	5W	Material Allowable (ksi) S_y (c)	S_{ult} (d)
18	Side Plates	Tension @ Upper Hole	6.6	19.8	33.0	100	115
	ASTM A517	Tension @ Lower Hole	6.0	18.0	30.0		
	Grade F	Shear Tear-out @ Upper Hole	6.6	19.8	33.0		
		Shear Tear-out @ Lower Hole	12.6	37.8	63.0		
19	Removable Pin	Shear	6.9	20.7	34.5	105	135
	ASTM A564						
	Type 630						
	17-4 pH						
	H 1150						

(a) See figure B-2 for location of item number and section

(b) W is the total static weight per unit area of the component and the lifting device

(c) S_y is the yield strength of the material (ksi)

(d) S_{ult} is the ultimate strength of the material (ksi)

(e) Stresses calculated are those required by ANSI N14.6

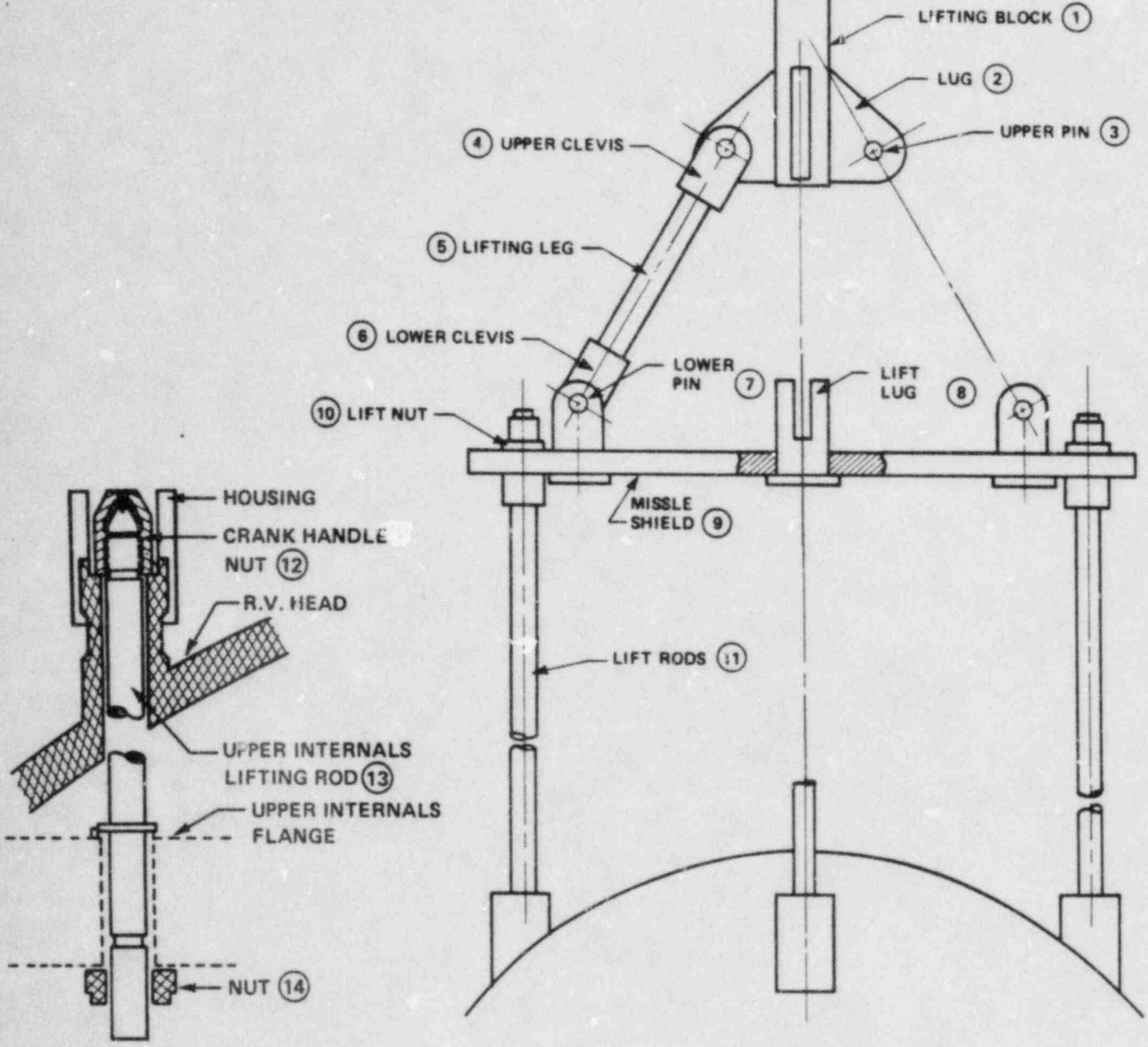


Figure B-1
INTEGRATED HEAD PACKAGE
(LIFT RIG PORTION)

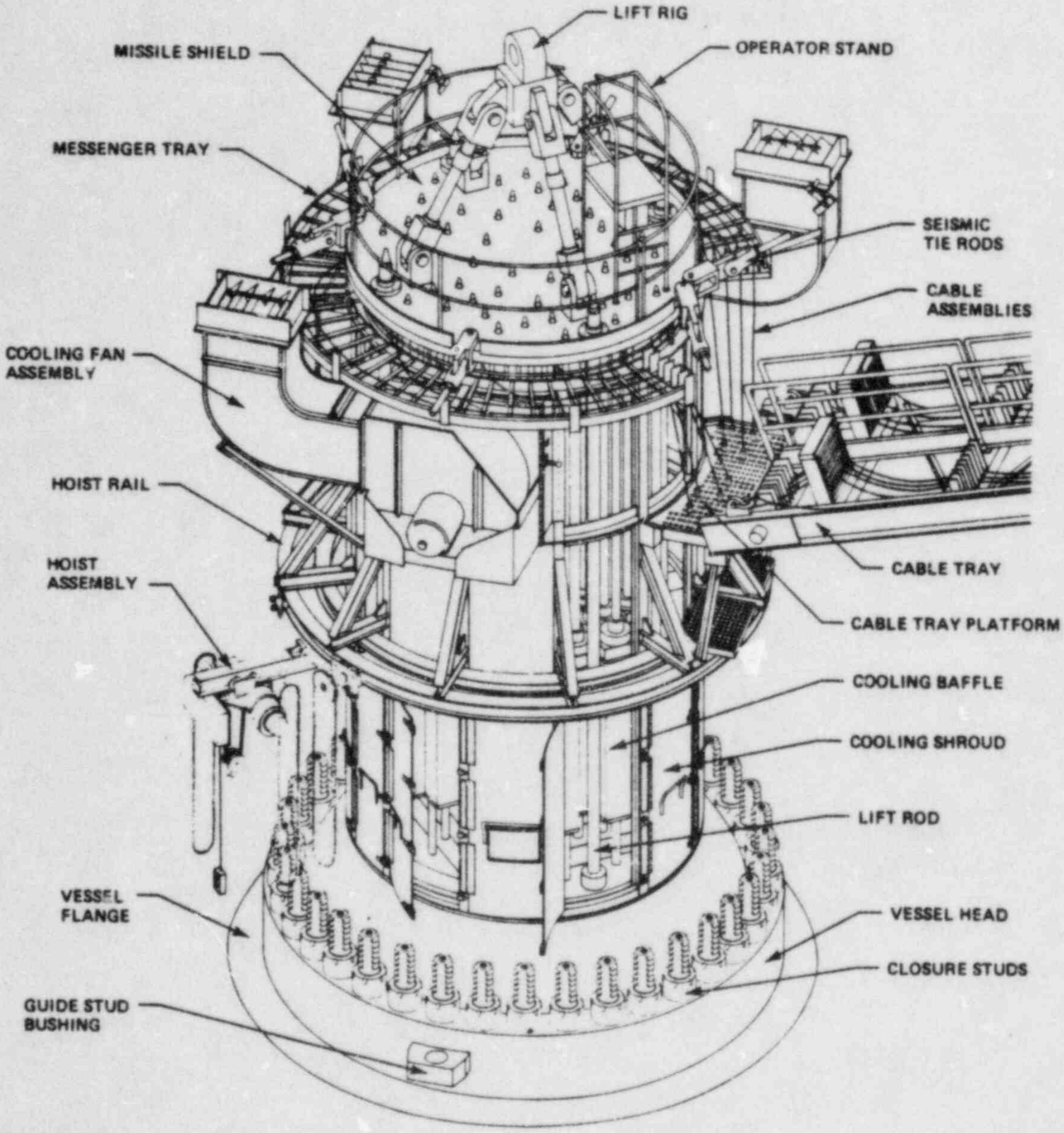


Figure B-2
INTEGRATED HEAD PACKAGE

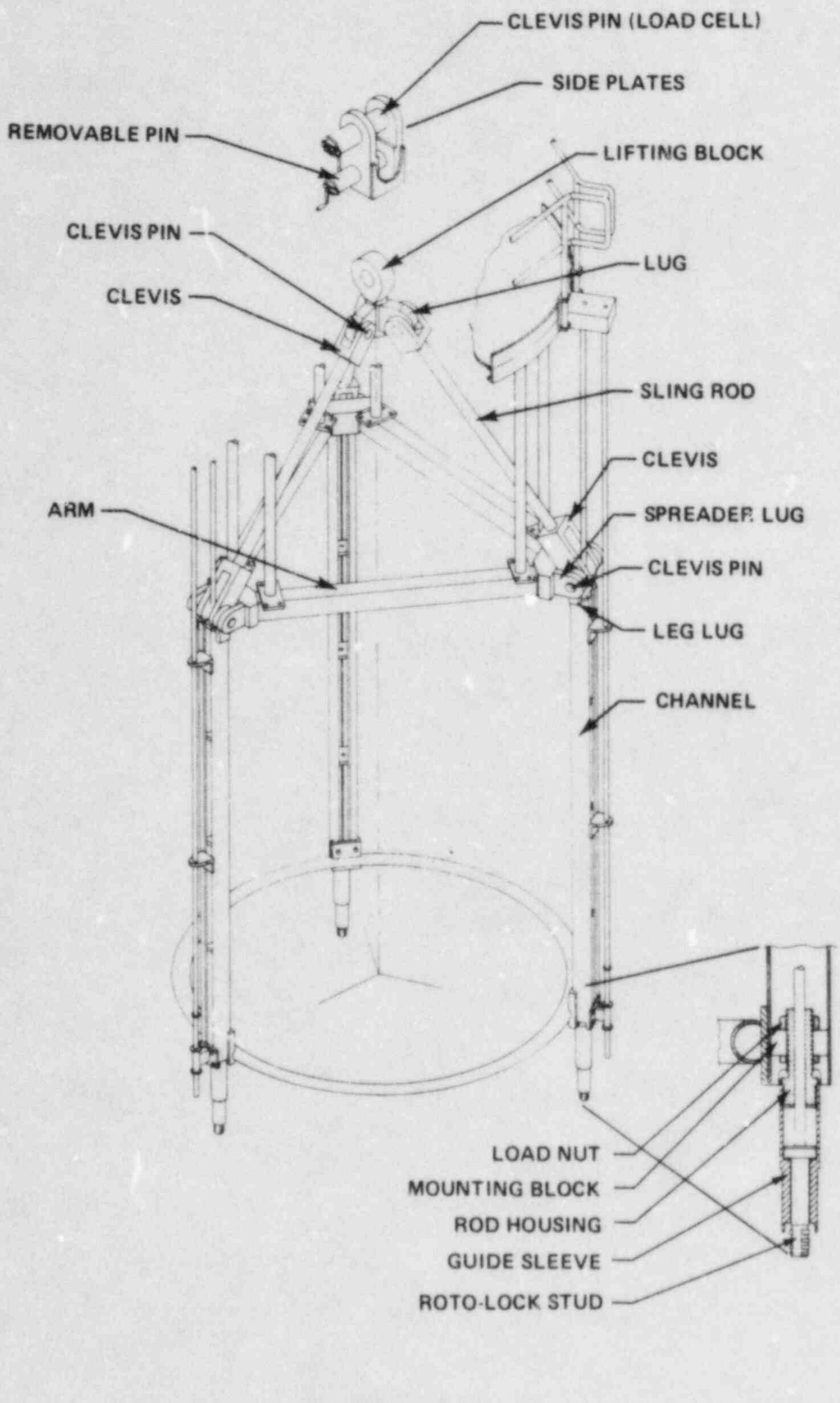


Figure B-3
REACTOR VESSEL INTERNALS LIFT RIG

ATTACHMENT C

CRITICAL ITEMS LIST PER ANSI N14.6-1978

1. GENERAL

Section 3.1.2 of ANSI N14.6-1978 specifies that the design specification shall include a critical items list, which identifies critical components and defines their critical characteristics for material, fabrication, non-destructive testing and quality assurance.

"Critical items list" is further defined in ANSI N14.6, Section 2 as:

> "critical items list. A list that specifies the items of a special lifting device and their essential characteristics for which specified quality requirements shall apply in the design, fabrication, utilization, and maintenance of the device."

Load carrying members and welds of these special lifting devices are considered to be the critical items.

Table C-1, C-2, C-3 and C-4 are the critical items list of parts and welds for the reactor vessel head lift rig assembly, the upper internals lift rod, the reactor vessel internals lift rig, the load cell and load cell linkage. These tables include the material identification, the applicable volumetric and surface inspections that were performed in the fabrication of these special lifting devices. In some instances, non-destructive testing was not specified since the material selection and strength result in very low tensile stresses, and non-destructive testing was not justified.

The material selection for all critical items was made to ASTM, ASME or special material requirements. The material requirements were supplemented by Westinghouse imposed non-destructive testing, and/or special heat treating requirements for almost all of the critical items.

Westinghouse required all welding, welders, and weld procedures to be in accordance with ASME Boiler and Pressure Vessel Code Section IX for all welds. Westinghouse required a certificate, or letter of compliance, that the materials and processes used by the manufacturer were in accordance with the purchase order and drawing requirements. Westinghouse also performed final inspections on these devices and issued quality releases.

TABLE C-1

REACTOR VESSEL HEAD LIFT RIG

CRITICAL ITEMS LIST OF PARTS

PER ANSI N14.6-1978

			Non-destructive Testing	
Item[a]	Description	Material	Material	Finished
1	Lifting Block	ASTM A508 Class 4	Ultrasonic	Magnetic Particle
2	Lug	ASTM A508 Class 4	Ultrasonic Magnetic Particle	Magnetic Particle
3,7	Upper & Lower Pin	ASTM A434 Class BD AISI 4340	Ultrasonic	Magnetic Particle
4,6	Upper & Lower Clevis	ASTM A668 Class M AISI 4340	Ultrasonic	Magnetic Particle
5	Lifting Leg	ASMT A434 Class BC AISI 4340	Ultrasonic	Magnetic Particle
8	Lift Lug	ASTM A508 Class 2	Ultrasonic	Magnetic Particle
9	Missile Shield	ASME SA 533 Type B Class 1	Ultrasonic	Magnetic Particle
10	Lift Nut	ASME SA 533 Type B Class 1	Ultrasonic	Magnetic Particle
11	Lift Rod	ASTM A434 Class BC AISI 4340	Ultrasonic	Magnetic Particle
12,13,14	Crank Handle Nut, Upper Internals Lift Rod, Nut	ASME SA479 Type 304	Ultrasonic	Liquid Penetrant

(a)See Figure B-1

TABLE C-2

REACTOR VESSEL HEAD LIFT RIG
CRITICAL ITEMS LIST OF WELDS
PER ANSI N14.6-1978

		Non-destructive Testing	
Item[a]	Description	Root Pass	Final
8,9	Lift Lug to Missile Shield Top and Bottom (fillet)	Magnetic Particle	Magnetic Particle Radiograph

(a)See Figure B-1

TABLE C-3

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE

CRITICAL ITEMS LIST OF PARTS

PER ANSI N14.6-1978

			Non-destructive Testing	
Item[a]	Description	Material	Material	Finished
1	Lifting Block	ASTM A350 Grade LF 2	Ultrasonic	Magnetic Particle
2	Lifting Block Lug	ASTM A516 Grade 70	Ultrasonic Magnetic Particle	Magnetic Particle
3,7	Clevis Pin	ASTM A564 Type 630 17-4 pH H-1150	Ultrasonic	Liquid Penetrant
4,6	Clevis	ASTM A471 Class 3	Ultrasonic	Magnetic Particle
5	Sling Rod	ASTM A434 Class BC AISI 4340 or ASTM A588	Ultrasonic	Magnetic Particle
8,10	Spreader Lug, Leg Lug	ASTM A516 GR 70	Ultrasonic Particle Magnetic	
11	Leg Channels	ASTM A36	Visual	
12	Mounting Block	ASTM A350 LFI	Ultrasonic Magentic Particle	

(a)See figure B-3

TABLE C-3 (Cont'd)

REACTOR VESSEL INTERNALS LIFT RIG, LOAD CELL AND LOAD CELL LINKAGE
CRITICAL ITEMS LIST OF PARTS
PER ANSI N14.6-1978

			Non-destructive Testing	
Item[a]	Description	Material	Material	Finished
13,14	Load Nuts Rod Housing	ASTM A276, Type 304 Condition A	Ultrasonic	
15	Guide Sleeve	ASTM A276, Type 304 Condition A	Ultrasonic	Liquid Penetrant
16	Rotolock Stud	ASTM A564, Type 630 17-4 pH, H-1100	Ultrasonic	Liquid Penetrant
17	Clevis Pin (load sensing)	ASTM A564 Type XM12	Ultrasonic	Magnetic Particle
18	Side Plates	ASTM A517 Grade F	Ultrasonic	Magentic Particle
19	Removable Pin	ASTM A564 Type 630 17-4 pH H-1150	Ultrasonic	Liquid Penetrant

(a)See figure B-3

TABLE C-4

REACTOR VESSEL INTERNALS LIFT RIG

CRITICAL ITEMS LIST OF WELDS

PER ANSI N14.6-1978

Item[a]	Description	Non-destructive Testing Root Pass	Non-destructive Testing Final
1,2	Lugs to Lifting Block (Full Penetration)	Magnetic Particle	Magnetic Particle Radiograph
8,9	Lug to Spreader Block (Full Penetration)	Magnetic Particle	Magnetic Particle
10,11	Leg Lug to Channel Leg (fillet)	Magnetic Particle	Magnetic Particle
11,12	Mounting Block to Channel Leg (fillet)	Magnetic Particle	Magnetic Particle

(a) See Figure B-1

ATTACHMENT D

SINGLE-FAILURE-PROOF HANDLING SYSTEMS

ITEM 1*

Provide the name of the manufacturer and the design-rated load (DRL). If the maximum critical load (MCL), as defined in NUREG 0554, is not the same as the DRL, provide this capacity.

STP Response

The FHB overhead crane is manufactured by Kranco and rated for 15 tons. The maximum critical load is a spent fuel pool heat exchanger which weighs 6.16 tons.

ITEM 2

Provide a detailed evaluation of the overhead handling system with respect to the features of design, fabrication, inspection, testing, and operation as delineated in NUREG 0554 and supplemented by the identified alternatives specified in NUREG 0612, Appendix C. This evaluation must include a point-by-point comparison for each section of NUREG 0554. If the alternatives of NUREG 0612, Appendix C, are used for certain applications in lieu of complying with the recommendation of NUREG 0554, this should be explicitly stated. If an alternative to any of those contained in NUREG 0554 or NUREG 0612, Appendix C, is proposed, details must be provided on the proposed alternative to demonstrate its equivalency. (If the crane in question has previously been approved by the staff as satisfying NUREG 0554, Reg. Guide 1.104, or Part B to BTP ASB 9-1, please reference the date of the staff's safety evaluation report or approval letter in lieu of providing the information requested by this item).

STP Response

The FHB overhead crane is designed to meet the intent of RG 1.104 as descibed in 9.1 of the FSAR. This was submitted to the NRC in revision 0 of the FSAR and there are no open items relating to this submittal. Table 9.1.3 of the FSAR compares crane design to RG 1.104 guidelines. The information is repeated here as Table D-1.

ITEM 3

With respect to the seismic analysis employed to demonstrate that the overhead handling system can retain the load during a seismic event equal to a safe shutdown earthquake, provide a description of the method of analysis, the assumptions used, and the mathematical model evaluated in the analysis. The description of assumptions should include the basis for selection of trolley and load position.

* Item numbers correspond to question numbers in Attachment (1) of Generic Letter 81-07.

STP Response

The finite element method of analysis was used to demonstrate that the overhead handling system can retain the load during a seismic event equal to a safe shutdown earthquake.

Stresses were examined for Dead Load + Live Load + SSE with the trolley at midspan, 1/4 span and the end of the span (hook at highest and lowest position). The allowable stresses for structural steel are in accordance with Part I of AISC-1969.

The general layout of the model for the crane is shown in Figure D-1. The large circles containing numbers, as well as the corresponding circles on the far girder, indicate the nodes at which the mass is assumed to be concentrated Nodes 1 through 4 and 8 account for all the mass of the bridge and trolley and include both transitional mass and rotary inertia. Node 7 contains the translational mass of the load and bottom block. The distances L_1 and L_3 was varied to account for different positions of the trolley, and L_4 was varied to account for different positions of the load.

All members shown as double lines were assumed to be infinitely rigid. Members shown as single lines were treated, for the most part, in the conventional manner as beams in a three-dimensional framework. The cable, from node 7 to node 8, is a pin-connected member subject only to axial distortion. For all other members, axial distortion is neglected. The two girt beams by means of which the trolley spans between girders bend only vertically; they are infinitely rigid in horizontal bending and have no resistance to torsion.

It was assumed that the two girders are identical, so that the structure is symmetrical about the Y-Z plane. The analysis is carried out separately for the symmetric and antisymmetric modes. The symmetric modes are excited by building motion in the Y and Z directions and by rocking about the X axis. The antisymmetric modes are excited by motion in the X direction and rocking about the Z axis. It was assumed that rotation of the building about the Y axis does not excite the crane since it is free to rotate on the runway.

The springs shown at the four support points "A" represent the flexibility of the crane runway. The vertical springs are always active. The horizontal springs may be active at both ends of the crane, or only at one end. If inactive, the spring constant is zero.

The boundary conditions at the four support points "A" are different for different excitations. In general, they are free to move in all three directions subject to the restraint offered by the springs except that for motion in the X direction and rocking about the Z axis, the supports are fixed in the X direction. At the trolley support point "B", the trolley was assumed to be fixed to the girder in the X and Y directions, but it is free to move in the Z direction. No moments were transmitted at any of these support points.

The various excitations produced by earthquakes acting in the X, Y, and Z directions were combined (square root of the sum of the squares) to determine the total excitations to which the crane is subjected. The response of the crane in each of the modes represented by the model was determined by conventional methods. The stresses of interest due to the various modes were combined (square root of the sum of the squares) to cbtain the total seismic stresses for which the crane should be designed.

ITEM 4

Provide an evaluation of the lifting devices for each single-failure-proof handling system with respect to the guidelines of NUREG 0612, Section 5.1.6.

STP Response

There are no special lifting devices for heavy loads used with the 15/2 ton crane. Slings will be procured and used in accordance with ANSI B30.9-1971 guidelines as modified by Sections 5.1.1.5 and 5.1.6 of NUREG 0612.

ITEM 5

Provide an evaluation of the interfacing lift points with respect to the guidelines of NUREG 0612, Section 5.1.6.

STP Response

STP follows the guidelines of position C.3.a of RG 1.104, Rev. 0 with regard to lift points. Interface lift points on the fuel pool gates and SFP heat exchanger hatches comply with NUREG 0612, Section 5.1.6, guidelines. The cask head will be built to the NUREG 0612 guidelines, and slings will be procured to these guidelines.

The new fuel containers, SFP heat exchangers, LHSI pump components, HHSI pump components and containment spray pump components have been fabricated with interface lift points which are not designed with the margins specified by NUREG 0612, Section 5.1.6. Safe load paths have been developed and will be described in procedures regulating the movement of heavy loads lifted by the FHB 15/2 ton overhead crane (see Figures 13a, 13b and 13c). Although analysis of movement of these loads is not in strict accordance with Appendix A of NUREG-0612, the combination of a single failure proof crane and safe load paths governed by procedures provides adequate assurance that plant safety will not be jeopardized and is considered to meet the intent of Appendix A and RG 1.104. These loads are not moved over safety related equipment or the spent fuel pool; a load drop on the safe lead path would not result in damage to safety related equipment.

TABLE D-1

FHB 15/2 TON CRANE - COMPLIANCE WITH REGULATORY GUIDE 1.104

Regulatory Position	STP Complies with Rev. 0	STP Meets the Intent of Rev. 0 and Complies with a Proposed Revision Dated January 1978	STP takes Exception to Rev. 0	Not Applicable by Either Rev. 0 or the Proposed Revision Dated January 1978
C.1.a				X
1.b(1)	X			
(2)				X
(3)				X
(4)				X
1.c	X			
1.d	X			
1.e	X			
1.f		X		
C.2.a	X			
2.b	X			
2.c	X			
2.d	X			
C.3.a	X			
3.b	X			
3.c	X			
3.d	X			
3.e	X			
3.f	X			
3.g		X		
3.h		X		
3.i		X		
3.j		X		
3.k	X			
3.l		X		
3.m		X		
3.n	X			
3.o			See note 1	
3.p		X		
3.q		X		
3.r	X			
3.s			See note 2	X
3.t				
3.u	X			

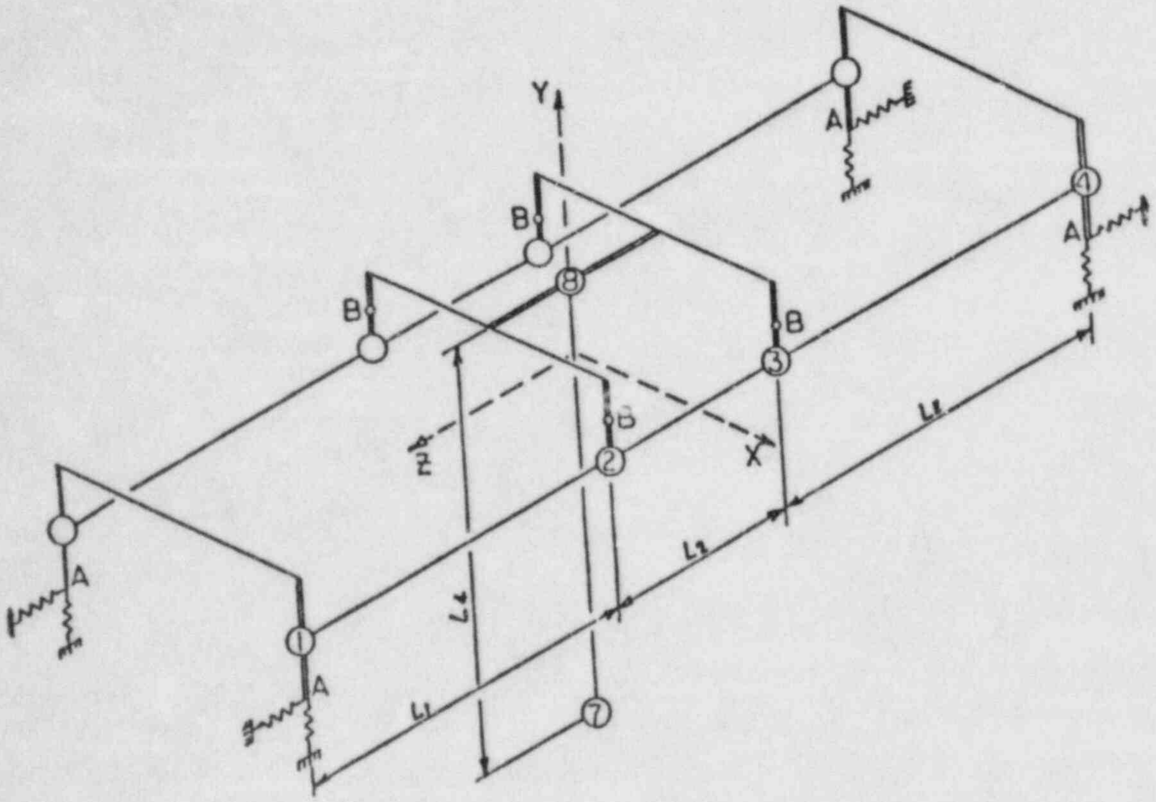
TABLE D-1 (Cont'd)

FHB 15/2 TON CRANE - COMPLIANCE WITH REGULATORY GUIDE 1.104

Regulatory Position	STP Complies with Rev. 0	STP Meets the Intent of Rev. 0 and Complies with a Proposed Revision Dated January 1978	STP takes Exception to Rev. 0	Not Applicable by Either Rev. 0 or the Proposed Revision Dated January 1978
C.4.a	X			
4.b		X		
4.c	X			
4.d				X
C.5.a	X			
5.b	X			

Note 1: Controlled plugging measures shall be provided so that if the operator reverses a drive while it is in motion, the torque during reverse shall be automatically controlled to a predetermined torque limit during deceleration.

Note 2: The crane is designed to CMAA standards (i.e, a 5:1 minimum factor of safety for each component) for a 15-ton lift.



SOUTH TEXAS PROJECT UNITS 1 & 2

Figure D-1
MODEL FOR SEISMIC ANALYSIS
15/2 TON FHB CRANE