J.O.No. 12177

THE CONTROL OF HEAVY LOADS AT NINE MILE POINT UNIT 2

DOCKET NO. 50-410

Nine Mile Point Unit 2

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SECTION 1

INTRODUCTION

Nuclear Regulatory Commission (NRC) letter dated December 22, 1980, to Niagara Mohawk Power Corporation (NMPC) contained NUREG 0612, Control of Heavy Loads at Nuclear Power Plants. This letter requested NMPC to review the control for handling heavy loads to determine the extent to which general guidelines were addressed and to identify changes and modifications that would be required to satisfy these guidelines.

The information presented in this report is a summary of the heavy loads analysis of Unit 2. The concerns of the NRC staff as defined in NUREG 0612 have been specifically addressed in Section 3. The objective of NUREG 0612 to provide a maximum practical "defense-in-depth" approach to reduce risk involved in load-handling failures remains an ongoing objective of NMPC.

Section 8.2 of this report provides a comparison and evaluation of the differences between the Unit 2 polar crane and NUREG 0554.

SECTION 2

BASIS OF REVIEW

A heavy load has been defined by NUREG 0612 as any weight greater than the combined weight of a single spent fuel assembly and its associated handling tool.

This report uses "greater than 1,000 pounds" as a basis for determining "heavy load." The actual weight for the spent fuel assembly and its associated handling tool is 1,129 pounds. In the area of the reactor and spent fuel pool, all loads which are hoisted and handled were investigated. This report does not address temporary rigging/load handling systems which are erected as needed during the course of normal plant maintenance; these are controlled by administrative procedures in accordance with NUREG 0612.

The general guidelines identified in NUREG 0612 were used as a basis for this review.

SECTION 3

RESULTS OF REVIEW

The results of the review are listed as direct responses to Enclosure 3 of the NRC's December 22, 1980, letter. For convenience the NRC requested information is repeated, followed by NMPC's response.

The following format corresponds point by point to Enclosure 3 of the NRC's letter:

2. INFORMATION REQUESTED FROM LICENSEE

2.1 General Requirements for Overhead Handling Systems

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

2.1-1 Requested Information

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

Response

This study included a systematic review of all permanent cranes, monorails, and hoists intended for use at Unit 2. The overhead handling systems, from which load drops may result in damage to a system required for plant shutdown or decay heat removal, are listed in Table 3-1.

2.1-2 Requested Information

Justify the exclusion of any overhead handling system from the above category by verifying that there is sufficient physical separation from any load-impact point and any safety-related component to permit a determination by inspection that no heavy load drop can result in damage to any system or component required for plant shutdown or decay heat removal.

Response

The overhead handling systems, which have been excluded from this study, are listed in Table 3-2. The specific justification for excluding each system is noted.

2.1-3 Requested Information

With respect to the design and operation of heavy-load handling systems in the reactor building and those load-handling systems identified in Item 2.1-1, provide your evaluation concerning compliance with the guidelines of NUREG 0612, Section 5.1.1. The following specific information should be included in your reply:

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

Response

See Section 5 for drawings which define safe load paths and show safety-related equipment.

b. A discussion of measures taken to ensure that load-handling operations remain within safe load paths, including procedures, if any, for deviation from these paths.

Response

Safe load paths will be referenced in procedures and shown on equipment layout drawings. Load paths will not be marked on the floor in the area where the load is to be handled. There are 10 to 15 load paths for the reactor building operating floor. Load paths would be confusing and overlapped by other load paths. There are limit switches on the reactor building polar crane (RBPC) to limit movement of heavy loads over the spent fuel pool. Most of the other cranes discussed in Item 2.1-1 are monorail which inherently define the load path.

c. The 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 5.1.2(2).

Response

See Tables 3-3, 3-4, and 3-5, for tabulation of heavy loads handled by cranes, hoists, and monorails. The procedures will comply with NUREG 0612 Section 5.1.1(2), except that the safe load paths are not marked on the floors. These procedures will be available for onsite review.

d. Verification that lifting devices identified in Item 2.1-3c comply with the requirements of ANSI N14.6-1978, or ANSI B30.9-1971 as appropriate. For lifting devices where these standards, as supplemented by NUREG 0612, Section 5.1.1(4) or 5.1.1(5) are not met, describe any proposed alternatives and demonstrate their equivalency in terms of load-handling reliability.

Response

See Section 6 for a discussion on lifting devices.

e. Verification that ANSI B30.2-1976, Chapter 2-2, has been invoked with respect to crane inspection, testing, and maintenance. Where any exception is taken to this standard, sufficient information should be provided to demonstrate the equivalency of proposed alternatives.

Response

See Section 7 for compliance with guidelines of ANSI B30.2-1976.

f. Verification that crane design complies with the guidelines of CMAA Specification No. 70 and Chapter 2-1 of ANSI B30.2-1976, including the demonstration of equivalency of actual design requirements for instances where specific compliance with these standards is not provided.

Response

See Section 8 for verification of crane design.

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

Response

See Section 9 for operator training, qualification, and conduct.

2.2 Specific Requirements for Overhead Handling Systems Operating in the Reactor Building

NUREG 0612, Section 5.1.4, provides guidelines concerning the design and operation of load-handling systems in the vicinity of spent fuel in the reactor vessel or in storage. 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 that the estimated consequences of such a drop will not exceed the limits set by the evaluation criteria of NUREG 0612, Section 5.1, Criteria I through III.

2.2-1 Requested Information

Identify by name, type, capacity, and equipment designator, any cranes physically capable (i.e., ignoring interlocks, moveable mechanic stops, or operating procedures) of carrying loads over spent fuel in the storage pool or in the reactor vessel.

Response

Name	Type	Capacity	Equipment Designator
a. Reactor Building Crane	Polar	125/25/0.5 ton	2MHR-CRN1
b. Fuel-Handling	Jib	0.5 ton	2MHF-CRN-1
c. Fuel-Handling	Jib	0.5 ton	2MHF-CRN-2
d. Channel-Handling	Jib	200 lb	2MHF-CRN-3
e. Fuel Grapple	Tele-scoping	-	NA

2.2-2 Requested Information

Justify the exclusion of any crane in this area from the above category by verifying that they are incapable of carrying heavy loads or are permanently prevented from movement of heavy load over stored fuel or into any location where, following any failure, such load may drop into the reactor vessel or spent fuel storage pool.

Response

The fuel-handling jib cranes and the channel-handling jib crane can be excluded since loads handled are less than 1,000 lb. The fuel grapple handles only the fuel assembly and therefore is also excluded since

previous analyses postulated worst-case accident for spent fuel assembly drop over the reactor core. The calculated exposures (design base accident) were a small fraction of the allowable guidelines of 10CFR100 as discussed in Section 15.7.4 of the Unit 2 FSAR.

2.2-3 Requested Information

Identify any cranes listed in Item 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.*

Response

The main hook (125 ton) of the reactor building polar crane is a single-failure proof design which complies with the criteria of NUREG 0612, Section 5.1.6. See Section 8 for a more detailed summary of the RBPC design. See Table 3-3 for the crane loads.

2.2-4 Requested Information

For cranes identified in Item 2.2-1 not categorized according to Item 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 2.3 of this request. With respect to Criteria I through III, provide a discussion of your evaluation of crane operation in the reactor building and your determination of compliance. This response

*All attachments are those accompanying Enclosure 3 of the NRC's December 22, 1980 letter.

should include the following information for each crane.

a. Where reliance is placed on the installation and use of electrical interlocks or mechanical stops, indicate the circumstances under which these protective devices can be removed or bypassed and the administrative procedures invoked to ensure proper authorization of such action. Discuss any related or proposed technical specifications concerning the bypass of such interlocks.

<u>Response</u>

In regards to the reactor building polar crane: electrical interlocks may be temporarily removed or bypassed with written approval of the station shift supervisor and/or station superintendent. The reasons for removal or bypassing will be included with the written approval. A site procedure which explains the conditions and requirements for temporary removal or bypassing will be developed.

b. Where reliance is placed on the operation of the standby gas treatment system, discuss present and/or proposed technical specifications and administrative or physical controls provided to ensure that these assumptions remain valid.

<u>Response</u>

Technical specifications will address required operability of standby gas treatment system during fuel handling operations.

c. 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 validity of such considerations.

Response

The fuel-handling procedures now being formulated will follow the guidelines of NUREG 0612.

d. Analyses performed to demonstate compliance with Criteria I thorugh III should conform to the guidelines of NUREG 0612, Appendix A. Justify any exception taken to these guidelines, and provided the specific information requested in Attachments 2, 3, or 4, as appropriate, for each analysis performed.

Response

No such analyses were required for this study.

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

NUREG 0612, Section 5.1.5, provides guidelines concerning the design and operation of load-handling systems in the vicinity of equipment or components required for safe reactor shutdown and decay heat removal. Information provided in response to this section should be sufficient to demonstrate that adequate measures have been taken to ensure that in these areas, either the likelihood of a load drop which might prevent safe reactor shutdown or prohibit continued decay heat removal is extremely small, or that damage to such equipment from load drops will be limited in order not to result in the loss of these safety-related functions. Cranes which must be evaluated in this section have been previously identified in your response to Item 2.1-1, and their loads in your response to Item 2.1-3c.

2.3-1 Requested Information

Identify any cranes listed in Item 2.1-1 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.

Response

See Section 8, Verification of Crane Design.

2.3-2 Requested Information

For any cranes identified in Item 2.1-1 not designated as single-failure proof in Item 2.3-1, a comprehensive hazard evaluation should be provided, including the following information:

a. The presentation in a matrix format of all heavy loads and potential impact areas where damage might occur to safety-related equipment. Heavy loads identification should include designation and weight or cross-reference to information provided in Item 2.1-3c. 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 plate general arrangement drawings.

   Response

   See hazard elimination tables in Section 4.

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 consideration 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).

Response

See comment section of the hazard elimination tables in Section 4.

(2) Where mechanical stops or electrical interlocks are to be provided, present details showing the areas where crane travel will be prohibited. Additionally, provide a discussion concerning the procedures that are to be used for authorizing the bypassing of interlocks or removable stops, for verifying that interlocks are functional prior to crane use, and for verifying that interlocks are restored to operability after operations which require bypassing have been completed.

Response

See the drawings listed in Section 5 for areas where crane travel is prohibited due to mechanical stops or interlocks. Bypassing of interlocks or mechanical stops will be covered in the load-handling procedures.

(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 validity of such considerations.

Response

See comment section of the hazard elimination tables in Section 4.

c. For interactions not eliminated by the analysis of Item 2.3-2b, 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 so evaluated, provide the load-handling-system (i.e., crane-load-combination) information specified in Attachment 1.

Response

All interactions were eliminated by analysis of Item 2.3-2b.

d. For interactions not eliminated in Items 2.3-2b or 2.3-2c, 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 for NUREG 0612, Appendix A.

(3) The information requested in Attachment 4.

Response

All interactions were eliminated by analysis of Item 2.3-2b.

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TABLE 3-1

OVERHEAD HANDLING SYSTEMS WHICH CARRY HEAVY LOADS OVER SAFE SHUTDOWN OR DECAY HEAT REMOVAL EQUIPMENT

Mark No.	Identification	Location	Function
2MHR-CRN1	125/25/0.5-Ton Reactor Building Polar Crane	Reactor Building at El 387'-4" and Azimuth 0°-359°	Refueling and maintenance
2MHR-CRN3, 4	34-Ton Recirc Motor Handling Cranes	Primary Containment at El 284'-11" and Azimuth 135° and 315°	Removal and replacement of pump motors
2MHS-CRN6	10-Ton Stop Log Area Crane	Screenwell Building Intake and Discharge Shaft Area El 307'-9"	Removal and replacement of SWP motor-operated valves and stop logs
2MHS-CRN7	8-Ton Single Girder Crane	Reactor Building at El 261'-0" and Azimuth 0°	Removal and replacement of outboard main steam and feedwater valves
2MHR-CRN65	2-Ton Monorail System	Primary Containment at El 305'-9" and Azimuth 240° to 105°	Removal and replacement of safety relief valves
2MHR-CRN66	2-Ton Transfer Monorail System	Primary Containment at El 261'-0" and Azimuth 165° to 235°	Transfer safety relief valves and CRD cart
2MHR-CRN67	8-Ton Monorail System	Primary Containment at El 261'-0" and Azimuth 315° to 45°	Removal and replacement of main steam isolation valves
2MHS-CRN2, 3, and 4	5-Ton Emergency Diesel Generator Cranes	Emergency Diesel Generator Building El 261'-0"	Maintenance of emergency generators
2MHW-CRN1	75/40-Ton Screenwell Room Crane	Screenwell Building above Service Water Pump Bays	Maintenance of service water pumps, circulating water pumps, feedwater heater tube bundles, and miscellaneous equipment

TABLE 3-2

OVERHEAD HANDLING SYSTEMS WHICH ARE EXCLUDED FROM FURTHER CONSIDERATION

Mark No.	Identification and Justification
2MHN-CRN1	30-Ton Radwaste Building Crane - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN56	Radwaste Building Monorail (10-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN70	Grating and Miscellaneous Equipment Hoist (2-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN71	Concrete Slab Hoist (3-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN72	Heat Exchanger Hoist (2-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN73	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.

TABLE 3-2 (Cont)

Mark No.	Identification and Justification
2MHN-CRN74	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHN-CRN75	Concrete Slab Hoist (4-Ton Capacity) - This crane is located inside the radwaste building, which does not contain any safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHF-CRN1 and CRN2	Refueling Area Jib Cranes - The capacities of these cranes are all 1/2 ton. Therefore, these cranes are excluded from the Heavy Loads study.
2MHF-CRN3	Channel Handling Boom with Counterbalance. The capacity is 200 lb. Therefore, this crane is excluded from the Heavy Loads study.
2MHT-CRN1	250/40-Ton Turbine Room Crane - This crane is located inside the turbine building, which does not contain any safety-related mechanical equipment. A load drop from this crane will not preclude plant shutdown.
2MHS-CRN1	RDS Cart Crane (1.5-Ton Capacity) - This crane is located in that area of the reactor building at El 289'-0" and Azimuth 221°F which does not contain safety-related equipment. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN5	Workshop Crane (10-Ton Capacity) - This crane is located in the turbine building dirty workshop and large tool area at El 261'-0". A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN9	Discharge Flume and Screenhouse Crane (10-Ton Capacity) - This crane is located in the

TABLE 3-2 (Cont)

Mark No.	Identification and Justification
	screenhouse. A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHS-CRN20	Lube Oil Tank Equipment Crane (1.5-Ton Capacity) This jib crane is located over the turbine oil reservoir at El 277'-6". A load drop from this crane would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN31	3-Ton Monorail Hoist System - This is located inside the control building at El 261'-0" and is used for the removal of the hatch cover slabs and equipment. A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN32	3-Ton Monorail Hoist System - This hoist is located inside the auxiliary boiler room at El 261'-0". A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN33 and CRN34	10-Ton Monorail Hoist Systems - These hoists are located in the turbine building for the handling of the condenser waterboxes during a plant shutdown. A load drop from these hoists would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN45 and CRN46	5-Ton Monorail Hoist Systems - These hoists are located inside the normal switchgear building at El 293'-0" and 261'-0", respectively, and are used for the handling of hatch cover slabs and equipment. Load drops from these hoists would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN48	10-Ton Monorail Hoist System - This system is located in the decontamination area at El 261'-0". A load drop from this hoist system would not result in damage to any system required for plant shutdown or decay heat removal.

TABLE 3-2 (Cont)

Mark No.	Identification and Justification
2MHK-CRN49	1-Ton Monorail Hoist System - This hoist is located in the screenwell stop log and trash rack area at El 261'-0". A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHK-CRN55	4-Ton Monorail Hoist System - This hoist is located in the control building above floor El 306'-0". A load drop from this hoist would not result in damage to any system required for plant shutdown or decay heat removal.
2MHR-CRN50	Pipe Chase Hatch Cover Hoist (5-Ton Capacity) - This hoist is located in the reactor building at El 353'-10" and Azimuth 50°. A load drop from this hoist would not result in damage to any system required for plant shutdown.
2MHR-CRN51	Pipe Chase Hatch Cover Hoist (10-Ton Capacity) - This hoist is located in the reactor building at El 328'-10" and Azimuth 320°. A load drop from this hoist would not result in damage to any system required for plant shutdown.
2MHR-CRN52	8-Ton Monorail Hoist System - This hoist is located in the reactor building at El 328'-10" and Azimuth 125°. It is used for removing a hatch cover. A load drop from this hoist will not result in damage to any system required for plant shutdown.
2MHR-CRN61	8-Ton Monorail Hoist System - This hoist is used for the removal and replacement of the equipment hatch cover at Azimuth 315° and El 261'-0". A load drop from this hoist would not result in damage to any system required for plant shutdown.

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TABLE 3-3

2MHR-CRN1/POLAR CRANE LOADS

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Fuel Transfer Shielding Bridge	34	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug A	90	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug B	102	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug C (with rigging)	119**	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug D	90	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug E	82	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug F	93	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug G	93	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Shield Plug H	82	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Drywell Head	55	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation

TABLE 3-3 (Cont)

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Reactor Vessel Head	92	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Steam Dryer	50	Main Strongbacks, Sling Assemblies, and Spreader Beams	*	Twice each refueling operation
Steam Separator	80	Main Strongbacks, Sling Assemblies, and Spreader Beams	*	Twice each refueling operation
Reactor Vessel Head Insulation and Support Frame	8	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Spent Fuel Shipping Cask	100	Cask Lifting Yoke	*	As needed over the life of plant
Reactor Head Stud Rack	4	Sling Assemblies	*	Twice each refueling operation
Reactor Stud Tensioner	5	Sling Assemblies	*	Twice each refueling operation
Refueling Canal Plugs	16 (max)	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
WCS Filter Demineralizer Removal Plugs	15	Main Strongbacks and Sling Assemblies	*	As needed over the life of plant
SFC Filter Removal Plugs	10	Main Strongbacks and Sling Assemblies	*	As needed over the life of plant

TABLE 3-3 (Cont)

Crane Load	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
SFC Filter Demineralizer Removal Plugs	4	Sling Assemblies	*	As needed over the life of plant
Reactor Service Platform	5	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Storage Pool Gate	50	Main Strongbacks and Sling Assemblies	*	Twice each refueling operation
Recirculation Pump Motor	33.5	Main Strongbacks and Sling Assemblies	*	As needed over the life of plant

*Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to spent fuel or safe shutdown equipment.

**Maximum load.

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TABLE 3-4

REACTOR BUILDING CRANES - LOADS HANDLED

Crane Load	Crane Mark No.	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Main Outboard Steam Valve(s) 2MSS*HYV7A, B, C, and D	2MHS-CRN7	7	Sling Assembly	*	*
MSS Valve Operators	2MHS-CRN7	6.3	Sling Assembly	*	*
Feedwater Valves	2MHS-CRN7	8	Sling Assembly	*	*
Hatch Cover (Pipe Chase) at El 328'-10"	2MHR-CRN51	5.5	Sling Assembly	*	*
Hatch Cover (Pipe Chase) at El 328'-10"	2MHR-CRN52	4	Sling Assembly	*	*
PSV Valves (PSV-120 to 137)	2MHR-CRN65	1.8	Sling Assembly	*	*
CRD Cart	2MHR-CRN66	1.5	Sling Assembly	*	*
Recirculation Pump Motors	2MHR-CRN3&4	33.5	Sling Assembly	*	*
RDS Cart	2MHS-CRN1	1	Sling Assembly	*	*
Cooling Coil Cart	2MHR-CRN3&4	5	Sling Assembly	*	*
Equipment/Personnel Hatch Cover at El 261'-0"	2MHR-CRN1	23	Sling Assembly	*	*
Inboard Steam Valves 2MSS*HYV6A, B C, and D	2MHR-CRN67	6.5	Sling Assembly	*	*

*Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to spent fuel or safe shutdown equipment. Frequency will depend on maintenance guidelines.

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TABLE 3-5

SCREENWELL AREA TRAVELING CRANES - LOADS HANDLED

Crane Load	Crane Mark No.	Weight (tons)	Designated Lifting Device	Governing Handling Procedure	Frequency Handled
Service Water Pumps	2MHW-CRN1	4	Sling Assembly	*	*
Service Water Pump Motors	2MHW-CRN1	2.5	Sling Assembly	*	*
Circulation Water Pumps	2MHW-CRN1	30	Sling Assembly	*	*
Circulation Water Pump Motors	2MHW-CRN1	20	Sling Assembly	*	*
Stop Log No. 6	2MHS-CRN6	1	Sling Assembly	*	*
Stop Log No. 9	2MHS-CRN6	2.5	Sling Assembly	*	*
6th Pt Heater	2MHW-CRN1	56	Sling Assembly	*	*
5th Pt Heater	2MHW-CRN1	34	Sling Assembly	*	*
4th Pt Heater	2MHW-CRN1	38	Sling Assembly	*	*
3rd Pt Heater	2MHW-CRN1	28	Sling Assembly	*	*

*Load-handling procedures will be developed to cover load-handling operations for heavy loads that are handled over or in proximity to safe shutdown equipment. Frequency will depend on maintenance guidelines.

SECTION 4

HAZARD ELIMINATION TABLE

Table 4-1 lists the potential impact where damage might occur to safety-related equipment upon a heavy load drop.

1. Hazard Elimination Categories

   a. Crane travel for this area/load combination is prohibited by electrical interlocks or mechanical stops.

   b. System redundancy and separation precludes loss of capability of system to perform its safety-related function following this load drop in this area.

   c. Site-specific considerations eliminate the need to consider load/equipment combination. (See comment at bottom of Table 4-1 for detailed explanation of the use of this category.)

   d. Likelihood of handling system failure for this load is extremely small (i.e., Section 5.1.6, NUREG 0612 satisfied).

   e. Analysis demonstrates that crane failure and load drop will not damage safety-related equipment.

   f. Load is handled only in shutdown condition. Safety-related components under the load paths are already inoperative due to plant conditions and/or maintenance requirements. Their failure does not prevent safe shutdown conditions from being maintained.

Nine Mile Point Unit 2

TABLE 4-1

HAZARD ELIMINATION

MARK NO. 2MHR-CRN1
(25-Ton Auxiliary Hoist)

Impact Area: Reactor Building - Refueling Floor
Location: At El 387 ft 4 in, Azimuth 0° to 359°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
WCS Filter Demineralizer Removal Plugs	353 ft, 10 in	Reactor and Spent Fuel Pool	A*
SFC Filter Removal Plugs	353 ft, 10 in	Reactor and Spent Fuel Pool.	A*
SFC Filter Demineralizer Removal Plugs	353 ft, 10 in	Reactor and Spent Fuel Pool	A*
Removal Plate Gratings	353 ft, 10 in	Reactor and Spent Fuel Pool	A*
Removal Hoist Plate Gratings	353 ft, 10 in	Reactor and Spent Fuel Pool	A*
Radioactive Tunnel Access Plug	353 ft, 10 in	Reactor and Spent Fuel Pool	A*

*Electrical interlocks and limit switches will prevent the carrying of any of these loads over spent fuel or safety-related equipment. See crane restricted area diagram (Figure 5-4).

Nine Mile Point Unit 2

TABLE 4-1 (Cont)

MARK NO. 2MHR-CRN3
(Recirc Motor Handling)

Impact Area: Reactor Building - Drywell
Location: At El 284 ft 11 in, Azimuth 135°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
Recirculation Pump (2RC-P1A) Motor	261 ft, 0 in	The recirculation pump and associated piping and electrical conduit not removed for the lift operation	C*

*This crane's sole purpose is for maintenance/removal of the pump motor and motor cooling coils.

This crane will be utilized only during cold shutdown conditions; however, failure of these components does not result in a loss of safe shutdown capability. The potential exists for damage to the pump or its associated piping.

TABLE 4-1 (Cont)

MARK NO. 2MHR-CRN4
(Recirc Motor Handling)

Impact Area: Reactor Building - Drywell
Location: At El 284 ft 11 in, Azimuth 315°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
Recirculation Pump (2RC-P1B) Motor	261 ft, 0 in	The recirculation pump and associated piping and electrical conduit not removed for lift operation	C*

*This crane's sole purpose is for maintenance/removal of the pump motor and motor cooling coils. When this motor is replaced, it will be hoisted up the equipment hatch at Azimuth 315° and carried over the reactor operating floor with the main hook of the RBPC (single-failure proof).

This crane will be utilized only during cold shutdown conditions. The potential exists for damage to the pump or its associated piping; however, failure of these components does not result in a loss of safe shutdown capability.

TABLE 4-1 (Cont)

MARK NO. 2MHS-CRN7
(Outboard MSS and FWS Valves)

Impact Area: Reactor Building - Main Steam Tunnel
Location: At El 261 ft 0 in, Azimuth 0°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
2MSS*HYV 7A, 7B 7C, and 7D	261 ft, 0 in	2 1/2-in Ø electrical conduit MSS-750-170-2	F
2FWS*AOV23A and 23B	261 ft, 0 in	MSS lines for valves	F
2FWS*MOV21A and 21B	261 ft, 0 in	WCS-008-89-1	F

TABLE 4-1 (Cont)

MARK NO. 2MHR-CRN65
(Main Steam Safety Relief Valve Removal)

Impact Area: Reactor Building - Primary Containment
Location: At El 305 ft 9 in, Azimuth 240° to 105°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
PSV Valves (PSV-120 to PSV-137)	296 ft, 6 in	2-ISC-750-107-2	F
		2-IAS-150-727-3	F
		2RHS-012-125-1	B
		2-MSS-026-43-1	F
		2-MSS-026-44-1	F
		2-MSS-026-45-1	F
		2-MSS-026-46-1	F

Nine Mile Point Unit 2

TABLE 4-1 (Cont)

MARK NO. 2MHR-CRN66
(PSV Valves and CRD Cart Removal)

Impact Area: Reactor Building - Primary Containment
Location: At El 261 ft 0 in, Azimuth 135° to 231°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
PSV Valves and CRD Cart	261 ft, 0 in	2-ICS-010-70-1	F
		2ICS*MOV128	F
		2-CCP-003-343-3	F
		2-CCP-003-344-3	F
		2MSS-026-43-1	F
		2MSS-026-44-1	F
		2CX999GF1-1 1/2" 2CK993NA-3"	F

Nine Mile Point Unit 2

TABLE 4-1 (Cont)

MARK NO. 2MHR-CRN67
(MSS Isolation Valves)

Impact Area: Reactor Building - Primary Containment
Location: At El 261 ft 0 in, Azimuth 315°

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
2MSS*HVY 6A, 6B, 6C, and 6D	261 ft, 0 in	2-FWS-024-031-1	F
		2-FWS-024-032-2	F
		2MSS-026-43-1	F
		2MSS-026-44-1	F
		2MSS-026-45-1	F
		2MSS-026-46-1	F

TABLE 4-1 (Cont)

MARK No. 2MHS-CRN2, 3, and 4
(Emergency Diesel Generator)

Impact Area: Emergency Diesel Generator Building
Location: El 261 ft 0 in

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
Any Diesel Component, Maintenance Tool, or Auxiliary Equipment	261 ft, 0 in	2EGS*EG1	F*
		2EGS*EG2	F*
		2EGS*EG3	F*

*The only time when the load will be over safety-related equipment would be when the diesel generator is down and being serviced. The overhead crane structure is being recertified for seismic qualification. An alarm system with light will alert operator when the crane is out of the stored position.

TABLE 4-1 (Cont)

MARK NO. 2MHW-CRN1

Impact Area: Screenwell Building
Location: Above Service Water Pump Bays

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
Service Water Pump Motors	224 ft, 0 in	Service water pumps and piping	B
Circulation Water Pumps	231 ft, 9 in	Service water pumps and piping	C*
Circulation Water Pump Motors	239 ft, 4 in	Service water pumps and piping	C*
Feedwater Heater Tube Bundles	280 ft, 0 in	Service water pumps and piping	C*
Stop Logs	261 ft, 0 in	Service water pumps and piping	C*

*Administrative procedures will prevent crane travel over safety-related equipment. See Safe Load Path Drawing (Figure 5-3).

Nine Mile Point Unit 2

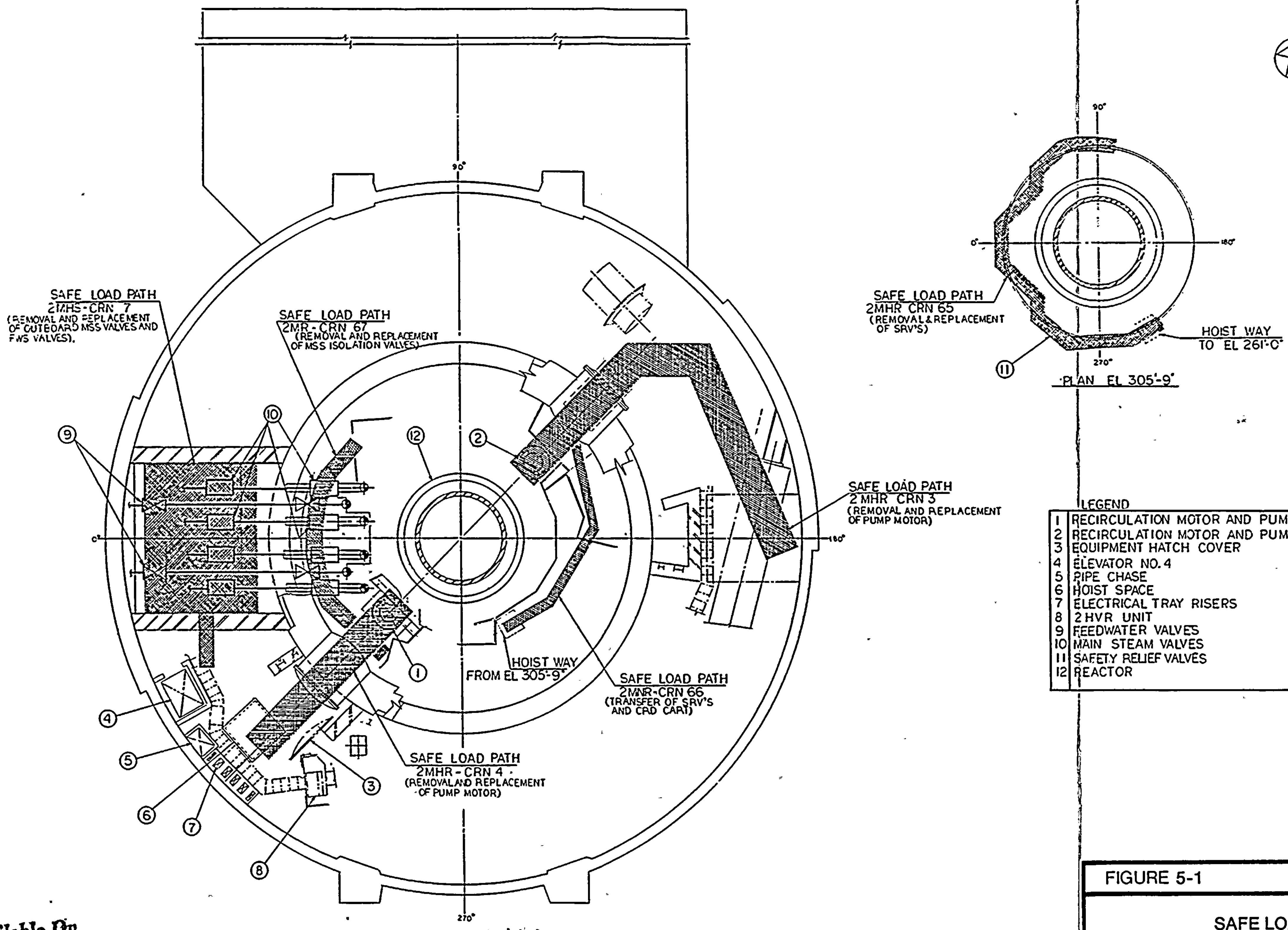
TABLE 4-1 (Cont)

MARK NO. 2MHS-CRN-6

Impact Area: Screenwell Building
Location: Intake and Discharge Shaft Area

Load	Elevation	Safety-Related Equipment	Hazard Elimination Category
Stop Log(s)	261 ft, 0 in and 285 ft, 0 in	2SWP*MOV30A	C*
		2SWP*MOV30B	C*
		2SWP*MOV77A	
		2SWP*MOV77B	C*
		SWP Piping	

*Operating procedures will restrict crane travel over safety-related equipment. See Safe Load Path Drawing (Figure 5-3).



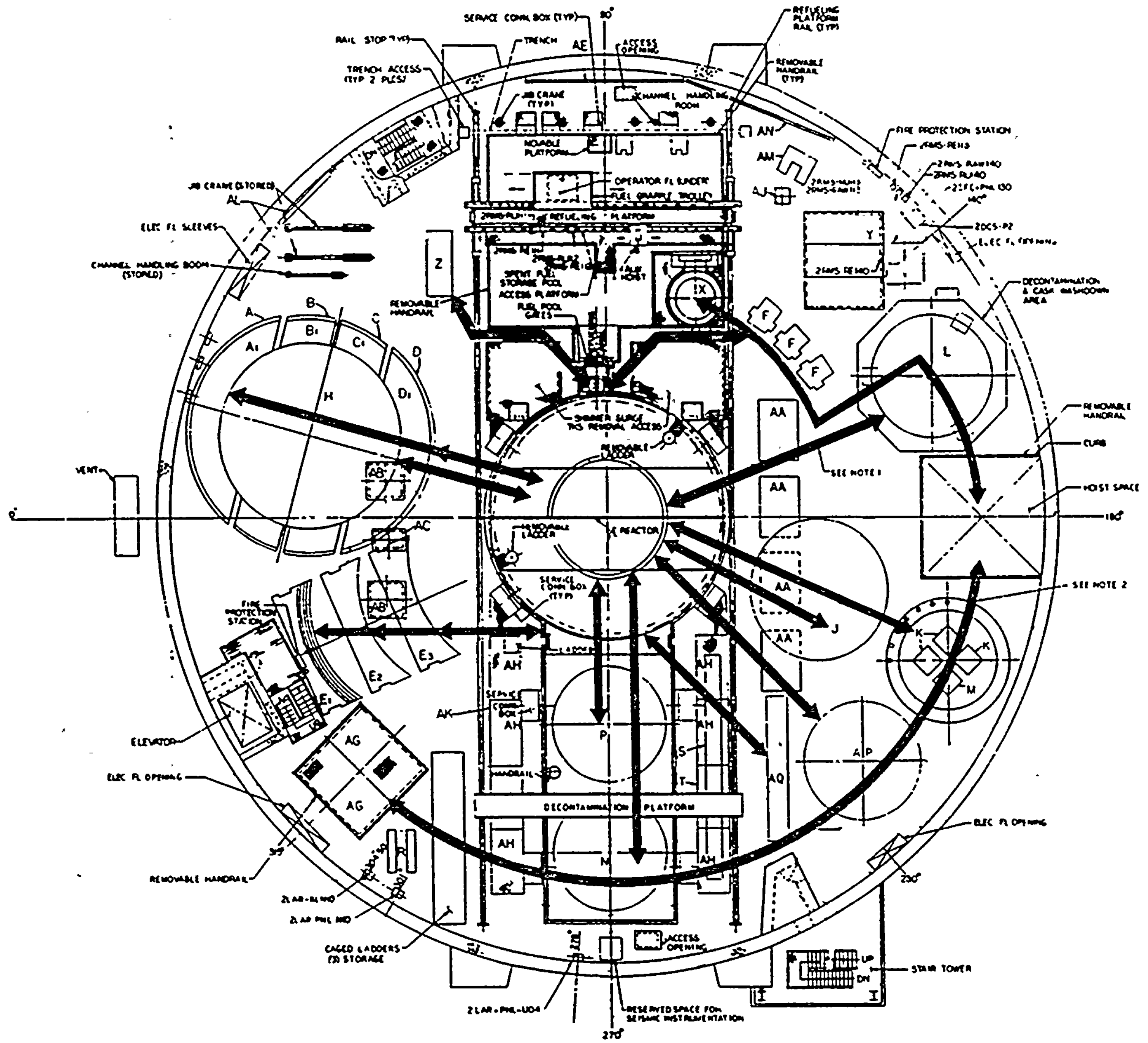
LEGEND

1	RECIRCULATION MOTOR AND PUMP 2RCS*PIB
2	RECIRCULATION MOTOR AND PUMP 2RCS*PIA
3	EQUIPMENT HATCH COVER
4	ELEVATOR NO. 4
5	PIPE CHASE
6	HOIST SPACE
7	ELECTRICAL TRAY RISERS
8	2 HVR UNIT
9	FEEDWATER VALVES
10	MAIN STEAM VALVES
11	SAFETY RELIEF VALVES
12	REACTOR

FIGURE 5-1

SAFE LOAD PATHS FOR HEAVY LOADS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
THE CONTROL OF HEAVY LOADS AT NMP2



PLAN EL 353'-10"

MARK	NO. REQ'D	DISMANTLING AND LAYOUT LIST
A	1	REACTOR SHIELD PLUG
B	1	REACTOR SHIELD PLUG
C	1	REACTOR SHIELD PLUG
D	1	REACTOR SHIELD PLUG
A1	1	REACTOR SHIELD PLUG
B1	1	REACTOR SHIELD PLUG
C1	1	REACTOR SHIELD PLUG
D1	1	REACTOR SHIELD PLUG
E1,2,3	2	STORAGE POOL PLUGS
F	3	REFUELING CANAL PLUGS
H	1	DRYWELL HEAD
J	1	REACTOR VESSEL INSULATION
K	3	REACTOR NUT & WASHER RACKS
L		REACTOR VESSEL HEAD
M	1	REACTOR HEAD STUD RACK
N	1	STEAM DRYER
P	1	STEAM SEPARATOR
R	1	PRIMARY AND REDUNDENT LIFTING RIGS
S	1	FLUX MONITOR SHIPPING CRATE
T	1	INSTRUMENT STRONGBACK STORAGE PIT
U	4	REACTOR STUD TENSIONER
X	1	SPENT FUEL SHIPPING CASK STORAGE AREA
Y	1	NEW FUEL STORAGE VAULT
Z	1	PORTABLE HFR SHIELDING BAGS STOR AREA
AA	4	WCS FILTER DEMINERALIZER ACCESS PLUGS
AB	2	SFC FILTER REMOVAL PLUGS
AC	1	SFC DEMINERALIZER REMOVAL PLUG
AE	1	SPENT FUEL RACK DISPLAY BOARD
AG	2	REMOVABLE HOIST PLATE GRATINGS
AH	8	REMOVABLE PLATE GRATINGS
AJ	1	PIPE CHASE ACCESS COVER PLATE
AK	1	ELECTRICAL CABLE STORAGE
AL	1	FUEL SUPPORT GRAPPLE
AM	1	NEW FUEL INSPECTION STAND
AN	1	NEW FUEL RACK DISPLAY BOARD
AP	1	REACTOR SERVICE PLATFORM
AQ	1	STORAGE POOL GATE

NOTE

1 SAFE LOAD PATHS ARE SHOWN BY DOUBLE ENDED ARROWS AND DEFINE PATH BETWEEN NORMAL POSITION AND LAYDOWN POSITION OF LOAD HANDLED FOR DESCRIPTION OF LOAD HANDLED SEE DISMANTLING AND LAYOUT LIST

2 LOAD PATH BETWEEN HOIST AREAS WILL BE ROUTINELY USED FOR EQUIPMENT REPLACEMENT DURING PLANT SHUTDOWN PERIODS.

3 ALL LOAD PATHS SHOWN ON THIS DRAWING DEFINE LOAD LIFTS THAT USE 125 TON NO 3 MAIN HOIST

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FIGURE 5-2

SAFE LOAD PATHS
FOR HEAVY LOADS REFUELING FLOOR

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
THE CONTROL OF HEAVY LOADS AT NMP2

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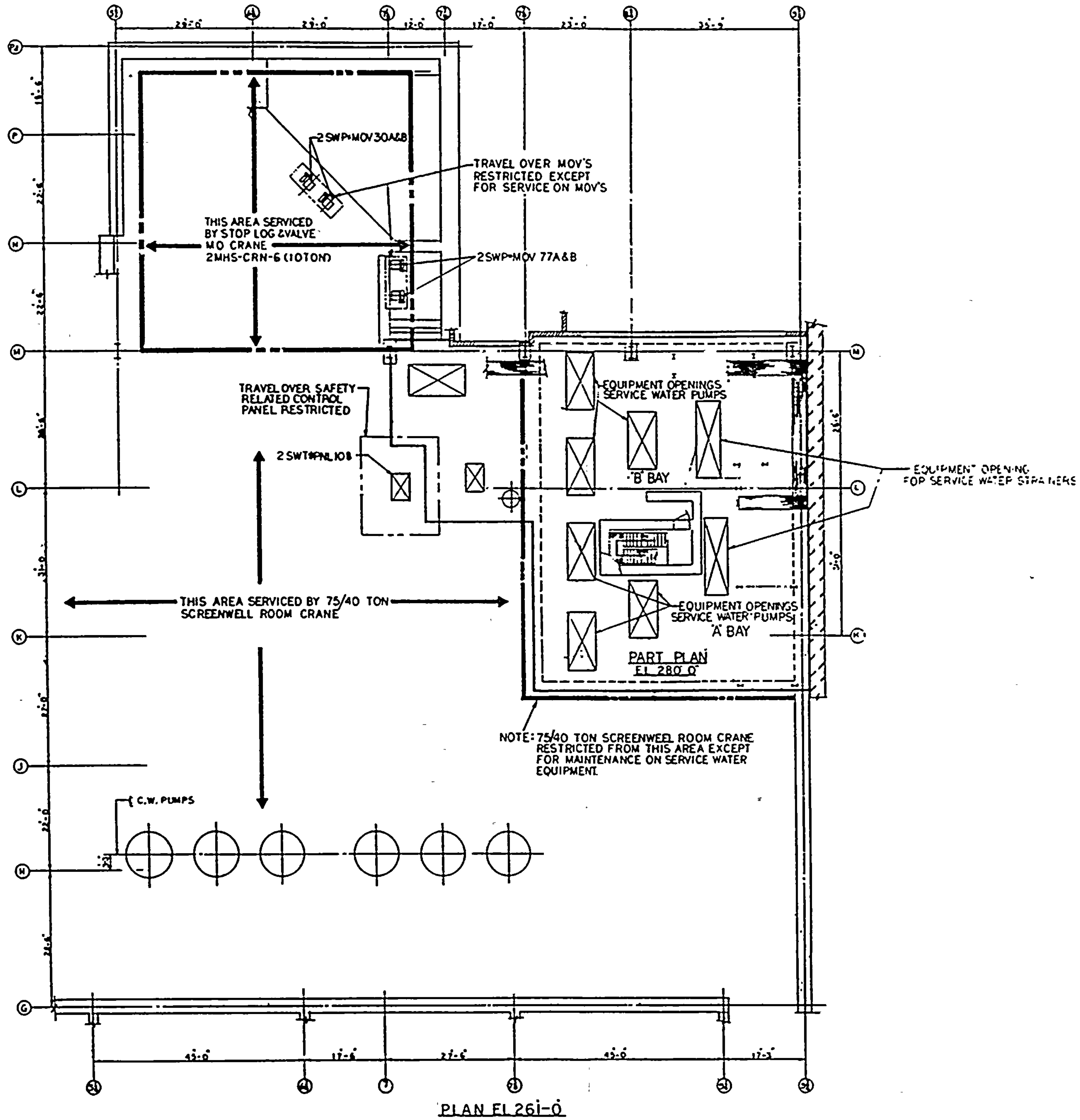

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FIGURE 5-3

SAFE LOAD PATHS
SCREENWELL BUILDINGS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
THE CONTROL OF HEAVY LOADS AT NMP2

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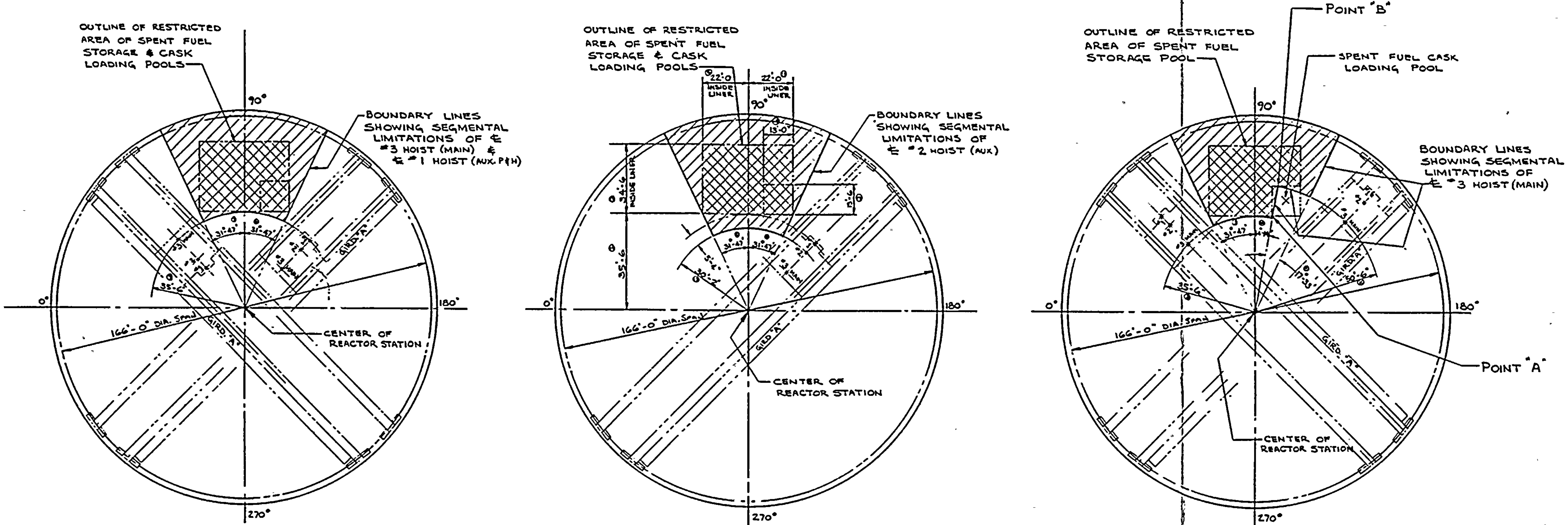

PLAN VIEW I

SELECTOR SW. "A" & "B" ON "NORMAL RESTRICTION" POSITION

(THIS VIEW SHOWS AREA OF RESTRICTION FOR #1 HOIST (AUX. P&H) AND #3 HOIST (MAIN))

PLAN VIEW II

SELECTOR SW. "A" & "B" ON "NORMAL RESTRICTION" POSITION

(THIS VIEW SHOWS AREA OF RESTRICTION FOR #2 HOIST (AUX) ONLY)

PLAN VIEW III

SELECTOR SW. "B" ON BY-PASS POSITION FOR "#3 HOIST (MAIN)"

(SELECTOR "A" ON "NORMAL RESTRICTION" POSITION)

FIGURE 5-4

CRANE RESTRICTED AREA
SHEET 1 OF 2

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
THE CONTROL OF HEAVY LOADS AT NMP2

CRANE OPERATION DATA

A key operated two selector (single key) switch is located on the radio transmitter and on the pendant push button station.

Selector "A" ---Three positions labled:
1) --"Normal Restriction"
2) Key operated by-pass ----"#1 hoist (aux. P & H)"
3) Key operated by-pass ----"#2 hoist (aux. - 25 Ton)"
Key is removable in the "normal restriction" position only.

Selector "B" ---Two positions labled
1) - "Normal Restriction"
2) Key operated by-pass ---"#3 hoist (main)"
Key is removable in the "normal restriction" position only.

(Note: - To select any key operated by-pass position on either selector, the corresponding selector switch will be in the "normal restriction" position.)

I Selector switch "A" and "B" in "normal restriction" position; bridge and trolley travel will be as follows:
(see plan view I & II)

Bridge Travel Restriction

With the trolley at either end of bridge, and with trolley proximity switch in the tripped position; any bridge motion from either direction which would position hooks over restricted area, will trip the bridge proximity switch and in conjunction with the trolley switch de-energize all crane motions and set brakes. The bridge will come to rest with the center line of hooks at the edge of a circular segmental section determined by the center of reactor station to either inner corner of the pool areas.

Trolley Travel Restriction

With either end of the bridge positioned over the restricted area; and with bridge proximity switch in tripped position, any trolley motion which would position hooks over the restricted area, will trip the trolley proximity switch and in conjunction with the bridge switch, de-energize all crane motions and set brakes. The trolley will come to rest with either the center line #3 hook (main) or the center line #1 hook (aux.) (depending upon which end of the bridge is positioned over the restricted area) on the inner arc line of a segmental section determined by the minumum distance from the center of reactor station to the nearest edge of the storage pool area.

To restore crane operation and resume motion with selectors in "normal restriction" position the following is required:

(a) - Insert key in selector "A" switch and select either #1 hoist (aux) or #2 hoist (aux) (2) by-pass position.
(b) - Re-start crane and back out trolley, or rotate bridge to re-set proximity limit switch.
(c) - Return selector "A" to "normal restriction" position and remove key.
(d) - Bridge and/or trolley may now continue travel in normal unrestricted areas.

II Selector "A" in key operated position "#1 hoist (aux. P & H)" (Selector "B" will be in "normal restriction" position.)

This position will allow un-restricted operation of the #1 hoist (aux P & H) in all areas of the station. This includes those areas of the spent fuel storage and cask loading pools. (#3 hoist (main) and #2 hoist (aux) will be inoperable.)

III Selector "A" in key operated position "#2 Hoist (aux)"(Selector "B" will be in "normal restriction" position.)

This position will allow un-restricted operation of the #2 hoist (aux) in all areas of the station. This includes those areas of the spent fuel storage and cask loading pools. (#3 hoist (main) and #1 hoist (aux P & H) will be inoperable.

IV Selector switch "B" in key operated position "#3 hoist (main)", bridge and trolley travel will be as follows:
(Selector "A" will be in "normal restriction" position and #1 hoist (aux P & H) and #2 hoist (aux) will be inoperable. See plan view III.)

Bridge Travel Restriction

With the trolley at either end of bridge and with trolley proximity switch in tripped position; any bridge motion from either direction which will position #3 main hook over the restricted spent fuel storage pool area, will trip the bridge proximity switch, and in conjunction with the trolley switch, de-energize operable crane motion and set brakes. The bridge will come to rest with the center line of #3 main hook at edge of a circular segmental section determined by the center of reactor station to either inner corner of the pool areas Hook has access to the cask loading pool area. Limitations of this area will be determined by a line from the center of reactor station to the inner corner of the cask loading pool (point A), and by an arc line determined by the distance from the center of reactor station to the far edge at (point B) of the cask loading pool.

Trolley Travel Restrictions

With either end of the bridge positioned over the restricted spent fuel storage pool area, and with the bridge proximity switch in tripped position, any trolley motion which would position the #3 main hook over the storage pool area, will trip the trolley proximity switch and in conjunction with the bridge switch, de-energize operable crane motions and set brakes. The trolley will come to rest with the center line of main hook at the edge of an arc line determined by the minimum distance from the center of reactor station to the edge of the spent fuel storage pool; in the area of the cask loading pool, the hook will be at edge of an arc line determined by the distance from the center of the reactor station to the far edge at (point B) of the cask loading pool.

To restore crane operation and resume motion with selector in "#3 hoist (main)" position, the following is required:

(a) - Return selector "B" to "normal restriction" position. Remove and insert key in selector"A" and place selector in either "#1 hoist (aux P & H)" or "#2 hoist (aux)(1) by-pass position.
(b) - Re-start crane, back out trolley, or rotate bridge to re-set proximity limit switch.
(c) - Return selector "A" to "normal restriction" position, remove and insert key in selector "B" and again place selector in "#3 hoist (main)" position.
(d) Bridge and/or trolley may now continue travel again in all areas except the spent fuel storage pool area.

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FIGURE 5-4

CRANE RESTRICTED AREA
SHEET 2 OF 2

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
THE CONTROL OF HEAVY LOADS AT NMP2

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SECTION 6

LIFTING DEVICES

The following specially designed lifting devices consist of primary and redundant strongbacks and sling assemblies. They are single-failure proof in accordance with NUREG-0554. The design approach for these devices is consistent with the design criteria contained in ANSI N14.6. Quality Assurance program requirements in compliance with the provisions of 10CFR50, Appendix B and supplementary Quality Assurance requirements were mandatory in the purchase specification. Critical items are identified as QA Category I components.

1. Lifting Rig Arrangement for Drywell and Vessel Heads
2. Lifting Rig Arrangement for Insulation Support Frame
3. Lifting Rig Arrangement for Steam Dryer
4. Lifting Rig Arrangement for Steam Separator
5. Lifting Rig Arrangement for Transfer Bridge
6. Lifting Rig Arrangement for Service Platform
7. Lifting Rig Arrangement for Shield Plugs

Nine Mile Point Unit 2

SECTION 7

VERIFICATION OF TESTING, INSPECTION, AND MAINTENANCE

Procedures will be written and approved for inspection, testing, and maintenance of the reactor building polar crane and those cranes identified in Item 2.1-1. These cranes will be inspected, tested, and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976 with the exception that tests and inspection will be performed prior to use where it is not practical to meet the frequency of ANSI B30.2 or where frequency of crane use is less than the specified inspection and test frequency.

SECTION 8

VERIFICATION OF CRANE DESIGN

8.1 INTRODUCTION

The reactor building polar crane (RBPC) has been designed for Class A1 standby service in accordance with Crane Manufacturers' Association of America (CMAA) Specification No. 70 and the mandatory requirements of ANSI B30.20 in addition to the technical requirements of SWEC Specification No. NMP2-251P. The RBPC is seismic Category I. The crane is designed for the following rated loads:

- No. 1 Auxiliary Hoist — 1/2-ton
- No. 2 Auxiliary Hoist — 25-ton
- No. 3 Main Hoist — 125-ton
- Crane Trolley — 125-ton
- Crane Bridge — 125-ton

The main hoist is designed to provide a dual loading path so that the single-failure of any component shall not result in loss of the lifted load. The single-failure system criteria also applies to the hoist electrical system. The hoist motor is a 75 hp dc shunt motor. The alternating power supply is rectified to supply the motor with dc power. The dc hoist controls are provided with phase loss and phase reversal protection.

The redundant main hoist system consists of a dual path through the hoist gear train, the reeving system, and the hoist load block along with restraints at critical points to provide load retention and to minimize uncontrolled motions of the load upon failure of any single hoise component. The system includes the complete gear trains connecting the hoist motor to the hoist drum, while the main hook is used for handling the spent fuel cask; positive interlocks are provided which prevent the transfer path of the cask to be over the spent fuel storage pool but still allow the hook to lower the cask into its proper position in the spent fuel loading pool.

The auxiliary hoists also have positive interlocks which prevent their transfer paths to be over the spent fuel storage pool. Overrides of these interlocks will be covered by special administrative procedures. The auxiliary hoists can also be placed in operable modes by use of key-operated selector positions. The operating modes of these hoists will also be controlled by administrative procedures.

8.2 DIFFERENCES BETWEEN UNIT 2 DESIGN AND NUREG 0554

A thorough evaluation was made between the RBPC design features and those recommended in NUREG 0554. The RBPC main hoist as designed contains all the major safety features recommended by NUREG 0554 to quality as single-failure proof. The following section provides a detailed summary of the differences between the RBPC design and NUREG 0554 recommendations.

The significant differences between the Unit 2 design and NUREG 0554 are as follows:

a. NUREG Section 2.2 requires a 15-percent design margin for wear-susceptible components.

   Evaluation

   All wear susceptible components, except the lifting eye thrust bearing have greater than a 15 percent design margin. The lifting eye thrust bearing has a 4 percent design margin. However, failure of this component will not result in a load drop.

b. NUREG Section 2.4 specifies impact tests for materials over 1/2 in. The specification requires impact tests for materials over 5/8-in thick.

   Evaluation

   ASME Section III, NC-2300, requires impact tests for materials greater than 5/8-in thick; the Unit 2 specification is consistent with this requirement.

c. NUREG Section 4.1 specifies a cable safety factor of 10 to 1 dynamic. The specification requires a cable safety factor of 10 to 1 static.

   Evaluation

   The dynamic safety factor of the crane when considering the maximum critical load (MCL) to be 120 tons is slightly under 9.6 to 1. This conservative design more than surpasses requirements to sustain the dynamic effects of load transfer due to the loss of one of the two independent rope systems. An ample design margin will still exist in the remaining rope system of eight parts supporting the load.

d. NUREG Section 4.3 specifies load attachment points to be designed for three times the load to be handled, static plus dynamic. The specification requires the load attachment points to be designed for three times the static load to be handled.

<u>Evaluation</u>

A design factor margin study and a main hoist load block design study were made to verify the safety of the RBPC design. For the main hoist load blocks study the structural components were reviewed for a 138-ton load (MCL plus 15 percent). The resulting stresses were less than 1/3 the minimum yield strength of the respective materials.

e. NUREG Section 4.6 specifies that lift beams and lifting devices be designed for three times the load, static plus dynamic. The specification requires three times the static load.

<u>Evaluation</u>

The lifting rigs and sling assemblies were designed for three times the static load times 1.05. The calculated stresses were less than the minimum yield strength of the respective materials. See Section 6 for further details on the design of these devices.

f. NUREG Section 5.1 specifies the bridge speed not to exceed the slow recommendation of CMAA, which is 50 ft/min. The Unit 2 crane's bridge span is designed to be 75 ft/min.

<u>Evaluation</u>

The RBPC design includes crane bridge inching motors with a speed of 2 ft/min. The 75 ft/min normal operating speed satisfies the moderate speed recommendation of CMAA-70. With these features the intent of NUREG 0554 is met.

g. NUREG Section 8.5 specifies that the MCL be marked on the crane. The specification uses maximum working load (MWL).

<u>Evaluation</u>

The MCL will be identified on the RBPC.

h. NUREG Section 9.0 specifies that the operating manual give the margin for degradation of wear-susceptible components.

Evaluation

This is an administrative requirement which will be covered in the Inspection Procedures detailed in Section 7. These procedures will be in compliance with ANSI B30.2.0.

i. NUREG Section 10.0 specifies that crane operator qualification be addressed.

Evaluation

Section 9 covers crane operator qualifications.

8.3 RBPC LOSS OF POWER AND FAILURE MODES AND EFFECTS ANALYSIS

With regard to the NRC's December 19, 1983, Clarification to Generic Letter 81-07, concerning electrical circuitry and phase loss of a single-failure proof crane, the dc hoist controls of the Unit 2 reactor building polar crane, Mark No. 2MHR-CRN1, are specifically provided with phase loss protection as well as phase reversal protection.

Inherently, the crane's dc hoist controls are provided with a fail-safe design such that power is removed from the hoist motor and the holding brakes applied upon any of the following contingencies:

- Opening of an ac phase
- Loss of ac fuses
- Loss of voltage
- Loss of regenerative power capability
- Loss of motor field
- Loss of dc fuse

Additionally, the crane's dc hoist controls are provided with a torque check, which prevents the hoist holding brakes from being released until the motor field is energized and armature current is flowing.

8.4 CRANES OTHER THAN RBPC

a. Cranes 2MHR-CRN3, 2MHR-CRN4, and 2MHS-CRN7 were designed so that the trolleys and crane bridges cannot be dislodged during an earthquake, in combination with SRV

and LOCA phenomenona. The design of the single girder underhung motor-operated bridge crane includes the requirements of CMAA Specification No. 70 and all the mandatory requirements of ANSI B30.11. The design of the wire rope hoists and trolleys include the requirements of HMI-100 and the mandatory requirements of ANSI B30.16 in addition to the technical requirements of SWEC Specification No. NMP2-P251W.

b. The 75-ton screenwell area crane, 2MHW-CRN1, is designed in accordance with the requirements of CMAA Specification No. 70 and ANSI B30.2.0 in addition to the technical requirements of SWEC Specification No. NMP2-P251C.

c. The wire rope hoists and trolleys of jib cranes 2MHF-CRN1, 2, and 3 include the requirements of HMI-100 and the mandatory requirements of ANSI B30.16 in addition to the technical requirements of SWEC Specification No. NMP2-P251Z.

d. 2MHR-CRN61, CRN65, CRN66, and CRN67 monorail hoist systems have been designed in accordance with the mandatory requirements of HMI-100 and ANSI B30.16 in addition to the technical and seismic requirements of SWEC Specification No. NMP2-P251R.

e. The remaining monorail hoist systems have been designed in accordance with all of the mandatory requirements of ANSI B30.16 in addition to the technical requirements of SWEC Specification No. NMP2-P251K. Hand-operated chain hoists and trolleys include the requirements of HMI-200.

SECTION 9

OPERATOR TRAINING, QUALIFICATION, AND CONDUCT

Unit 2 uses lesson guides to train crane operators. These lesson guides ensure proper and safe operation of floor-operated overhead cranes in accordance with ANSI B30.2-1976. The crane operator program ensures that the recommendations of ANSI B30.2-1976, Chapter 2-3, are adequately included. The current crane operator training program includes the requirements for a practical operating examination. This practical examination is given after the operator undergoes detailed classroom instruction. In addition, the operator is required to meet certain physical qualifications before qualifying to train as a crane operator. These physical qualifications are consistent with ANSI B30.2-1976.

QUESTION F430.1 (8.2.1)

Section 8.2.1 does not specify transmission line lengths to the Scriba substation, nor does it include layout and right-of-way drawings. Provide these drawings or a date by which they will be supplied.

RESPONSE

Section 8.2.1 has been modified to include transmission line lengths to the Scriba substation.

See Figure 430.1-1 for layout and right-of-way drawing. 10

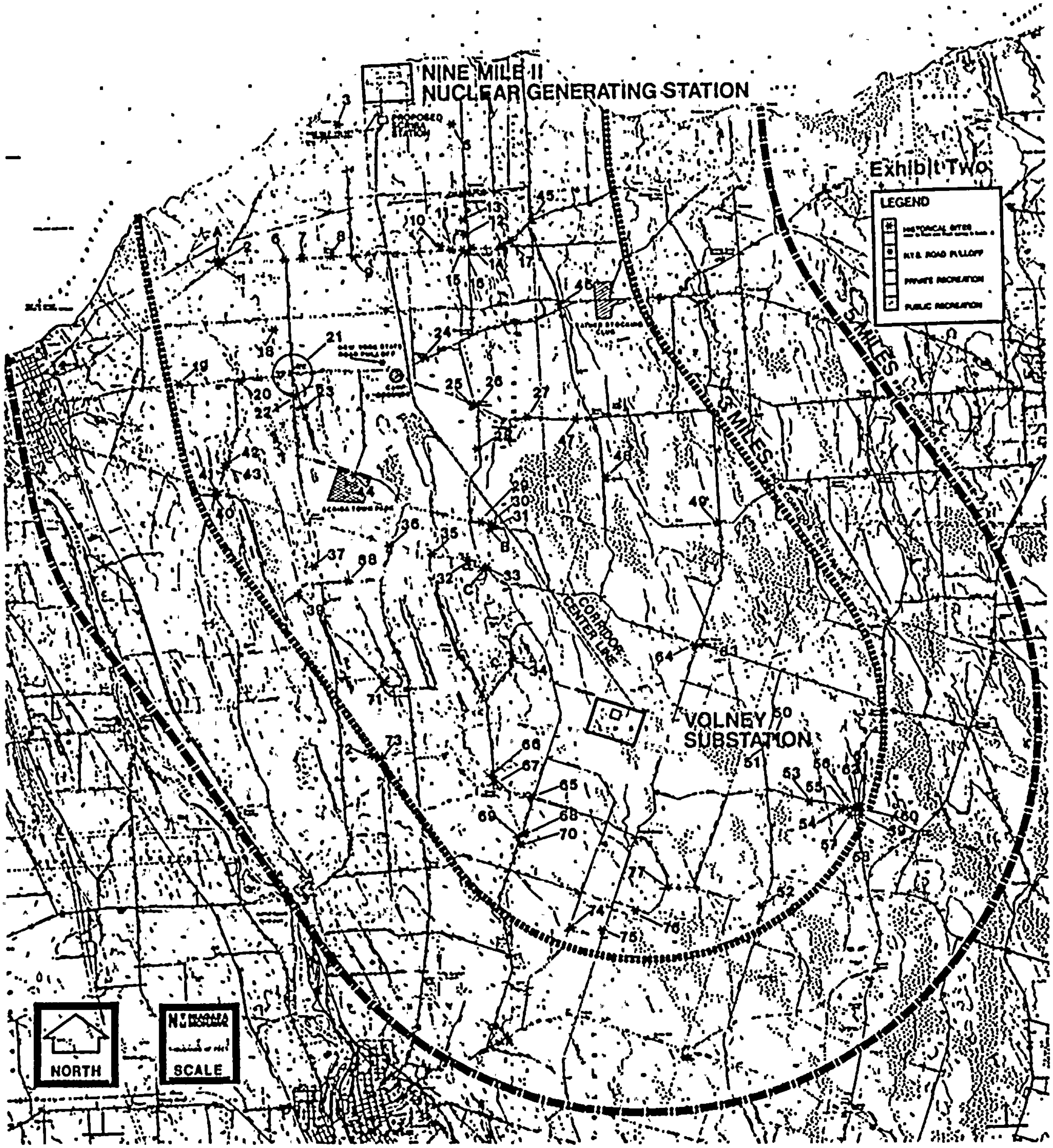


FIGURE 430.1-1

UNIT 2 — VOLNEY TO UNIT 2
TRANSMISSION RIGHT OF WAY

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

QUESTION F430.2 (SRP 8.2)

The staff understands that the configuration of the offsite power circuits will be changed from that which is currently described in the FSAR. Accordingly, provide an FSAR amendment which includes:

a. A revised Figure 8.2-1 and narrative description of the new offsite power circuit configuration.

b. Drawings of the physical orientation of the offsite circuits around the Nine Mile Point and Fitzpatrick Power Stations. Suggest using Figures similar to 2.1-2 and 2.1-3.

c. Drawings which show tower spacing for lines which share a common right of way.

d. Steady state and transient stability analyses results for the new offsite configuration including the loss of the largest capacity to the grid or removal of the largest load from the grid.

RESPONSE

See revised Sections 8.1 and 8.2. A tower spacing drawing is not provided since the 115 kV is not on a common right-of-way. See Figure 430.7-1. 8

NIAGARA MOHAWK WILL COMMIT TO:

1) CHANGE FSAR TO REFLECT 8 BREAKER SCHEME

2) ADD A FOOTNOTE ON CONTROL (DUCTBANK) OF THE 115/345 ON ONE LINE DRAWING TO SHOW SEPARATION BETWEEN ALTERNATE SCHEMES.

3) Provide a WRITE UP IN TEXT ON A & B BREAKERS ALTERNATE PROTECTIVE SCHEME.

4) WILL ADD DIMENSIONS BETWEEN TRANSFORMERS

5) ~~[illegible]~~ Indicate that THE ORIGINAL STABILITY ANALYSIS IS APPLICABLE TO THE NEW SCHEME. ~~[illegible]~~

[illegible]

QUESTION F430.3 (SRP 8.1.8.2)

Provide information and a discussion of grid availability, including the frequency, duration, and causes of outages as required by R.G. 1.70.

RESPONSE

NMPC's records indicate that there has been one trip of the Nine Mile-Volney No. 9 line since its original energization, occurring on May 17, 1983, at 10:41 am. Power was restored immediately, and the cause is unknown. There are no records on any other lines because these lines in and out of Scriba Station are new and have no record of operation. A study performed on the central region (including the Unit 2 transmission system) of the NMPC service area has shown 58 trips on 6,100 year-miles of 345-kV lines over a 15-yr period. This results in 0.0095 unplanned trips per mile per year. These trips include all unplanned events, including the following: |11

1. Lighting strikes.

2. Equipment failures.

3. System disturbances.

It should be noted that the experienced trip rate (0.0095) from all unplanned sources is less than the design value for lighting strikes of 0.0117 unplanned trips per mile per year.

Refer to Question 2

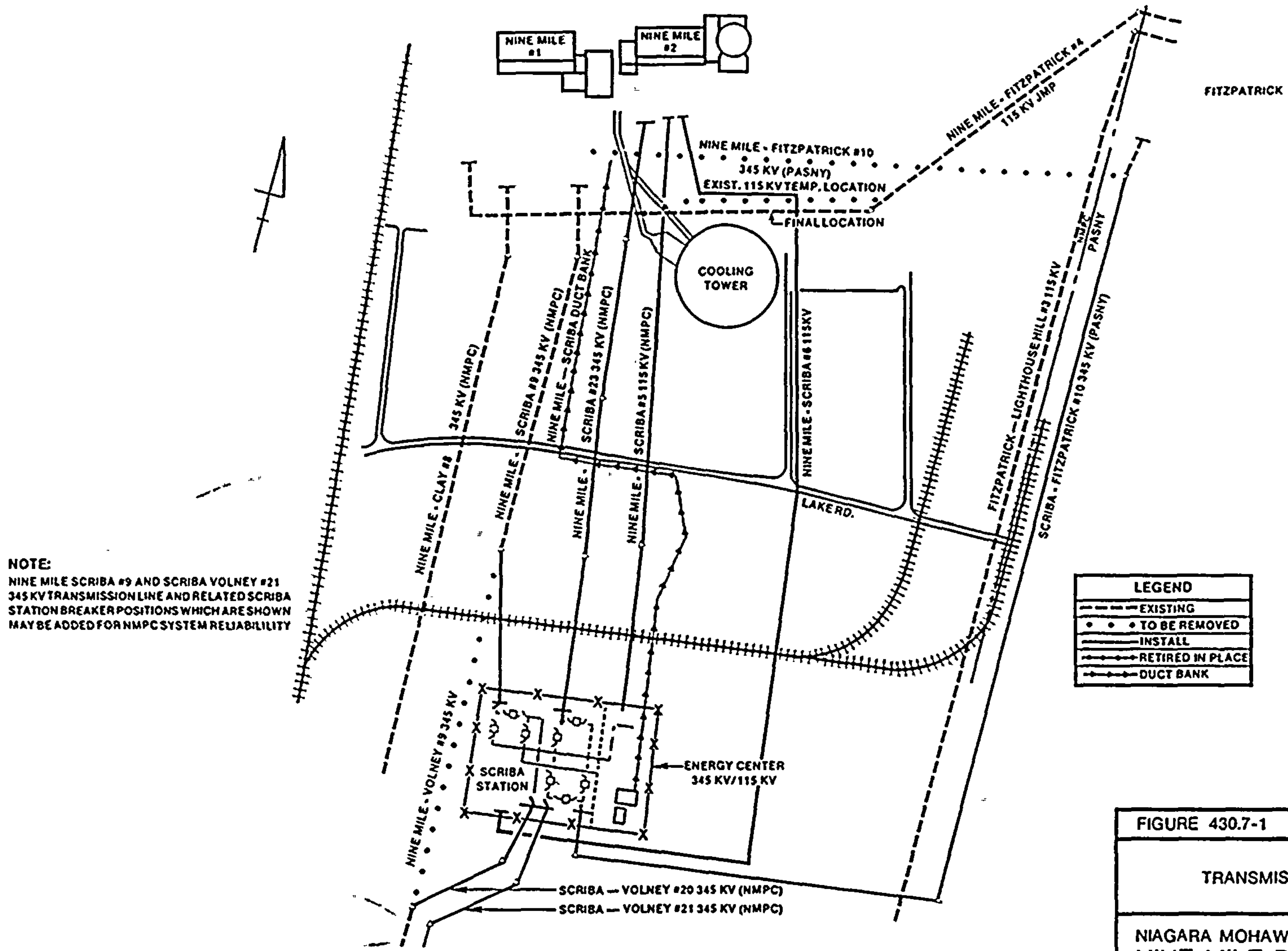


FIGURE 430.7-1

TRANSMISSION PROJECT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

QUESTION F430.7 (SRP 8.2)

Describe the routing and separation between the offsite circuits from the 115-kV switchyard to the Class 1E buses.

RESPONSE

Source A, designated as the Nine Mile-Scriba No. 5 circuit, exits the north side of the Scriba Station and is routed in a northerly direction to a termination structure in the Unit 2 switchyard. Source B, designated as the Nine Mile-Scriba No. 6 circuit, exits the south side of the Scriba Station and is routed in an easterly direction for approximately 1,000 ft and then northerly to a termination structure in the Unit 2 switchyard. A distance of approximately 500 ft is maintained between these circuits until they approach their respective termination structures in the Unit 2 switchyard. Figure 430.7-1 details the routing of these 15-kV circuits. 8

PSB Comments

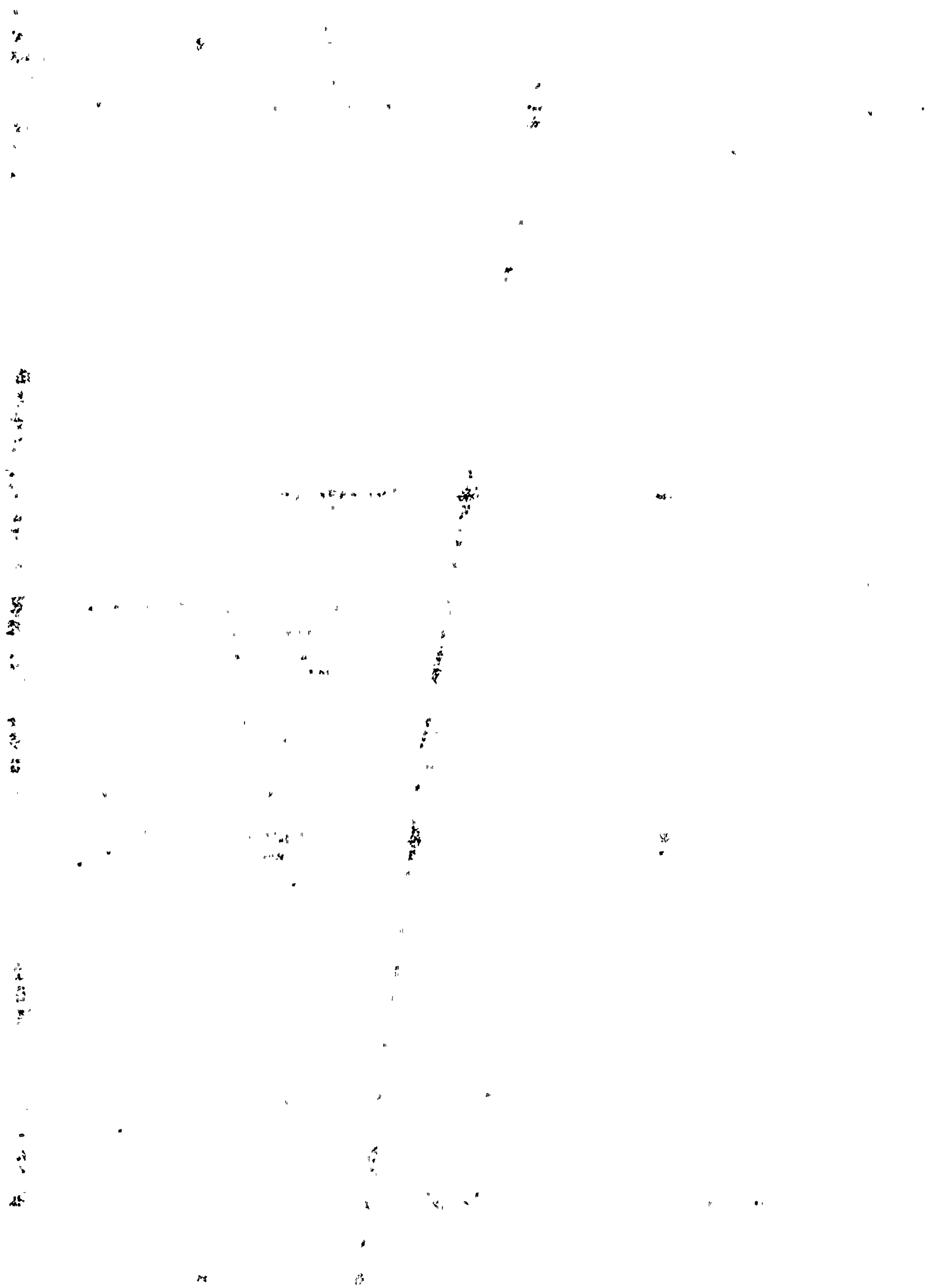
a) Describe the separation between the 345/115 kV transformers at Scriba substation. Are they located on the north and south sides of the Scriba substation with their respective transmission lines? They should be separated in accordance with GDC-17.

b) Describe the routing of the offsite circuits between the NMP-2 115 kV switchyard through the plant to their termination at the 4160 V safety buses. The routes should be separated.

Response To PSB Comments

a) See response To PSB comments on Q430.02, and revised section 8.2.1.4.

b) See revised section 8.2.1.4



switchyard. Reserve station service transformer 2RTX-XSR1B, energized from the offsite Power Source B, feeds Division II of the onsite emergency distribution system through its 4.16-kV tertiary winding; its 13.8-kV secondary winding serves as backup source for the plant nonsafety-related power distribution system. The auxiliary boiler transformer, normally energized from the offsite Source A, feeds the auxiliary boiler and associated loads through its 13.8-kV secondary winding; its 4.16-kV tertiary winding provides a backup source for Divisions I or II of the emergency power distribution system. Bus sectionalizing disconnect switch 2YUC-MDS20 is normally open, maintaining separation between the two offsite sources. add ATTachment-A

Under normal operating conditions, reserve station service transfer 2RTX-XSR1A and auxiliary boiler transformer 2ABS-X1 are energized from the 115-kV Scriba Substation source; reserve station service transformer 2RTX-SXR1B is energized from the 115-kV James A. FitzPatrick Substation source; and normal station service transformer 2STX-XNS1 is energized from the main generator. The 115-kV disconnect switches 2YUL-MDS1, 2YUL-MDS2, and 2YUC-MDS10 are closed, and disconnect switch 2YUC-MDS20 is open. Circuit switchers 2YUC-MDS3, 2YUC-MDS5, and 2YUC-MDS4 are closed.

In case of the loss of power from Scriba Substation, transformers 2RTX-XSR1A and 2ABS-X1 can be energized from the James A. FitzPatrick Substation by operating the appropriate 115-kV disconnect switches.

In case of the loss of power from James A. FitzPatrick Substation, transformer 2RTX-XSR1B can be powered from Scriba Substation by operating the appropriate 115-kV disconnect switches.

In case of loss of power to the normal station service transformer from the main generator, its associated normal switchgear buses are automatically transferred to the reserve transformer sources. The transfer scheme is described in Section 8.3.1.

The 115-kV circuit switchers and disconnect switches are designed to operate as described below. The opening or closing of the circuit switchers or the disconnect switches is controlled by actual permissive interlocks. 7

<u>115-kV Circuit Switcher 2YUC-MDS3</u> closes when there is no electrical fault on reserve station service transformer 2RTX-XSR1A (i.e., lockout relays 86-2SPRX01 and 86-2SPRZ01 are not tripped) and the control switch for 2YUC-MDS3 on the main control panel 2CEC*PNL852 is in the CLOSE position. Circuit switcher 2YUC-MDS3 opens when an electrical fault

Attachment - A

The 4.16 KV tertiary windings of reserve station service transformers 2RTX-XSR1A and 2RTX-XSR1B, and auxiliary boiler transformer 2ABS-X1 are connected to the 4.16 KV switchgear 2NNS-SWG016, 2NNS-SWG017 and 2NNS-SWG018 respectively through separate nonsegregated phase busducts. Separate cables, routed in separate nonsafety related raceways, connect these switchgear to their respective class 1E buses.

Insert A →

The control cables associated with alternates 1 and 2 are routed in separate ducts in the switchyard and are terminated in two sections of a common panel.

430.7

Insert A

The control duckbank between Scriba Station and Unit 2 consists of two duckbanks located in the same trench separated by 5 feet of concrete. Each duckbank including manholes has control circuits associated with one alternate of the control scheme as shown on Figure 8.2-8.

Attachment-A (cont'd)

The sections are separated by a barrier. The alternate (alternate-1 and alternate 2) protection circuits for the two sources (A, B) are routed to Scriba substation via separate ducts. The alarm and position indication circuits for the two offsite sources are routed to the control room partially in separate nonsafety related raceways and partially in common nonsafety related raceways.

The Two 345KV/115KV Transformers located in Scriba Substation are located in diagonally opposite corners of the substation and are approximately 400 feet apart.

QUESTION F430.8 (SRP Appendix 8A) 1.10

Regarding the degraded voltage condition and undervoltage 1.11
relays discussed in FSAR Section 8.2.2:

a. You state that 517.5 V (90 percent of the motor 1.13
nameplate voltage of 575 V) is required at the 600 V 1.14
buses to ensure proper starting and running of all
Class 1E motors. Since 90 percent is the motor rated 1.15
voltage for continuous operation, the additional voltage 1.16
drop from the 600 V buses to the motor terminals will
result in the motors operating at less than their 1.17
continuous rated voltage. Justify this condition. 1.18
Likewise, justify the capability to start 80% rated NSSS 1.19
and MOV motors with only 80% of the motor rated voltage 1.20
up at the buses.

b. You state that from the voltage profile study the grid 1.21
voltage needed to maintian adequate station voltages at 1.22
the lowest tap of the load tap changer (LTC) is below 1.23
the normal operating range of the grid. Is this the 1.24
worst case condition? Since the sensing for the LTC is 1.25
on the 13.8 KV system, is there a lightly loaded 13.8 KV 1.26
condition which would result in the LTC being on a
higher tap and consequently worse 4.16 KV voltages?
Also, provide the results of your analysis for the 1.27
opposite condition, i.e., heavily loaded 13.8 KV system 1.28
and lightly loaded 4.16 KV system resulting in 4.16 KV 1.29
system overvoltages.

c. You state that when the auxiliary boiler transformer is 1.30
supplying the onsite emergency power distribution system 1.31
and the grid is at its normal operating minimum, the 1.32
voltage at the 600 V buses under the most severe load
conditions is 460 V (80 percent of 575 V). Per the 1.33
discussion in item (a) above justify the capability to
start NSSS and MOV motors and to operate continuously 1.34
all Class 1E motors at this low voltage.

d. Extend your analysis to include all Class 1E equipment 1.35
(not just motors) down to the 120/208 and 120/240 volt 1.36
levels, and provide the Class 1E bus voltage profiles 1.37
for steady state and transient conditions.

e. Provide a detailed description of your second level 1.38
undervoltage relay design, including setpoints; and 1.39
address each position of SRP Branch Technical Position
PSB-1.

RESPONSE See revised Section 8.2.2 1.41

REVISED WORDING

tem voltage fluctuations of 120.75 kV (105 percent) to 109.25 kV (95 percent) and secondary load fluctuations. The 4.16-kV tertiary winding voltage fluctuates in accordance with the foregoing selected tap position, primary voltage variation, and/or 4.16-kV emergency switchgear bus load condition.

Add Attachment -A.

The Class 1E motors are capable of starting at 75 percent and running at 90 percent of their rated voltage. The maximum permissible voltage drop between the 4.16-kV emergency bus and the connected load under normal running condition is 20 V, while that during motor starting is 60 V. The maximum permissible voltage drop between 600-V emergency load center buses and their connected loads under normal operating conditions is 12 V; for the motor control centers, 5 this is generally broken up as 4 V between the load center and the motor control center (MCC) and 8 V between the MCC and the motors. However, for MCC feeders having longer ca- 5 ble lengths, the voltage drops from 600-V load centers to the MCC and from the MCC to the motor are redistributed within the framework of the total voltage drop limitation of 12 V. The voltage profile study of the plant electrical power distribution system shows that with the preceding criteria for the permissible voltage drops, the minimum voltage that will ensure proper starting and running of all Class 1E motors at the 4.16-kV and 600-V level are: 1) 460 V (80 percent of the motor name plate voltage of 575 V) at 600-V buses during the most severe motor starting condition at the 4.16-kV bus with the 4.16-kV bus loaded, and 2) 517.5-V (90 percent of the motor name plate voltage of 575 V) at the 600-V buses under full load condition of the 4.16-kV bus.

From the voltage profile study, it is observed that the minimum 115-kV system voltage that will satisfy these conditions is 98 kV (85 percent of 115 kV) at the lowest tap of the LTC (103.5 kV). This is below the normal operating range of the 115-kV system (109.25 kV or 95 percent to 120.75 kV or 105 percent). The emergency onsite ac power distribution system undervoltage relays are set accordingly to prevent degraded voltage conditions of the offsite power sources from affecting site operating conditions.

From the voltage profile study it is also observed that in case the onsite emergency power distribution system is fed through the auxiliary boiler transformer, the minimum 115-kV system voltage that will provide at least 460 V (80 percent of 575 V) at 600-V buses under the most severe load condition is 109.25 kV (95 percent of 115 kV).

Attachment - A

The minimum starting voltage for all class IE motors except the NSSS motors and MOVs, is 75 percent of the motor nameplate voltage. The minimum starting voltage for all NSSS motors and MOVs is 80 percent of the motor nameplate voltage. All class IE motors are capable of running at the minimum voltage of 90 percent of the motor nameplate voltage.

The maximum permissible voltage drop between any 4.16 KV emergency bus and the connected loads (4.16 KV) under normal running condition is 20 V, while that during motor starting is 60 V. The maximum permissible voltage drop between the 600 V

emergency load center buses and their connected loads under normal operating conditions is 12V; for the motor control centers, this is broken up as 4V between the load center and the motor control center, and 8V between the motor control center and the motors. However, for MCC feeders having longer cable lengths, the voltage drops from 600-V load centers to the MCC and from the MCC to the motor are redistributed within the framework of the total voltage drop limitation of 12 V.

The voltage profile study of the plant electrical power distribution system has been performed using permissible voltage drops stated above. This study shows that the minimum voltage that will ensure proper starting of all class IE motors at 4.16 KV as well as 600 V buses is 460 V at 600 V motor terminals (80 percent of the motor nameplate voltage of 575 V) during the most

severe motor starting condition with 4.16 KV and 600V buses fully loaded. The minimum voltage that will ensure proper running of all class IE motors at 4.16 KV as well as 600 V buses is 517.5 V at the 600V motor terminals (90 percent of the motor nameplate voltage of 575V) under full load conditions of 4.16KV and 600 V buses.

From the voltage profile study for the reserve station service transformers it is observed that the minimum 115 KV system voltage that will satisfy the above conditions of the minimum voltages is 107.8 KV (93.74 percent of 115 KV) under the worst loading conditions i.e when the 13.8 KV buses

are unloaded and 4.16 KV buses fully loaded. This voltage is less than the minimum 115 KV system voltage which is 109.25 KV (95 percent of 115 KV). Under the opposite conditions i.e when the 13.8 KV buses are heavily loaded and the 4.16 KV buses are lightly loaded with the 115 KV system operating at the minimum (109.25 KV), the voltage at the 4.16 KV load terminal will be 4.328 KV (108.2 percent of the motor nameplate voltage of 4 KV). This is within 10 percent of the motor nameplate voltage.

From the voltage profile study for the auxiliary boiler transformer it is observed that when the auxiliary boiler is feeding any 4.16 KV bus, the minimum 115 KV

system voltage that will ensure at least 80 percent of the motor nameplate voltage at the motor terminals during starting condition and 90 percent of the motor nameplate voltage at the motor terminals during normal running condition for 4.16 KV as well as 600V levels is 109.25 KV (95 percent of 115 KV), which is within the operating limits of 115 KV system.

DLP X NRC X

The ~~_______~~ voltage criteria that will ensure proper starting and continuous operation of all class 1E control and other loads at 120V level are as follows:

a. The minimum pickup voltage for all starters is 77V (70 percent of the rated coil voltage of 110V).

b. The minimum voltage for all other control devices including MOVs and SOVs is 96V (80 percent of 120V.).

All 600V cables feeding 600V - 120/208V transformers and 120V cables are sized to ensure the minimum voltages shown above for 120V loads at the 120V load terminals assuming the minimum voltage (460V) at the 600V buses.

The minimum voltages under the most severe starting and running conditions stated above will also be maintained when the emergency diesel generators (Division I and II) are feeding the 4.16 kV emergency buses. RD.

The minimum 125 V dc voltage that will ensure proper operation of all class 1E dc loads are as follows:

a. The minimum operating voltage for all Division I and Division II dc loads (i.e. MOV's and SOV's) is 101 volts.

b. The minimum operating voltage for all Division III dc loads (i.e. MOV's and SOV's) is 101 volts.
110

All 125 V dc cables are sized to maintain these minimum voltages at the 125 V load terminals assuming the battery terminal voltage at the minimum of 105 V for Division I and II, and 112.5 V for Division III, except in cases where the devices
(i.e. relays, Trip and close coils, etc.)

are capable of operating at levels below 101 V or 110 V, when the cables are sized to maintain these minimum voltages.

Two levels of undervoltage protection are provided at the 4.16 KV emergency buses; one to detect loss of offsite power, and the second to detect degraded voltage conditions. The loss of offsite power relay is set to trip the offsite power supply breaker, alarm in the control room and initiate emergency diesel generator starting when the 4.16 KV bus voltage drops to 3212.33 V which corresponds to

475.5 V at the 600 V buses.
The time setting is 3.0 seconds.

The degraded voltage relay is set at 3607.76 V which corresponds to 533.69 V at the 600V buses. This is provided with two time delays; the first time delay is set at 8 seconds; following this time delay, the degraded voltage condition is alarmed in the control room under normal operating condition of the plant. Under an accident condition, the offsite power supply breaker will trip and emergency diesel generator will start following this time delay. The second time delay is set at 30 seconds. Following this time delay, the degraded voltage condition will be alarmed in the control room, the offsite power

supply breaker will trip and emergency diesel generator will start under normal operating conditions of the plant.

The undervoltage protection scheme uses coincident logic (two out of three phases) to preclude spurious trips of the offsite power sources. The relays and other devices associated with the undervoltage protection scheme are class IE and are located on the respective class IE switchgear.

During the load sequencing time, the voltage on the ~~to~~ 4.16 KV bus will not degrade below ~~[illegible]~~ the level and for a duration of time that will allow the ~~[illegible]~~ loss of offsite relay to trip and initiate load shedding.

POWER SYSTEM BRANCH

F430.8

ADDITIONAL INFORMATION:

- WILL PROVIDE A TABLE OF BUS VOLTAGES. RESULTS OF ANALYSIS FOR DEGRADED BUS ANALYSIS.

- WILL PROVIDE A REFERENCE TO CHAPTER 14.2: DEGRADED VOLTAGE TEST.

QUESTION F430.10 (SRP 8.2)

For the Class 1E switchgear 2ENS*SWG101, 102, and 103 shown in Figure 8.3-2, state whether the "cubicle only" positions for access to the alternate offsite source normally have a circuit breaker installed. Describe what is required to connect the alternate offsite source to the safety buses through these cubicles.

RESPONSE

See revised Section 8.3.1.1.2.

PSB Comments

If a safety bus is being powered from its alternate offsite power source and that source is subsequently lost, will the bus be automatically reenergized from the diesel generator? This should be the case.

Response To PSB Comments

See revised Section 8.3.1.1.2

REVISED WORDING

Add Attachment-A

rated speed, voltage, and frequency, the generator breaker 101-1 closes. Within 10 sec from the starting signal, the load sequencing begins. Similarly, the emergency bus 2ENS*SWG103 is transferred to its emergency diesel generator 2EGS*EG3 upon loss of voltage or sustained degraded voltage from reserve transformer 2RTX-XSR1B. Upon loss of voltage or degraded voltage from reserve transformer 2RTX-XSRIA or 2RTX-XSRIB, the emergency bus 2ENS*SWG102 is also transferred to its emergency diesel generator 2EGS*EG2 in a similar way, except that no load shedding on the bus is required. In case of a LOCA, the emergency diesel generators start and run on no-load so that they can pick up loads in the event a delayed loss of offsite power should occur following a LOCA. X

The emergency 4.16-kV switchgear is rated for 250 MVA interrupting capacity. All breakers are rated for 1,200 amps continuous duty. Each divsional switchgear has two dc control power buses supplied by its associated divisional emergency dc power system. Class 1E battery 2BYS*BAT2A feeds bus 2ENS*SWG101 via Class 1E 125-V dc switchgear 2BYS*SWG002A. Class 1E battery 2BYS*BAT2B feeds bus 2ENS*SWG103 via Class 1E 125-V dc switchgear 2BYS*SWG002B. Similarly, Class 1E battery 2BYS*BAT2C feeds bus 2ENS*SWG102 via Class 1E 125-V dc panel 2EGS*PNL002. One control bus supplies control power to the main breakers, associated relaying, and control circuits; the other bus supplies control power for the feeder breakers, associated relaying, and control circuits. The two control buses are supplied by two separate cables originated at the same breaker on the dc bus. The two cables are routed separately. Each control bus can be connected to the other dc feeder via a pullout fuse block arrangement. | 4

Emergency 4.16-kV switchgear buses are electrically independent and physically isolated from each other so that any failure in one division will not jeopardize the safety function of any other division. Emergency 4.16-kV switchgear buses are located in separate rooms in the emergency switchgear room at el 261 ft in the control building, a Category I structure.

600-V Distribution System

The 600-V distribution system consists of the normal and emergency 600-V load centers, 600-V MCCs, and 600-V power distribution panels. The load centers feed the MCCs, 600-V distribution panels, 600-V motor loads from 50 to 200 hp, and other loads from 60 to 150 kW. The MCCs feed plant auxiliary motor loads from 1/2 to 50 hp, motor-operated

Attachment - A

If either of the emergency buses 2ENS*SWG101 or 2ENS*SWG103 is powered from the auxiliary boiler transformer source and this source is subsequently lost, the bus will automatically be transferred to its emergency diesel generator.

QUESTION F430.15 (SRP 8.3.1)

Provide the following information regarding the Division I and II automatic starting and loading systems:

a. If the offsite source is lost when it is powering the Class 1E buses with the diesel generator running in standby will the residual bus voltage be allowed to decay prior to sequencing the first group of loads? Describe how this is accomplished.

b. Explain the various starting times indicated for the SW pumps in Table 8.3-1.

c. Clarify Tables 8.3-5 and 8.3-6. It is difficult to discern discrete load sequencing intervals and to correlate the times given in these tables with the times given in Table 8.3.1. It is also difficult to correlate the numbers given in the "starting," "running" and "total load" columns of Tables 8.3-5 and 8.3-6.

d. Describe whether the Class 1E LOCA loads are sequenced on offsite power or block loaded. If they are load sequenced, we require that a separate sequencer for offsite and onsite power for each electrical division be provided. Alternatively, provide a detailed analysis to demonstrate that there are no credible sneak circuits or common failure modes in the sequencer design which could render both onsite and offsite power sources unavailable. In addition, provide information concerning the reliability of your sequencer and reference the design detailed drawings.

e. Table 8.3-5 indicates that the diesel generator load for the final load sequence interval during a simultaneous LOOP and LOCA is 4,679 KW. This is in excess of the 4400 KW continuous rating of the diesel generator shown in Figure 8.3-2. Justify the operation of the diesel generator at greater than its continuous rating.

RESPONSE

See revised Section 8.3.1.1.2 and revised Tables 8.3-1, 8.3-2, 8.3-5, and 8.3-6.

PSB Comments

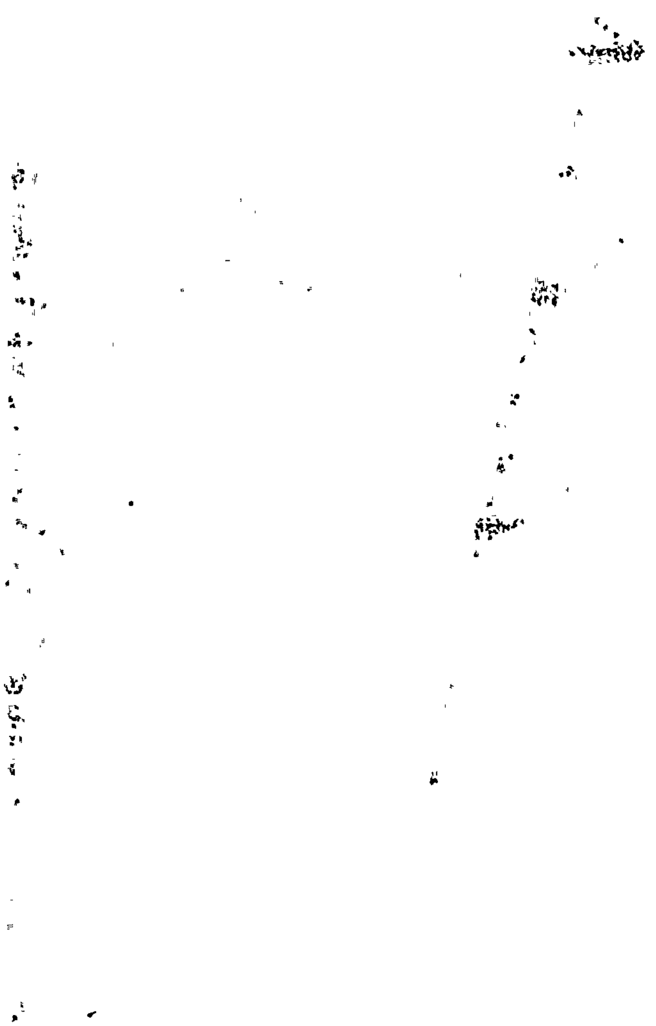
d. Provide more information on the sequencer circuitry. What is meant by sequential relaying? What type of relays are used? Describe the location of the sequencer circuits. Are they centrally located or distributed? Will failure of one relay result in loss of the entire load sequencer? .983

Response To PSB Comments

1. Load sequence delaying means the staggering of time in starting emergency pumps so as to prevent tripping of diesel generator. These time sequences will allow diesel generator voltage to return

2. Separate agastat timers are provided for each sequence load at the switchgear feeding the load.

3. Timers are connected in such a way that failure of one timer will not affect the timing operation of other timers. Refer to ESK-5EN S21 & 5EN S22



QUESTION F430.16 (SRP 8.3.1)

Regarding the control and protection systems for Division I, II, and III diesel generators discussed in FSAR Section 8.3.1.1.2:

a. Is coincident logic used on the Division I and II generator phase over-current trip as required by R.G. 1.9?

b. Are all conditions which shut down the diesel generator during test but bypassed during emergency operation, alarmed in the main control room in accordance with R.G. 1.9?

c. Cross reference the diesel generator conditions you have identified in FSAR Section 8.3.1.1.2 subparagraphs 1, 2, 3, and 4 with the annunciation provided in the main control room identified in subparagraph 5. Do this for both Divisions I and II and III.

RESPONSE

See revised Section 8.3.1.1.2 and Table 8.3-3A.

PSB Comments

c. • Regarding the alarms associated with the division I and II diesel generators - the single common alarm in the control room which is designated as Emergency Diesel Generator System Trouble/Trip does not provide a clear indication to the operator of whether the machine has a disabling or non-disabling condition since both are annunciated in the same window. All the conditions which render the diesel generator incapable of responding to an emergency auto-start signal should be alarmed in a common diesel generator inoperable window. Non-disabling conditions should not be mixed with these.

• Regarding the alarms associated with the division III diesel generators - if the "low fuel oil level in day tank" and "low starting air pressure" conditions render the diesel generator incapable of responding to an emergency start they should not be alarmed as "Engine Trouble" together with other non-disabling conditions.

GE Input

Response To PSB Comments

1) Table 430-16 is a list of CONTROL ROOM Annunciator ~~ALARM~~ WINDOWS FOR THE DIESEL GENERATORS. THIS TABLE INCLUDES A WINDOW DESCRIPTION, ORIGINATING DEVICE NUMBER AND A DESCRIPTION OF THE ORIGINATING DEVICE. THIS TABLE SHOWS THE GROUPING OF DISABLING Versus NON DISABLING CONDITIONS.

also see revised section 8.3.1.1.2

2) ~~Most of the~~ diesel engine conditions annunciated as an "Engine Trouble Alarm" in the control room ~~will exist~~ normally occurs only while The engine is in running mode. During engine standby mode, "low fuel oil level in day tank" or "low starting air pressure" condition will initiate "Engine Trouble Alarm" in the control room to alert the operator of abnormal situation. The operator is required to take necessary action to ensure that proper fuel supply or adequate air supply to diesel engine is available.

The fuel oil day tank is backed by a seven-day storage tank. Diesel generator starting air supply system has two redundant trains; either train can start the diesel engine. Therefore, even if one tank is at low pressure, adequate starting capability is still available through redundant air supply train.

h. Directional ground overcurrent (with shutdown).

i. Blown potential transformer fuse.

j. Mode selector switch in OFF position.

k. Incomplete sequence (starting).

l. Overspeed engine (with shutdown).

m. Excessive vibration engine (with shutdown).

n. Generator control in maintenance position or inoperable.

o. Generator space heater auxiliary switches or MCC not proper for auto operation.

5. All conditions mentioned in items 1, 2, 3, and 4 are annunciated in a common window in the main control room designated as Emergency Diesel Generator System Trouble/Trip. 7

6. Indicating instruments which are provided for monitoring the status of system pressure, temperature, level, etc, locally in the diesel generator control room and/or main control room are discussed in Sections 9.5.4 through 9.5.8. In addition, the following indicators are provided for monitoring the status of the generators:

a. Voltmeters.

b. Ammeters.

Table 430-16

Annunciator windows for The Diesel Generators displayed in Control Room

ALM WINDOW	WINDOW DESCRIPTION	ALM INPUT SIGNAL	
852103	EMERG. DG-1 FUEL SYS INOP	74-2EGFA04	FUEL SYS INOP
852104	" " START SYS INOP	74-2EGAA05	AIR START SYS INOP
852111	" " FUEL SYS TROUBLE	2EGF-FIS13A & 62-	ENG XFR PMP LO FLOW
		2EGFX LS8A	DAY TK LVL H
		2EGFX LS12A H/L	STOR TK LVL H
		2EGF-PDIS20A	F.O. STR 1A DIFF PRESS HI
		2EGF-PDIS20C	F.O STR 1C DIFF PRESS HI
		49X-2EGFA01	PMP MOTOR OVERLOAD
		49X-2EGFA02	PMP MOTOR OVERLOAD
852112	EMERG. DG 1 START SYS TROUBLE	2EGA-PS22A H	TK1A PRESS H
		2EGA-PS21 H	TK2A PRESS H
		49X-2EGAA01	CPRSR MOTOR OVERLOAD
		49X-2EGAA02	CPRSR MOTOR OVERLOAD
852113	EMERG DG 1 IN MAINT MODE	30-7830	KEY LOCK OFF POSN MAINT
852116	" " SVCE WTR DISCH PRESS LO	2SWP*PSLX66A	DISCH PRESS LO
852125	" " OVERVOLTAGE	30-7042	GEN 1 OVERVOLTAGE
852129	" " ELECT. SYS TRBL/TRIP	30-7047	DC CONTROL POWER
		30-7049	CONTROL IN MAINT. POSN
		30-7027	G1 SEQUENCE INCOMPLETE
		30-7023	BLOWN PT FUSE
		30-7018	OVERCURRENT V
		30-7021	PHASE OVERCURRENT
852141	EMERG DG 1 OVERSPEED TRIP	30-7124	ENGINE OVERSPEED
852143	" " CONTROL PWR FAILURE	74-2EGPX01	DIFF CKT POWER FAILURE
		74-2EGPX02	PROT CKT POWER FAILURE
852147	" " SHUTDOWN MECH FAILURE	30-7128	DG 1 VIBRATION
		30-7120	JKT WTR LP CIRC. PMP
		30-7015	TURB THRUST BRG FAIL
		30-7011	ENGINE LUBE OIL PRESS LO

852	EMERG. DG 1 SHUTDOWN MECH FAILURE	30-7012	TURBO LUBE OIL PRESS LO
		30-7013	ROD BRG TEMP HI
		30-7016	JKT WTR TEMP HI
85248	EMERG. DG 1 MECHANICAL FAILURE	30-7031	CRANKCASE LEVEL LO
		30-7044	JKT WTR LVL OFF NORM
		30-7045	DAY TK LVL OFF NORM
		30-7034	JKT WTR PRESS LO
		30-7036	FUEL OIL PRESS LO
		30-7037	FILTERS DIFF PRESS HI
		30-7038	#1 AIR RCVR PRESS LO
		30-7039	#2 AIR RCVR PRESS LO
		30-7040	STG AIR PRESS LO
		30-7043	CRANKCASE PRESS HI
		30-7030	LUBE OIL TEMP OFF NORM
		30-7033	JKT WTR TEMP OFF NORM

NOTE: WINDOW DESCRIPTIONS AND ALARM INPUTS FOR DG1 ARE SHOW ABOVE. WINDOW DESCRIPTIONS AND ALARM INPUTS FOR DG3 IS SIMILAR

B DSL GEN #2, DIV 3 LOW FUEL OIL LEVEL IN DAY TANK WILL INDICATE DG #2 SYSTEM INOPERABLE. LOW STARTING AIR PRESSURE CONDITION WILL INDICATE DIV 3 DG #2 START SYSTEM TROUBLE.

JUN.28 '84 11:16 SWEC-CHOC-NMP2 (609) 482-3948 P.01

QUESTION F430.18 (SRP 8.3.1)

For the Division I, II, and III diesel generators address whether an automatic start signal will separate the diesel generator from the test mode and return control of the diesel to the automatic system. Also, address whether a loss of power occurrence during a test will separate the diesel generator from the test mode and make it available for automatic loading. For this case, a loss of power signal may not be generated if the diesel generator maintains bus voltage, and overcurrent or underfrequency trips must be relied on to separate from the offsite circuits. These trips should not result in a lockout for this condition. Describe the sequences which take place to separate the diesel generator from its test mode during the above events.

RESPONSE

See revised Section 8.3.1.1.2. | 8

PSB Comments

- The response to this question for the division III diesel generator incorrectly states the HPCS diesel generator is running in parallel with the offsite power and no further governor adjustment is necessary. Actually the HPCS diesel generator has been separated from offsite power by tripping of the dg feed breakers due to the LOCA signal. Therefore, it should be returned to the isochronous mode.

- The response also states that if the HPCS dg is running unloaded, a LOOP signal or a LOCA signal would automatically trip the feed breaker and connect the diesel generator to the HPCS bus. If offsite power is available and only a LOCA signal is received with the dg running unloaded, the LOCA loads should be loaded onto the offsite power supply rather than the diesel generator.

Response to PSB Comments

See revised Section 8.3.1.1.2

QUESTION F430.39 (8.3)

The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its controls and monitoring instrumentation. This equipment is generally panel mounted and in some instances the panels are mounted directly on the diesel generator skid. Major diesel engine damage has occurred at some operating plants from vibration induced wear on skid mounted control and monitoring instrumentation. This sensitive instrumentation is not made to withstand and function accurately for prolonged periods under continuous vibrational stresses normally encountered with internal combustion engines. Operation of sensitive instrumentation under this environment rapidly deteriorates calibration, accuracy, and control signal output.

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area. If the floor is not vibration free, the panel shall be equipped with vibration mounts.

Confirm your compliance with the above requirement or provide justification for noncompliance. (SRP 8.3.1, Parts II and III)

RESPONSE

See revised Section 8.3.1.1.2.

PSB Comments.

The response appears to be acceptable. The mounting for the Division III DG control panel must be confirmed.

Response To PSB Comments

See revised section 8.3.1.1.2

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not jeopardize the safety function of any other standby diesel generator.

Automatic Starting and Loading The HPCS diesel generator starts automatically in case of a LOCA and loss of offsite power supply. The sequence of events following such a condition is as follows:

0-3 sec	Offsite power supply breaker 102-4 trips; HPCS diesel generator starts.
10 sec	HPCS diesel generator supply breaker 102-1 closes; HPCS pump starts; 600-V loads energized.
27 sec	HPCS pump at rated speed; HPCS injection valves fully open.

The control power for automatic starting and loading is provided from the Division III emergency 125-V dc system.

Periodic testing of the HPCS diesel generator does not impair its capability to supply emergency power within required times.

The diesel generator performs its emergency function automatically when it is operating in the test mode. During the test mode, the diesel generator is either loaded by paralleling with the offsite power system or is running unloaded. The emergency start demand signal that reverts the diesel to emergency mode from test mode is a loss of offsite power (LOOP) signal or a LOCA signal.

If a LOOP occurs, a parallel-loaded diesel generator would attempt to supply power to the offsite test loads through the closed feed breakers. A set of three directional overcurrent relays will trip the offsite feed breakers when the overcurrent exceeds the preset value on the relays. The diesel generator would continue to power the HPCS bus. The diesel generator would keep running with the voltage regulator in the automatic mode and the governor shifting from the droop mode to the isochronous mode.

If a LOCA signal is received during HPCS diesel generator periodic testing and the diesel generator is running in 9 parallel with the offsite power, the diesel generator feed breakers will trip. The LOCA signal would override the test start signal and the diesel generator would continue 9 running unloaded. The HPCS pump motor automatically would start from the HPCS bus. Since the HPCS

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430.18

diesel generator is running in parallel with the offsite power, no further governor adjustment is necessary.

Except in the case of a LOCA, diesel generator protective trips are operational. A LOCA signal causes all engine protective trips except engine overspeed and generator differential protection to be bypassed. 7

If the diesel generator is running unloaded, a LOOP signal or a LOCA signal would automatically trip the feed breaker and connect the diesel generator to the HPCS bus.

Control and Protection System The logics for control and protection of the Division III standby power system are shown on Figure 7.3-3. The Division III standby diesel generator has a control and protection system designed to initiate diesel generator trouble alarms and shutdown sequences to prevent damage or destruction of the engine or generator should a malfunction occur during emergency or test mode operation. The protective functions are as follows:

1. The HPCS diesel generator is rendered incapable of responding to an emergency auto-start signal in case of a LOCA and loss of offsite power due to the following conditions. These conditions are annunciated in the diesel generator control room and in the main control room:

   a. Low fuel oil level in day tank.

   b. Low starting air pressure.

   c. Control power failure.

   d. Engine in maintenance position.

   e. Diesel engine trip/lockout not reset. 7

   f. Generator trip/lockout not reset.

430.39

Except for sensors and other equipment that must be directly mounted on the engine or associated piping, the control and monitoring instrumentation is installed on a free-standing floor-mounted panel located in a separate room from the engine skid, and located on a vibration-free floor area.

QUESTION F430.19 (SRP 8.1, 8.3.1, 8.3.2)

Regarding protection of containment electrical penetrations:

a. FSAR Section 8.3.1.1.5 states that power feeders passing through electrical penetrations are provided with primary and backup protective devices. The overcurrent protection should not be limited to power feeders. All electrical circuits with available fault current greater than the continuous rating of the penetration (to maintain mechanical integrity) should be protected by two overcurrent devices. Verify that this is the case.

b. All primary and backup breaker overload and short circuit protection systems should be qualified for the service environment including seismic. However, the seismic qualification for non-Class 1E circuit breaker protection systems should as a minimum assure that the protection systems remain operable during an operating basis earthquake. In addition, the non-Class 1E circuit breaker and protection system shall be of high quality. Verify that this is the case.

c. Indicate whether redundant overcurrent penetration protection is provided on the low frequency mg set feeds to the reactor recirculation pump feeds. Either provide the redundant protection or justify omission of the redundant device.

d. Where external control power is needed for tripping breakers, signals for tripping the primary and backup breakers should be independent, physically separated and powered from separate sources. Verify that your design complies and identify the power supplies to the redundant circuit breakers.

e. Provide the fault current clearing-time curves of the penetrations' primary and secondary current interrupting devices plotted against the thermal capability (I^2t) curve of the penetration (to maintain mechanical integrity). Also provide a simplified one line diagram showing the location of the protective devices in the penetration circuit and indicate the maximum available fault current of the circuit.

Insert X →

RESPONSE

See revised Section 8.3.1.1.5.

PSB Comments

a. The new information provided for the control and instrumentation circuits states that the penetrations can carry the maximum short circuit current available for an extended period (sufficiently longer than the fault clearing time) without exceeding their thermal limit. They should be able to carry this current continuously unless they have two protective devices in series, otherwise a single failure of a protective device under a fault condition would damage the penetration. Discuss your compliance with this position.

b. Response OK

c. Open. Have not responded to this question.

d. The response only address the RCP breakers. Are there any other penetration circuit breakers which require external control power for tripping? If so, address them as well.

e. The response does not provide the penetration I^2t curves plotted against the fault current clearing time curves of the interrupting devices. We need these curves to verify that the penetration is protected by both interrupting devices over the full range of the I^2t curve. Each set of curves should show the maximum available fault current to the penetration and should have a simple one line diagram showing orientation of the protective devices to the penetration. Penetration protection curves should also be provided for 120 VAC and 125 VDC control circuits.

Insert X

Response To RSB Comments:

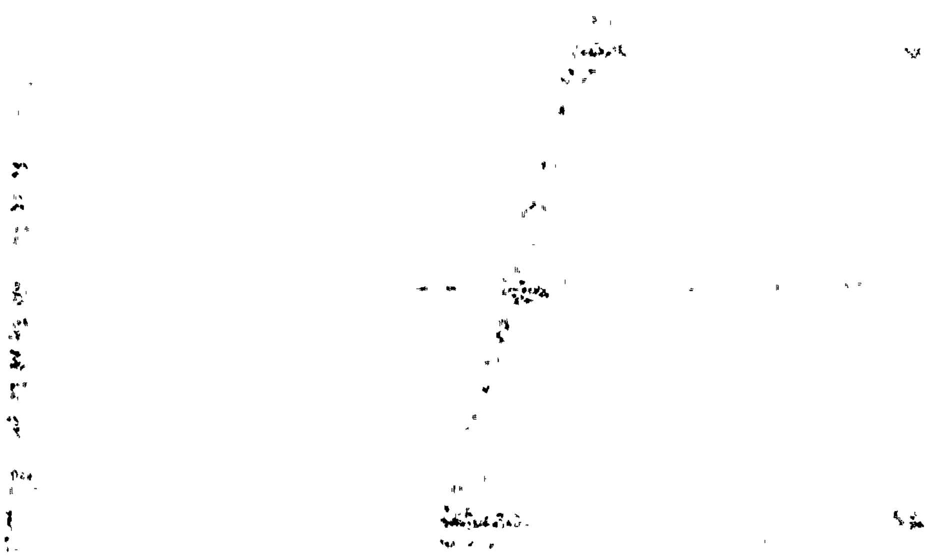
a. See revised section 8.3.1.1.5

c. See revised section 8.3.1.1.5

d. See revised section 8.3.1.1.5

e.

I^2t curves will be supplied under separate cover.



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Type 5

Type 5 penetrations contain shielded signal cables and are used to connect nuclear incore innstrumentation cables inside and outside the primary containment. Type 5 penetrations also use pigtail terminations and terminal enclosures.

All power feeders passing through electrical penetrations are provided with primary and backup protective devices which are capable of limiting the maximum heat produced by the fault current (I^2t) at the penetration to a value less than the thermal capability of the penetration.

For all control and instrumentation circuits, the penetrations can continuously carry the maximum short circuit current available for an extended period (sufficiently longer than the fault clearing time) without exceeding their thermal limit. All primary and backup circuit breakers are purchased as Class 1E except for the following: X

7

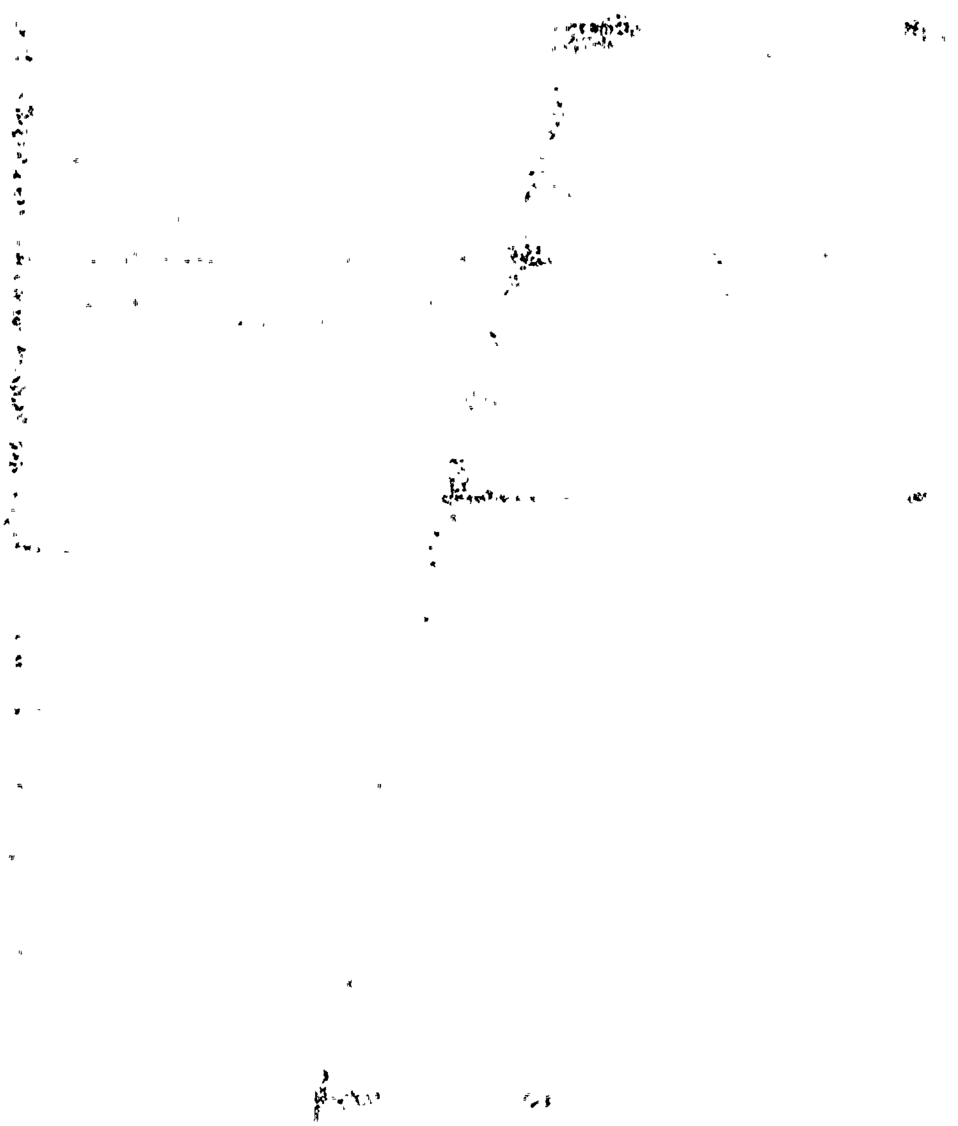
1. 4.16-kV circuit breakers used for LFMG set (one in each feeder circuit).
2. Feeder breakers for loads that are operated only during plant shutdown condition, e.g., containment hoist.

The breakers are purchased as non-1E. The non-1E breakers are similar to the Class 1E breakers and are of a high quality. The motor control centers housing the circuit breakers for the non-1E feeders going through the penetrations are seismically mounted.

The two 13.8-kV feeders to the reactor recirculation pumps have two redundant circuit breakers in series in the 13.8-kV safety-related switchgear. The 13.8-kV circuit breakers are electrically operated. Their operating time has been assured as 30 cycles for the purpose of calculation. This is very conservative. The actual time is expected to be around 10 cycles. The two breakers receive trip signals from the two separate divisions of the RPS system (see Section 8.3.1.1.3). Add Attachment-A X

7

Each 600-V feeder from the MCCs has a backup thermal-magnetic circuit breaker in series with the primary thermal-magnetic breaker. The backup circuit breaker trip setting is the same as the primary circuit breaker. The 600-V circuit breakers are molded case type with 1-cycle operating time. The calculated worst case I^2t for the different types



(430.19)

Attachment-A

Redundant overcurrent penetration protection is provided for the LFMG sets; one circuit breaker is located at the 4.16KV bus feeding the LFMG set motor, and the other is at the output of the LFMG set. The two circuit breakers are provided with control power from two different normal dc sources.

There are no other penetration circuit breakers which require external control power for tripping.

QUESTION F430.20 (SRP 8.1, 8.3.1)

In FSAR Sections 1.8 and 8.3.1.3.1, you state that cables are marked at 15 ft. intervals. The requirement for marking cables at 5 ft. intervals in Regulatory Guide 1.75 is not a typographical error. The marking interval is specified as 5 ft. in both the 1975 and 1978 versions of the Regulatory Guide. Therefore, justify the wider marking interval used at Nine Mile Point Unit 2. Also, verify that raceways are marked, prior to installation of cables, not exceeding 15 ft. intervals and at entry to and exiting from enclosed areas in accordance with IEEE 384-1974.

RESPONSE

See revised Section 1.8.

PSB Comment

a. The marking of cables at 15 ft. intervals is not in accordance with the interval specified in R.G. 1.75. The staff has also been consistent in applying the 5 ft. interval requirement in current license reviews. You should, therefore, mark the cables at 5 ft. intervals beginning immediately or provide justification why it is not being done.

b. Regarding the marking of raceways, I have not found any response which indicates that raceways are marked, prior to installation of cables, not exceeding 15 ft. intervals and at entry to and exiting from enclosed areas. Provide this response.

Response To PSB Comment

a. See revised section 1.8. Reg Guide 1.75

b. See revised section 8.3.1.3.1

TABLE 1.8-1 (Cont)

Regulatory Guide 1.75, Revision 2 (September 1978)

Physical Independence of Electric Systems

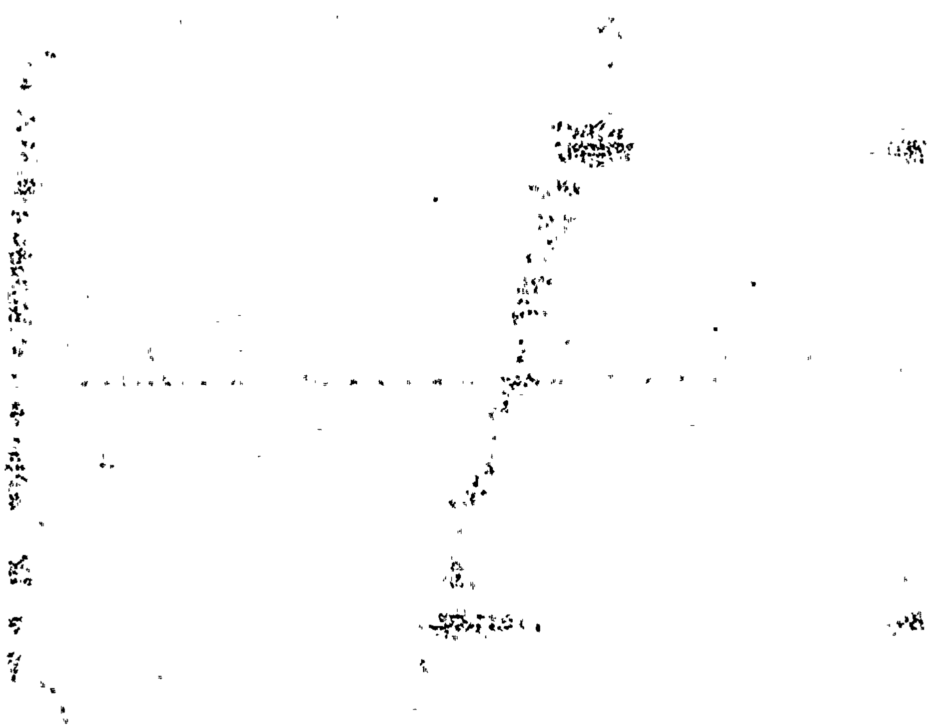
FSAR Sections 7.1.2, 7.6.2, 8.3.1

Position

The Unit 2 project complies with the Regulatory Position (Paragraph C) of this guide through the alternate approach described below and in Section 7.6.2 and 8.3.1.

Regulatory Position C.9 requires that cable splices in raceways be prohibited. Splicing in electrical penetrations is considered to be exempt from this requirement.

Regulatory Position C.10 requires that the cables be marked at 5-ft intervals. This is a typographical error as confirmed by the former Electrical, Instrument and Control Branch Chief of USNRC, T. A. Ippolito, on October 10, 1975, 7
and the NRC Power Systems Branch Section Leader, R. G. FitzPatrick, on October 30, 1980. The correct distance is 15 ft, which has been followed in Unit 2.



REVISED WORDING

Channel IIB	Blue
Power supply	Noncolor
PCRVICS	
Input channels	
Channel 1A	Green
Channel 1B	Yellow
Channel 1C	Orange
Channel 1D	Blue
Output and power supply	
MSLIV	Noncolor
MOV, SOV, Division I	Green
MOV, SOV, Division II	Yellow

All safety-related equipment has permanently affixed color coded identification plates. Safety-related cables outside the control room are color coded through application of paint, colored tape, or colored wrap-around split-sleeve markers. Cables in trays are color marked at each end, at internals not exceeding 15 ft, at both sides of walls, and at partitions on floors separating areas. Flexible or rigid plastic color markers with pressure sensitive adhesive backing are used for cable trays and conduits. All markers used are prequalified for the environmental conditions to which they may be exposed.

Add Attachment-A

8.3.1.3.2 Alphanumeric Coding

Each piece of equipment, cable, and raceway is identified by an alphanumeric code number in addition to the color coding.

Equipment Alphanumeric Code

The alphanumeric code used to identify any piece of equipment has the following format:

```
2   ENS   *   SWG   101
|    |    |    |     |
(1)  (2) (3)  (4)   (5)
```

Where:

1 = Unit number

2 = System code, e.g., ENS for 4.16-kV emergency system, EPS for 13.8-kV emergency system, etc.

(430.20)

Attachment - A

. . . . . prior to or during pulling of cables. All exposed safety related raceways are color marked at intervals not to exceed 15 ft and at both sides of walls, and at partition or floor separating areas, prior to installation of cables.

QUESTION F430.22 (SRP 8.1, 8.3.1)

In the discussion of electrical isolation in Section 8.3.1.4.1 you state that whenever a safety-related power or control circuit is connected with any nonsafety-related circuit, appropriate isolation devices are used. Discuss what you consider an appropriate isolation device for a power circuit. In accordance with Regulatory Guide 1.75 a circuit breaker tripped on a LOCA signal is an acceptable isolation device. For the 600 V emergency lighting panels 2 LAC*PNL100A and 300B and their loads, identify which portions of the system are qualified Class 1E and which are not and identify the isolation devices used between the Class 1E and non-1E portions. Since these panels feed other critical Class 1E safety related loads, the panels themselves should not be tripped on a LOCA signal.

RESPONSE

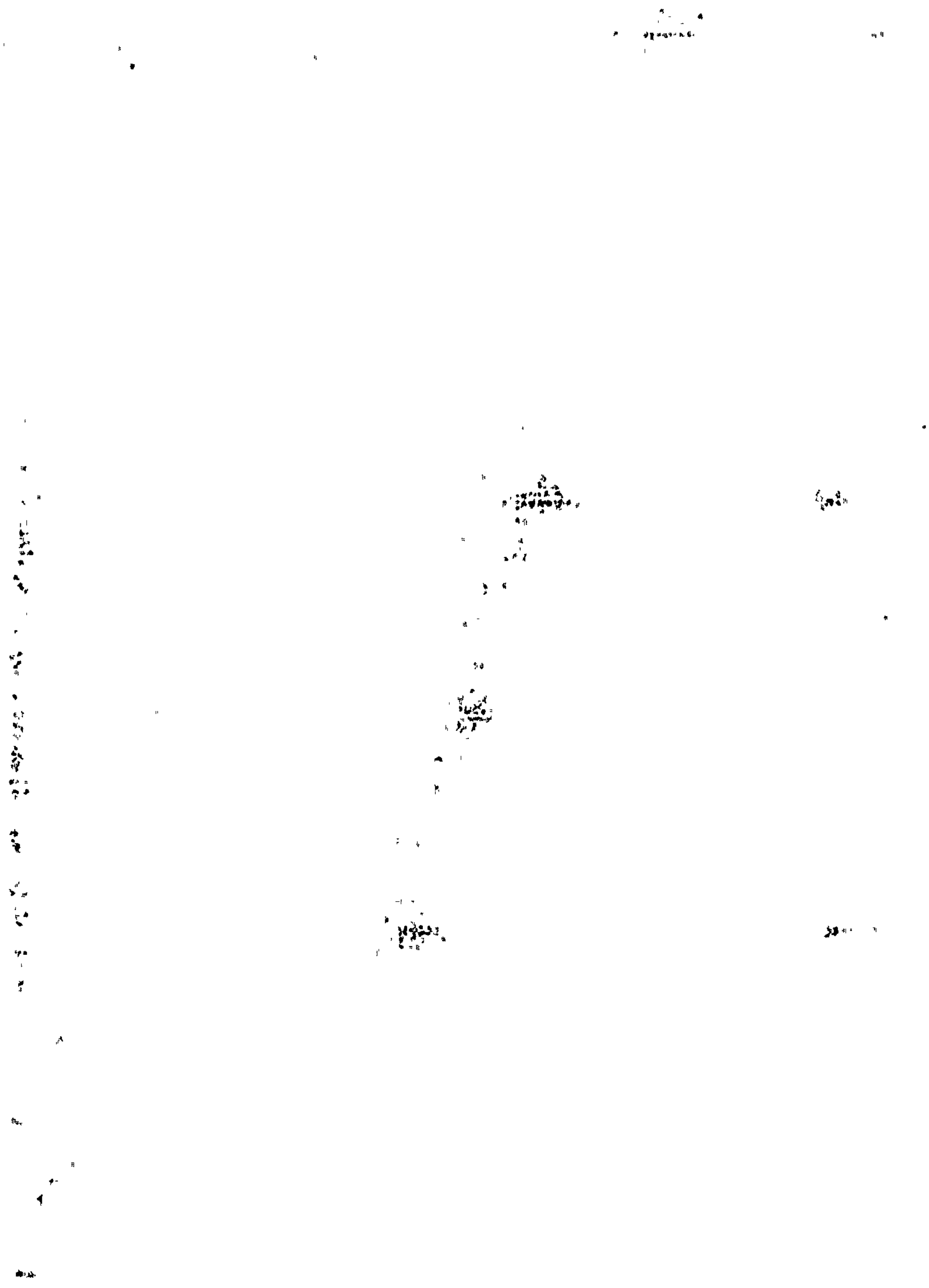
See revised Sections 8.3.1.4.1 and 8.3.1.1.2.

PSB Comments

The response to this question does not address how the emergency lighting circuits are isolated from the Class 1E system. The lighting fixtures are not qualified Class 1E, therefore, they must have isolation. An acceptable isolation means are two overcurrent devices in series both coordinated with the upstream bus feeder overcurrent device.

Response To PSB Comments

See revised Section 9.5.3.3



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Redundant divisions of the emergency lighting system, fed from redundant divisions of plant emergency ac distribution system, illuminate essential areas so that failure of power supply to any one division will not cause total failure of lighting in these areas during an emergency. The emergency
7 lighting system is a Class 1E system except for the lighting
fixtures, which are seismically supported. Add Attachment-A X

All critical areas of the station requiring continuous lighting are also provided partial illumination by the essential lighting system. The essential lighting system receives power from the station normal UPS system.

The egress lighting system provides adequate lighting for all egress signs inside the plant, exit doors, hallways, corridors, passageways, and stairways, etc, leading to the outside building exits. The system is designed for inside building egress emergency conditions in accordance with OSHA requirements. The egress lighting system receives power from the station normal UPS systems which also feed the essential lighting system. Seismically supported 8-hr battery packs will provide necessary illumination for access and egress routes for safe shutdown areas, if not provided
7 with emergency lighting.

All battery pack lighting is Exide model B-200 or similar which provides high efficiency lighting and instantaneous load transfer upon loss of ac supply. These are capable of feeding 2-25 watt lamps for 8 hrs. The battery packs are seismically supported.

9.5.3.4 Inspection and Testing Requirements

Since the lighting system is on at all times, any malfunction is easily identified. The self-contained
7 battery pack units are tested periodically. Relamping is
done as required.

9.5.4 Standby Diesel Generator Fuel Oil Storage and Transfer System

Unit 2 is provided with three standby diesel generators, including one dedicated for the high-pressure core spray (HPCS) system. Each operates on No. 2D diesel fuel oil. Each diesel engine has an independent fuel oil storage and transfer system to supply sufficient fuel to the diesel engine during a loss-of-coolant accident (LOCA), as well as during loss of offsite power.

ATTachment A

Each lighting circuit is provided with TWO coordinated class IE circuit breakers so That failure in any lighting circuit will not affect any other class IE devices or system. (See Figure 8.3-4.)

QUESTION F430.23 (SRP 8.1, 8.3.1)

Regarding separation of electrical circuits:

a. Describe the separation of non 1E circuits from associated circuits and Class 1E circuits. Also address the qualification and identification of the associated circuits.

b. In FSAR Section 8.3.1.4.2 you state that if the required 6 inch separation cannot be maintained between circuits on terminal boards a fire resistant barrier is provided between the terminals or an analysis is made to establish that a fire in one divisional circuit inside the panel will not disable both divisions. Identify the areas where an analysis is used and provide the analysis results for staff review.

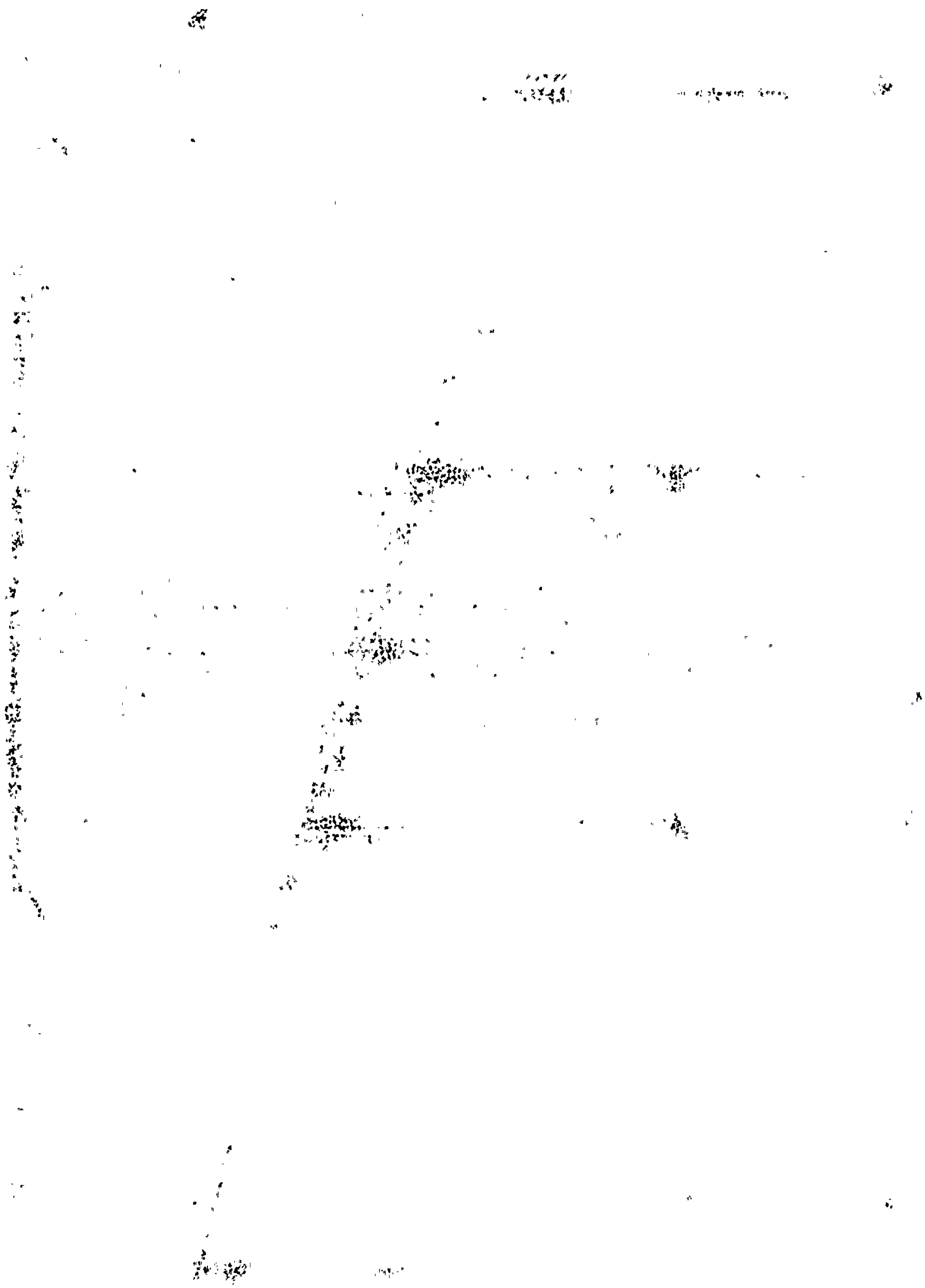
c. Does the electrical penetration separation discussed in Section 8.3.1.4.2 result in 3 ft. horizontal and 5 ft. vertical clearance between redundant Class 1E circuits and Class 1E and non-Class 1E circuits?

d. Justify the routing of redundant Class 1E circuits in the east vertical cable chase and the routing of Class 1E and non-Class 1E circuits in the second and third electrical tunnels. Your response should address position C.8 of R.G. 1.75.

e. Is flexible conduit utilized as a barrier in the NSSS or non-NSSS portions of the plants? If so identify the areas where it is used and the separation distances maintained.

f. Describe the separation provided for the RPS circuits.

g. FSAR appendix 9A, section 9.A.3.7.3, addresses the means used to route cables into the control building and through the cable routing areas within the control building. Provide a comparable description in FSAR Chapter 8 which addresses the cable separation used in those areas to meet the IEEE 384-1974 and R.G. 1.75 requirements. Do these areas contain high energy equipment or piping (high or moderate energy) that could be a potential source of missiles or pipe whip? Are power cables routed through the area?



RESPONSE

See revised Sections 8.3.1.4.1 and 8.3.1.4.2 for response to parts a, c, d, e, f, and g.

In response to part b, to date there are no cases where analysis has been used to justify less than 6-in separation.

PSB Comments

a. Your response on associated circuits should describe the identification and color coding used for these circuits. Do the circuits become associated because of inadequate separation distances or by virtue of being connected to the Class 1E power system? Verify that the associated circuit is routed only with the division to which it is associated down to an isolation device.

b. Your response to this question states that to date there are no cases where analysis has been used to justify less than 6-in. separation. Verify that this response includes cabinets located in the PGCC.

c. Response OK

d. In accordance with position C.8 of R.G. 1.75 verify that the electrical tunnels and vertical cable chases are ventilated.

e. Your response indicates that flexible conduit is used as a barrier in NSSS panels to achieve required separation. Provide an analysis supported by tests which indicate the flex conduit is a suitable barrier and describe the separation maintained between the flex conduit and external circuit. We also understand that a fire retardant tape will be used as a barrier in PGCC cabinets. Provide an analysis supported by tests which indicate the tape is a suitable barrier and describe the separation maintained between the tape and external circuit.

Response To PSB Comments

a) See Revised Section 8.3.1.4.1

b. Within the PGCC, wherever the six inches air space cannot be maintained for separation, alternate means have been employed as allowed by Regulatory Guide 1.75 and IEEE-384. A summary is provided below:

(1) Use of flexible or rigid conduit containing redundant circuits

(2) Use of metallic plates as a barrier between redundant divisional circuits

(3) Use of Sil-Temp tape

(4) Steel enclosures (cans) for devices in close proximity with redundant devices and circuits

(5) Connector (metallic) housing used as an acceptable barrier

(6) Use of common devices (fire-tested) for divisional separation which includes scram contactors, HFA relays, Agastat relays, and P&B relays

(7) Use of MDR relays with isolation barrier(metallic plate) for divisional circuits.

d Electrical Tunnels and vertical cable chases are ventilated See section 9.4.1.2.1 and 9.4.1.2.6.

[illegible] [illegible]

[illegible] [illegible]

[illegible]

ranging from zero to 140 amps

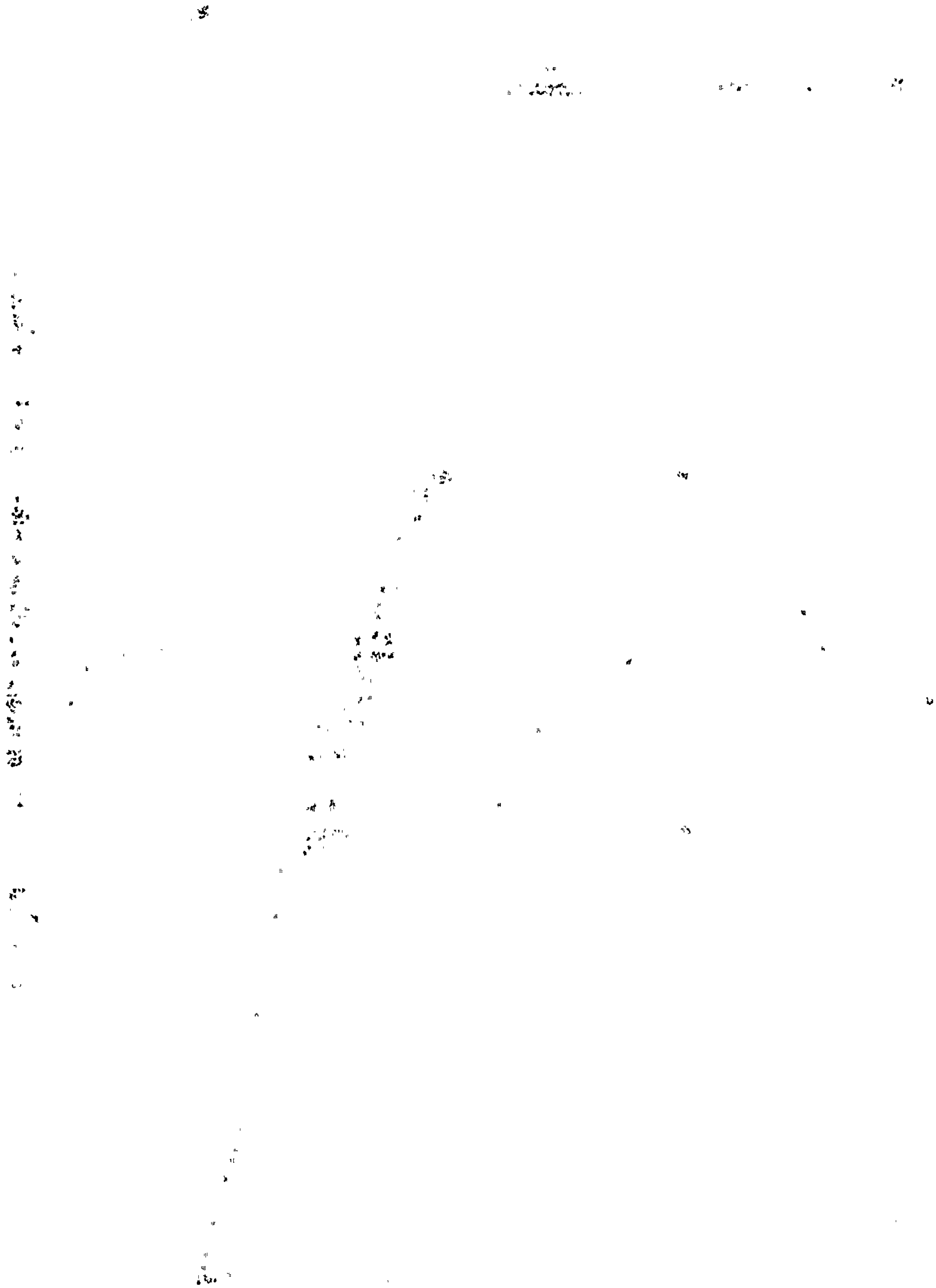
e. Flexible steel conduit as a separation barrier:

The testing has demonstrated that the electrical short circuit in a #10 AWG, tefzel insulated wire circuit, supportted by a continuous source of DC current, ~~of at least 140 amps~~, within a flexible steel conduit, cannot cause electrical fire of sufficient magnitude and induce thermal energy migration through a flexible steel conduit barrier. The wiring which generates heat to the separation barrier melts apart and becomes an open circuit before significant thermal damage can occur to the separation barrier.

Fire retardant tape as a separation barrier:

Tests were conducted on siltemp tape samples using "siltemp" as an electrical separation barrier. The tests demonstrated that the tape is capable of preventing propagation of damage between the circuits under maximum short circuit and neigboring rated current circuits. Thus the "siltemp" tape provides adequate thermal and electrical insulation to preclude propagation of damages between two redundant circuits.

1. Will provide Analysis under separate cover (For sil temp tape and flexible conduit "Fire test")
2. will Document electrical configuration of PGCC to match test of item 1 above including "two breaker" scheme.



REVISED WORDING

8.3.1.4.1 Electrical Isolation

The three divisions of the plant onsite power system are electrically independent of each other. This independence is maintained through the loads the divisions feed; each division feeds a separate load group and there is no chance of interconnecting independent divisions through the loads. Each division has its dedicated standby power source that is independent of the standby power source of any other division. There is no provision for paralleling the standby power sources of different divisions or for using the standby power source of one division to feed the loads of any other division. Each division uses its own control power sources for instrumentation and control, and the control power source of each division is independent of the control power of any other division. There is no provision for interconnecting these control power sources or for feeding the control circuits of one division from the control power sources of any other division.

Each division is also isolated from the associated nonsafety-related systems. Whenever a safety-related power or control circuit is connected with any nonsafety-related circuit, appropriate isolation devices as defined in Regulatory Guide 1.75 and IEEE 384 are used. Nonsafety power loads are not fed from safety buses except the stub bus loads (see Tables 8.3-1 and 8.3-2). The stub buses are tripped on LOCA signal. 7

The associated circuits are treated as Class 1E circuits. The associated circuit cables meet all the requirements of Class 1E cables.

Add Attachment-A

8.3.1.4.2 Physical Separation

Physical Separation of the Class 1E Equipment

The items of equipment associated with each of the three independent divisions of the Class 1E onsite power systems are located in separate Seismic Category I structures to physically isolate them from each other. The Class 1E 4.16-kV switchgear buses of the three divisions are located in the Division I, II, and III emergency switchgear rooms in the control building at el 261 ft. The Class 1E 600-V load centers associated with Divisions I and II are located in the emergency switchgear room of the respective division. The Class 1E MCCs associated with Divisions I and II are located in the emergency switchgear rooms of the respective division, in separate rooms in the screenwell building (el 261 ft), and in the reactor auxiliary building auxiliary

Attachment - A

Certain circuits become 'associated circuits' by virtue of being connected to the class 1E power system. These circuits are treated as class 1E. They are identified and color coded as the class 1E circuit they are associated with and are isolated by appropriate isolation devices. They are not routed with any other division than the one they are associated with.

QUESTION F430.24 (SRP 8.3.2)

Regarding the 125 V dc Class 1E power distribution systems:

a. What is the operating voltage range of the loads connected to the Division I, II and III dc distribution systems?

b. Are the metal battery racks grounded?

c. Does the Division III system have a battery discharge alarm or low voltage alarm set approximately at battery open circuit voltage?

d. Describe the location of the water facilities in the battery rooms and discuss the potential for inadvertent spilling of water on the batteries from these facilities.

e. Recent operating experience has shown that an incompatibility between the battery rack and the battery may cause cracking of the battery case. The cracking may be caused in part by improper support at the battery stress points. Describe the battery stress points and their relationship with battery rack support.

RESPONSE

See revised Section 8.3.2.1.2.

PSB COMMENTS

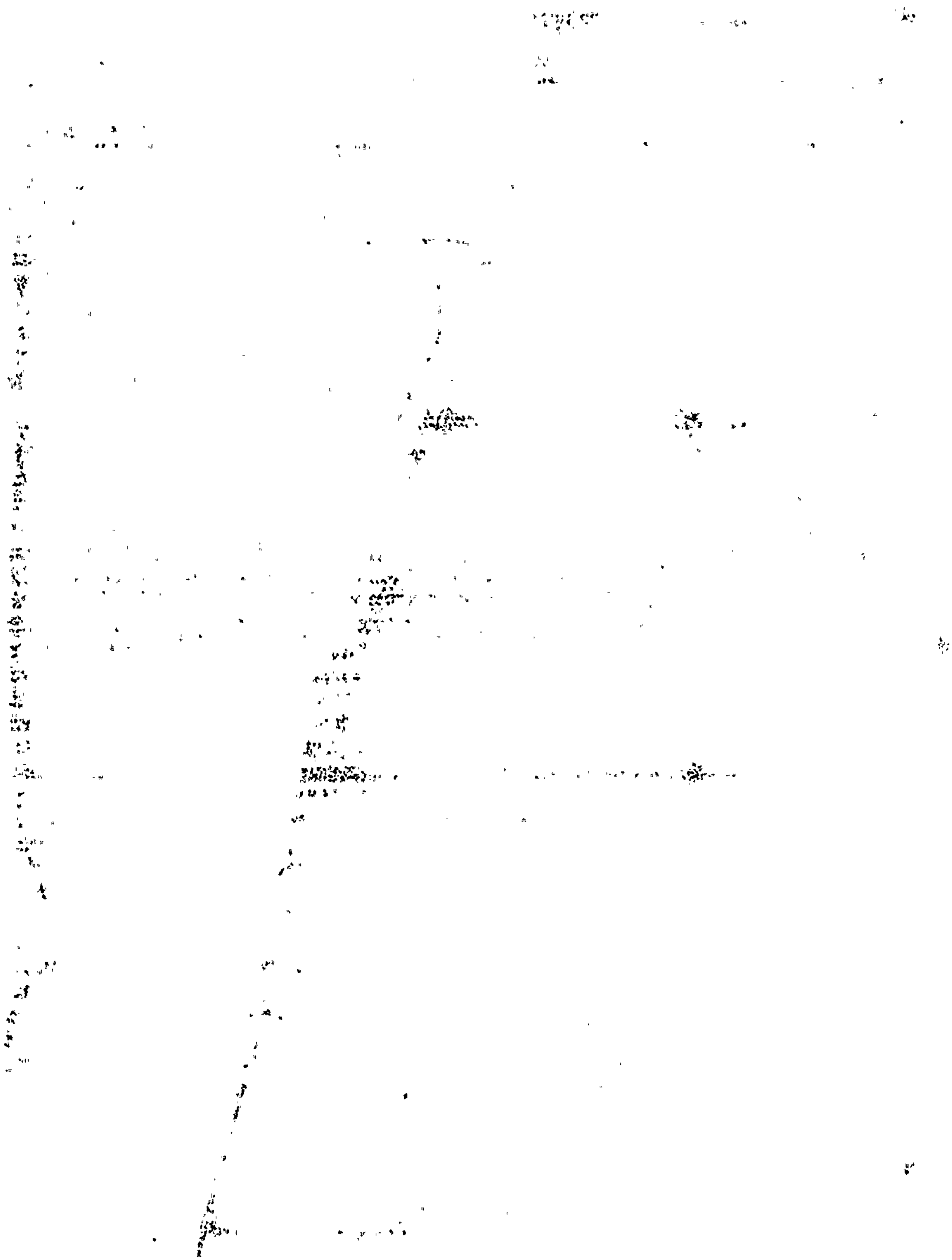
a. The maximum battery terminal voltage indicated on FSAR page 8.3-57 for the division III batteries is 2.5 volts higher (137.5 V vs 135 V) than the maximum operating voltage of the loads. Demonstrate how a 2.5 volt drop to the terminals of the loads is maintained at light load and maximum voltage while no more than a 2.5 volt drop is maintained during heavy load and minimum voltage (battery voltage 112.5 V vs load voltage 110 V). There also appears to be a discrepancy between the maximum battery voltage (137.5 V) indicated on FSAR page 8.3-57 and that indicated on page 8.3-58 (2.33 V/cell X 60 = 139.8). Resolve this discrepancy.

c. The division III bus low voltage alarm setting of 112.5 V is not set sufficiently high to act as a battery discharge alarm. A battery low voltage alarm set at 123-125 V dc or a separate discharge alarm should be provided.

RESPONSE To PSB Comments

The division III batteries are floated at 2.22V/Cell (133.2Vdc) to minimize the periodic equalization of the batteries. Whenever equalization is required, the vendor recommends equalizing at 2.28-2.29 Volts/Cell (137.4Vdc). The normal operating voltage range of the dc loads is 110 to 135Vdc, which is maintained by battery float voltage of 133.2 volts. However, during equalization state (137.4Vdc) and lightly loaded conditions, the voltage drop in the circuit brings the voltage at the load terminals ~~close to~~ WITHIN the operating range. For the low voltage and heavy load condition, the dc bus voltage is expected to be about 120 V or above. The low voltage condition will be annunciated in the control room whenever the bus voltage drops below 120Vdc.

See revised section 8.3.2.1.2.



f. Division III standby diesel generator standby fuel pump.

g. Division III standby diesel generator field flashing.

All the loads with their magnitudes and durations are given in Tables 8.3-8 through 8.3-10. INSERT A

Safety-Related Dc System Design Criteria

The safety-related dc system is designed to the following criteria:

1. The emergency 125-V dc system consists of three physically separate and electrically independent dc power divisions corresponding to the three divisions of the onsite ac power system. Each division feeds a separate emergency dc load group through a separate distribution system.

2. Each division of the emergency dc system has its own battery, primary and backup battery chargers, dc switchgear and distribution panels, which are all Class 1E and Category I.

3. Each emergency battery is sized in accordance with Regulatory Guide 1.32, IEEE-308-1974, and IEEE-485-1978. It is capable of performing its duty cycle (Tables 8.3-8 through 8.3-10) following the loss of chargers after the battery had been floated between 130 and 135 V dc, is fully charged at 65°F, and with capacity deteriorated to 80 percent. Adequate design margin is included in sizing the battery to support future load growth and less than optimum operating conditions. Should both battery chargers for any particular battery be out of service at any point in the dc load cycle, the battery is capable of starting and operating its associated loads for 2 hr according to a precalculated load profile without the battery terminal voltage falling below 105 V dc.

4. Each emergency dc bus has a primary and a backup battery charger. Each emergency battery charger is capable of supplying the largest combined demands of the steady-state loads on the battery while recharging the battery from the design minimum charge state to the fully charged state within 24 hr.

430.24

INSERT A

The normal operating voltage range of the Division III dc loads listed in Tables 8.3-10 is 110 to 135 Volts. The Division III 125V dc battery terminal voltage is normally maintained between 112.5 and 137.5 volts dc in order to provide adequate operating voltage for the connected loads.

will recalculate and confirm

Question 430.24

5. All components of the emergency 125-V dc system are designed as Class 1E and Category I. The components of the three divisions are located in separate rooms in a Category I structure.

6: Each emergency battery room has a separate exhaust duct that is directly discharged to the atmosphere that limits the hydrogen accumulation to less than 2 percent by volume, and maintains the battery room temperature between 65° and 104°F. Each battery room has smoke detection equipment located in 3 hr rated fire areas.

7. The installation design for the emergency batteries provides adequate space for inspection, maintenance, replacement, and testing of the batteries.

8. The emergency dc system is ungrounded.

Safety-Related Dc System Description

Emergency Batteries Division I and II emergency batteries 2BYS*BAT2A and 2BYS*BAT2B are calcium grid type lead-acid batteries having an amp-hr rating of 2,550, on an 8-hr basis at 77°F. The average float voltage is 2.22 V/cell; the average equalizing voltage is 2.33 V/cell. One minute
7 rating of Division I and II batteries is 2,720 amps at 1.75 V per cell.

Division III emergency battery 2BYS*BAT2C consists of calcium grid lead acid cells having an amp-hr rating of 100 on an 8-hr basis. The average float voltage is 2.22 V/cell. The average equalizing voltage is 2.33 V/cell. One minute
7 rating of Division III battery is 148 amps at 1.75 V per cell.

2.29

The battery cell containers are made of translucent plastic material. The cells are sealed type with covers fixed in place with permanent leakproof joints. High and low electrolyte level markers are provided on all four sides of the plastic containers. Cell covers have flash vent arrestor and sample tube openings. All Class 1E batteries are mounted on two-step Category I steel racks with restraining members arranged to prevent motion of the cells relative to
7 each other or to the rack. The battery racks are grounded. The emergency batteries 2BYS*BAT2A, 2BYS*BAT2B, and 2BYS*BAT2C are located in three separate battery rooms in the control building on el 261 ft. The emergency batteries are qualified for their service environment in accordance

The Division III emergency 125-V dc panel is designated as 2CES*IPNL414. The bus is rated for 100 amp which is based on the maximum 1-min demand on the battery. The main and feeder breakers are molded case circuit breakers with overcurrent protective devices. The main breaker for the battery is rated for the maximum 1-min demand on the battery. The circuit breakers are rated for 10-kA interrupting capability. The panel has ground detection and bus undervoltage alarm. Loss of power to the battery chargers and the bus undervoltage conditions are annunciated in the control room when the bus voltage falls below 112.5 V dc. The bus voltage and the battery current are indicated in the control room for monitoring. The Division III emergency 125-V dc panel is located in the Division III diesel generator control room in the emergency diesel generator building at el 261 ft.

The Division I and II emergency 125-V dc systems utilize other emergency distribution panels connected to the dc switchgear for miscellaneous dc circuits. These panels are in NEMA 12 enclosures suitable for indoor application. These panels have fusible switches for branch circuit protection.

Safety-Related Dc System Instrumentation and Control

Remote indications and alarms are provided for all three divisions in the main control room for monitoring the status of the emergency dc system as follows:

1. Indications:

   a. Ammeter for the battery current.

   b. A common ammeter for the primary and backup charger output currents.

   c. Voltmeters for the dc bus voltages.

2. Alarms:

   a. Division I dc system trouble alarm, actuated by the Division I dc bus undervoltage/overvoltage bus ground, battery breaker open, and battery charger undervoltage.

   b. Division II dc system trouble alarm, actuated by the Division II dc bus undervoltage/overvoltage, bus ground, battery breaker open, and battery charger undervoltage.

QUESTION F430.25 (SRP 8.1)

Describe the means used to bypass the thermal overload protection to Class 1E MOVs during accident conditions. Describe what indication of the bypass or lack of bypass is provided in the control room. Give MOV drawing references as specific examples of the design.

RESPONSE

The thermal overload on all safety-related MOVs is bypassed by any automatic safety signal and manually by the operator holding the spring return control switch. Annunciation is provided in the control room for those overload control conditions. An example is shown on Drawing No. ESK-6CSL02 and ESK-6CSL03 in the drawing package.

PSB Comments

The response to this question provided on page Q&R F430.25-1 appears in conflict with that provided on FSAR page 8.3-42a. Resolve this conflict and provide a description of the detailed operation of the bypass circuitry.

Response to PSB Comments

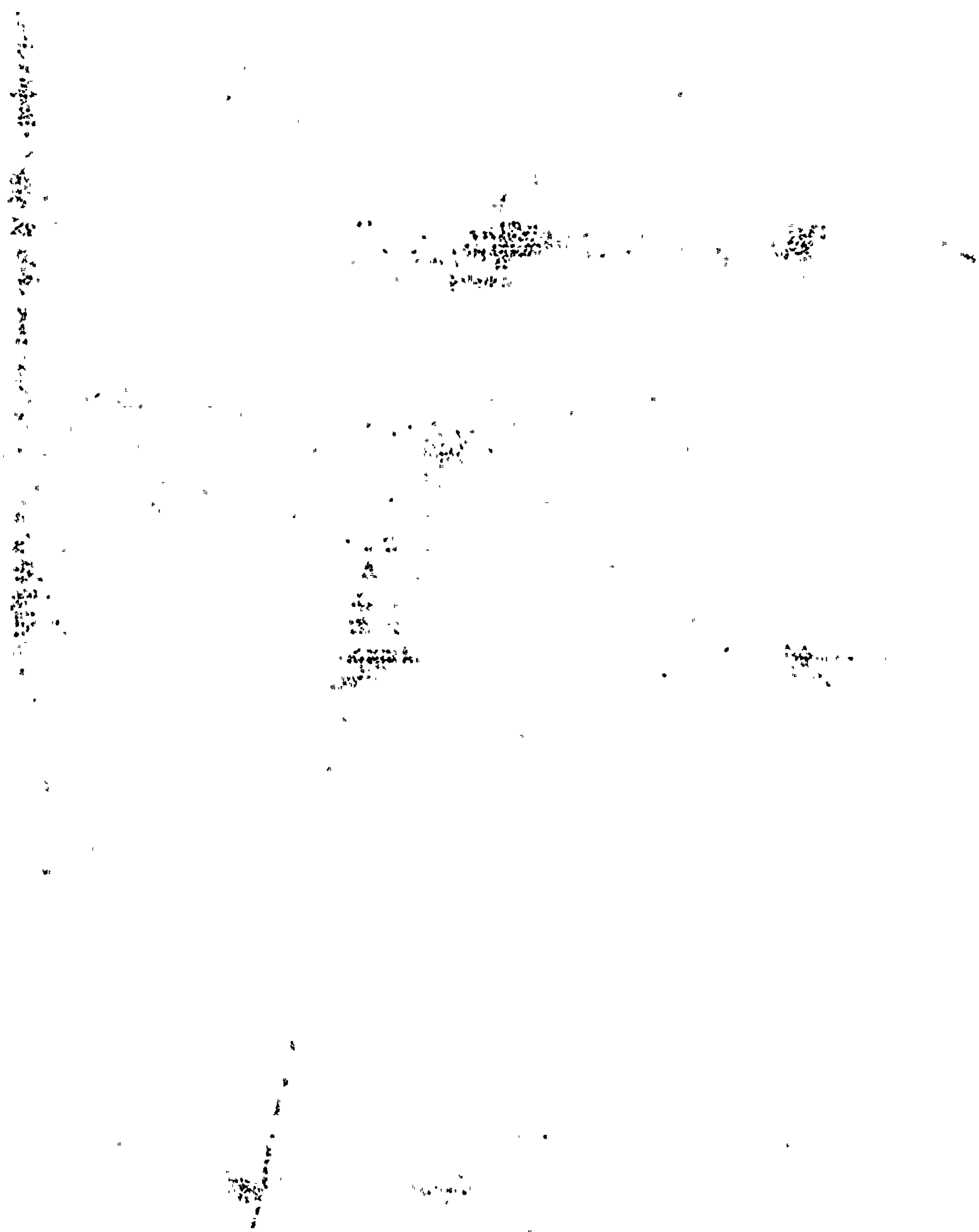
See revised section 8.3.1.1.8 and section 1.8 Reg Guide 1.106.

The thermal overload protection devices for Class 1E MOVs are bypassed using auxiliary relays during normal plant operation and accident conditions. Only during test conditions are these overload protection devices active. Indication of these active overload protection devices is provided in the main control room. 7

The relay trip setpoint drift problems are minimized by appropriate testing and preventive maintenance.

Insert

The thermal overload on all safety-related MOVs is bypassed by any automatic safety signal and manually by the operator holding the spring return control switch. Annunciation is provided in the control room for those overload control conditions. An example is shown on Drawing No. ESK-6CSL02 & ESK-6CSL03 in the drawing package.



REVISED WORDING

TABLE 1.8-1 (Cont)

Regulatory Guide 1.106, Revision 1 (March 1977)

Thermal Overload Protection for
Electric Motors on Motor-Operated Valves

FSAR Section 8.3.1

Position

The Unit 2 project complies with Regulatory Position (Paragraph C) of this guide. Unit 2 utilizes Position 1, Method (b). a

The thermal overload protection devices are normally active during normal plant operation and are automatically bypassed under accident conditions by a safety signal.

Insert

The thermal overload on all safety-related MOVs is bypassed by any automatic safety signal and manually by the operator holding the spring return control switch. Annunciation is provided in the control room for those overload control conditions. An example is shown on Drawing No. ESK-6CSL02 & ESK-6CSL03 in the drawing package.

QUESTION F430.26 (SRP 8.3.2)

Note 1 in Table 8.3-8 on the Battery Load Profile indicates that the motor starting currents occur approximately 1 second after the beginning of the load cycle, and the tripping amps for circuit breakers occur during the first second of the load cycle. Provide the rationale behind this statement and also provide the one minute ratings of the Class 1E batteries.

RESPONSE

See revised Section 8.3.2.1.2.

The rationale is stated in Footnote 1 on Table 8.3-8 and was discussed with the NRC on November 4, 1983.

PSB Comments

Document the rationale used in assuming that the motor starting currents and the circuit breaker tripping amps do not occur simultaneously. Provide this documentation as a response to this question or as a revised footnote.

Response To PSB Comments:

See Table 8.3-8 Note 1

QUESTION F430.35 (SRP 8.3.1, 8.3.2)

Recent experience with nuclear power plant Class 1E motor-operated valve motors has shown that in some instances the motor winding on the valve operator could fail when the valve is subjected to frequent cycling. This is primarily due to the limited duty cycle of the motor. Provide the required duty cycle of the ECCS and RCIC steam and water line motor operated isolation valves as they relate to their respective system modes of operation during various events.

Demonstrate that the availability of the safety systems in the Nine Mile Point Unit 2 design will not be compromised due to the limited duty cycle of the valve operator motors.

RESPONSE

The frequent cycling of ECCS motor-operated valves (MOVs) is ended after the first hour of a LOCA or transient event by operator action. In this hour, the maximum expected duty cycle of any HPCS isolation valve is 5 strokes open and 5 strokes closed, or 10 cycles (energized to deenergized). This expected duty cycle is less than the allowable for any of the HPCS valves. During normal operation, the ECCS MOVs are expected to open and close up to two times during monthly testing, well within their allowable duty cycling.

For the low-pressure ECCS and RCIC MOVs, a response will be provided by June 1984.

PSB Comments

Partial response provided is OK. Additional response to be provided May 1984.

Response.

~~430.35~~

Response

The frequent cycling of ECCS motor operated valves (MOV) is ended after the first hour of LOCA or transient event. The allowable duty cycle of ECCS QA Category I MOV's is 5 cycles open and close per hour. The duty rating for RCIC MOV's is also 5 cycles, except for a 2 cycle rating for the turbine exhaust valve (E51-F068). These allowable cycles per hour envelope the required duty for ECCS and RCIC valves during normal, transient, and accident modes of operation.

¶ Operating procedures will caution plant operators to be aware of the allowable duty cycles on these valves.

¶ To verify their operability, class 1E motor operated valves are qualified in accordance with IEEE-382-1980 as part of the Unit 2 equipment qualification program.

See revised section 5.4.12.4

B31.1 and the additional requirements of the design specification when applicable.

All power-actuated valve operators have been assembled, factory tested, and adjusted on the valve for proper operation, position and torque switch setting, position transmitter function (where applicable), and speed requirements at the manufacturer's shop. Valve actuator electric motors have been furnished in accordance with applicable sections of NEMA Standard MG-1. Assembled power-actuated valves have been tested to demonstrate adequate stem thrust (or torque) capability to operate the valve within the specified time at specified differential pressure. Tests verified that no mechanical damage to valve components occurred during full stroking of the valve.

See insert (1)

Operational Analysis

Preoperational and operational testing performed on the installed valves consists of total circuit checkout and performance tests.

Valves that function as containment isolation valves, will be exercised in accordance with Technical Specifications (Chapter 16) to assure their operability at the time of an emergency or faulted condition. Other valves, serving as system blocks or throttling valves, will be exercised when appropriate.

5.4.13 Safety and Relief Valves

5.4.13.1 Safety Design Bases

Overpressure protection has been provided at isolatable portions of systems in accordance with the rules set forth in Safety Class 1, 2, and 3 components.

5.4.13.2 Description

Pressure relief valves have been designed and constructed in accordance with the same code class as that of the line valves in the system.

Table 3.2-1 lists the applicable code classes for valves. The design criteria, design loading, and design procedure are described in Section 3.9.3B. Specific data (e.g., capacity, set point) are discussed in Section 5.2.2.

Insert ① to 5.4.12.4, p5.4-51

Class 1E motor operated valves are qualified in accordance with IEEE-382-1980 as part of the Unit 2 Equipment Qualification Program to verify the required operability.

QUESTION F430.36 (SRP 8.3)

Operating experience at certain nuclear power plants which have two cycle turbocharged diesel engines manufactured by the Electromotive Division (EMD) of General Motors driving emergency generators have experienced a significant number of turbocharger mechanical gear drive failures. The failures have occurred as the result of running the emergency diesel generators at no load or light load conditions for extended periods. No load or light load operation could occur during periodic equipment testing or during accident conditions with availability of offsite power. When this equipment is operated under no load conditions insufficient exhaust gas volume is generated to operate the turbocharger. As a result the turbocharger is driven mechanically from a gear drive in order to supply enough combustion air to the engine to maintain rated speed. The turbocharger and mechanical drive gear normally supplied with these engines are not designed for standby service encountered in nuclear power plant application where the equipment may be called upon to operate at no load or light load condition and full rated speed for a prolonged period. The EMD equipment was originally designed for locomotive service where no load speeds for the engine and generator are much lower than full load speeds. The locomotive turbocharged diesel hardly ever runs at full speed except at full load. The EMD has strongly recommended to users of this diesel engine design against operation at no load or light load conditions at full rated speed for extended periods because of the short life expectancy of the turbocharger mechanical gear drive unit normally furnished. No load or light load operation also causes general deterioration in any diesel engine.

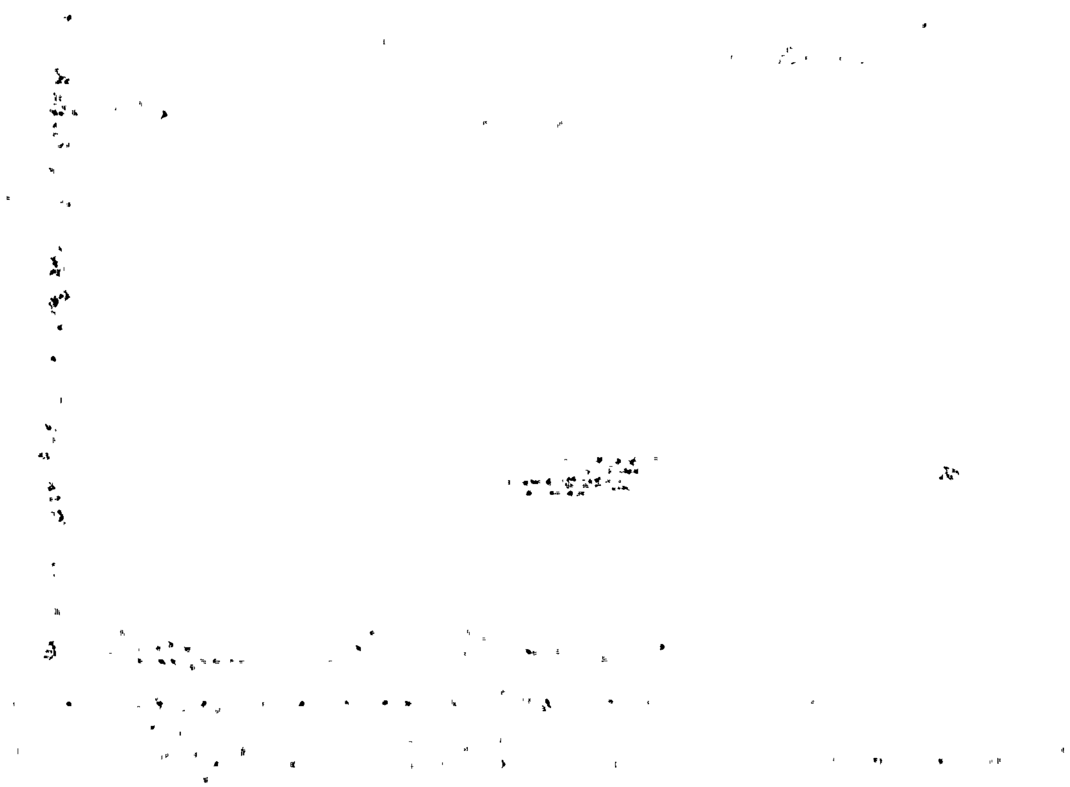
To cope with the severe service the equipment is normally subjected to and in the interest of reducing failures and increasing the availability of their equipment EMD has developed a heavy duty turbocharger driven gear unit that can replace existing equipment. This is available as a replacement kit, or engines can be ordered with the heavy duty turbocharger drive gear assembly.

To assure optimum availability of emergency diesel generators on demand, applicant's who have in place, on order or intend to order emergency generators driven by two cycle diesel engines manufactured by EMD should be provided with the heavy duty turbocharger mechanical drive gear assembly as recommended by EMD for the class of service encountered in nuclear power plants. Confirm your compliance with this requirement. (SRP 8.3.1, Part III)

RESPONSE

See Section 1.12, Licensing Issue 16.

- NIAGARA MOHAWK COMMITS TO INSTALLING A HEAVY DUTY TURBOCHARGER PRIOR TO FUEL LOAD.



QUESTION F430.37 (SRP 8.3)

Provide a detail discussion (or plan) of the level of training proposed for your operators, maintenance crew, quality assurance, and supervisory personnel responsible for the operation and maintenance of the emergency diesel generators. Identify the number and type of personnel that will be dedicated to the operations and maintenance of the emergency diesel generators and the number and type that will be assigned from your general plant operations and maintenance groups to assist when needed.

In your discussion identify the amount and kind of training that will be received by each of the above categories and the type of ongoing training program planned to assure optimum availability of the emergency generators.

Also discuss the level of education and minimum experience requirements for the various categories of operations and maintenance personnel associated with the emergency diesel generators. (SRP 8.3.1, Parts II and III)

RESPONSE

Information will be provided in January 1984.

SEE ATTACHED

Will be expanded to include

1. Who provides training
2. Ongoing + requalification
3. Neets CR 660 [illegible] NUREG
4. Equivalent to Vendor Training

ATTACHMENT A

ADMINISTRATIVE PROCEDURE

REFERENCES

APN	EDUCATIONAL REQUIREMENT	EXPERIENCE REQUIREMENT
APN-10A Licensed Operator Candidate	High School Diploma or equivalent (Section 3.2)	2 years at time of NRC exam (Section 3.2)
APN-10B Licensed NRC Operator Retraining	Same As APN-10A Holding Current NRC License	
APN-10L Training of Non-Licensed Operators	Meet Req. of APN-10A (Sections 3.1, 3.2, and 3.3)	
APN-10M Training for Mechanics	Section 3.2 Labor Agreement and Qualifications	Section 3.3 Progressive
APN-10N Training for Electricians	Section 3.2 Labor Agreement and Qualifications	Section 3.3 Progressive

LESSON PLAN OUTLINE

I. PURPOSE

II. SAFETY DESIGN BASES

III. GENERAL DESCRIPTION

- -Overall Operation
- -Basic Theory of Operation

IV. DETAILED DESCRIPTION

- -Starting Systems
- -Lube Oil Systems
- -Governoring Systems
- -Cooling Systems
- -Turbocharging System
- -Fuel Oil System
- -Electrical Generator System
- -Electrical Distribution System

V. INSTRUMENTATION AND CONTROLS

- -Control Room
- -Local

VI. PRECAUTIONS AND LIMITATIONS

VII. INTERLOCKS

VIII. TECHNICAL SPECIFICATIONS

IX. MITIGATION OF CORE DAMAGE

ATTACHMENT B
(continued)

X. PROCEDURES

- Start Up
- Shut Down
- Normal OPS

This is a proposed outline that will coincide with text material found in the Operations Technology course, which is presently being written.

ATTACHMENT C

MAINTENANCE
LESSON PLAN OUTLINE
DIESEL GENERATORS

I. PURPOSE

II. SYSTEM DESCRIPTION/DESIGN BASIS

III. GENERAL DESCRIPTION

- A) Engine
- B) Generators
- C) Power Panels/Loads Supplied ✓

IV. DETAILED DESCRIPTION

- A) Starting Systems
- B) Fuel Oil System
- C) Cooling System
- D) Turbocharger Operation
- E) Lube Oile System
- F) System Interconnection
- G) Controls
- H) Protective Devices
    - 1) Overspeed
    - 2) Temperature
    - 3) Oil Pressure
    - 4) Low Water

IV. DETAILED DESCRIPTION (Continued)

5) Crankcase Pressure

6) Generator Protection Devices

7) Fire

V. STANDBY STATUS

VI. TECHNICAL SPECIFICATIONS

VII. MAINTENANCE PROCEDURES

~~The "long range" plans for Maintenance involves increasing the manpower to [illegible] men. The training should be equal for each.~~

The physical requirements are designated in APN-10M, and APN-10N.

QUESTION F430.40 (9.5.2)

The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

(a) Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe cold plant shutdown.

(b) Indicate the maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.

(c) Indicate the types of communication systems available at each of the above identified working stations.

(d) Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:

1. the dial telephone system

2. the PP/PA system

3. the M/CC system

4. the SPC system

(e) Describe the performance requirements and tests that the above onsite working stations communication systems will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions. (SRP 9.5.2, Parts I and II)

RESPONSE

(a),(b),(d),(e) See revised Section 9.5.2.4.

(c) See Section 9.5.2.2 and Figures 9.5-5 through 9.5-39.

PSB Comments

Not acceptable. The applicant has not responded adequately to parts (a) and (c) of the question. (The necessity for a response may disappear depending on the acceptability of the applicant's position that the plant design does not require communications.)

Response To PSB Comments

See Revised Section 9.5.2.4

QUESTION F430.41 (9.5.2)

Expand the communication section of your FSAR to provide a discussion on how effective communications will be maintained under the following conditions:

(a) loss of offsite power (LOOP)

(b) design basis seismic event (w/LOOP)

(c) LOOP (seismic event) coincident w/single active failure of one emergency diesel generator

Describe any operator actions which may be required to establish and/or restore communications to the working stations identified previously. State where the action must be taken, and the time required for this operation. (SRP 9.5.2, Part II and II)

RESPONSE

See revised Section 9.5.2.4.

PSB Comments

Not acceptable. The applicant has responded to parts (a) and (c) of the question, and these responses are acceptable. The applicant has not responded to part (c) of the question. (Part (c) may also become academic - see comments for Q430.40.)

Response To PSB Comments

See revised section 9.5.2.4

(backup) via dc switchgear 2BYS-SWG001B. The normal and the bypass ac sources are normally energized from the normal station service transformer. In case of loss of power from the normal station service transformer, these are automatically transferred to the offsite power sources through the reserve station service transformers. In case of loss of offsite power the bypass sources 2NJS-US5 and 2NJS-US6 are connectible to the standby diesel generators, except when a LOCA condition exists. In case of a LOOP coincident with failure of one diesel generator, the other diesel generator will supply the UPS system via its 7
associated stub bus. In case of loss of all ac sources, the UPS systems are energized from the dc backup sources. The backup batteries are rated for 2 hr. Separate cable trays are used to run cables associated with two UPS systems. Thus, no additional operator action is necessary for establishing communication with any working station under 7
above conditions. The M/CC system is powered from the plant normal ac system.

The portable radio communication system is powered by rechargeable batteries and is independent of the plant electrical system. The SPC system requires no plant electric power. Attachment B

The intraplant communication systems will not be subjected to any common mode failure through damage to the system wiring since the PP/PA, dial telephone, and M/CC systems are run in separate raceways. The communication system wiring is not treated as safety related.

Only the telephone system has interconnecting wiring. However, outside the station the telephone lines are run in two directions, east and west, to different telephone company switchboards for redundancy. Failure of one communication system will not affect the performance of any other communication system since these are independent of each other. ATTACHMENT A

In case of any accident conditions, the plant can be shut down from the control room or remote shutdown room and this does not require any communication with other locations in the plant. 7

The communication systems will provide satisfactory voice communication in noisy surroundings up to 120 db. For PP/PA system coverage, the output of speakers in a given area will exceed ambient noise. The soundproof telephone booths provided in areas with high ambient noise level are designed

Attachment-A

The areas of the plant where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents in order to mitigate the consequences of the event, and the types of communication systems available at each of these areas are identified on Figures 9.5-5 through 9.5-39.

(430.41)

Attachment-B

During a design basis seismic event, in the case that all other communication systems are unavailable, necessary communication will be maintained by using the portable radios.

Communication equipment will be testing during preoperational testing to ensure effective communication.

[illegible]

[illegible]

[illegible]

QUESTION F430.44 (9.5.3)

In FSAR Section 9.5.3.2, you discuss emergency lighting for plant areas required for "operating" safety related equipment. However, there is no discussion of emergency lighting in the areas where the actual safety related equipment is located. This is not in conformance with SRP 9.5.3 recommendations and guidelines. Revise your design to provide justification for non-compliance. (SRP 9.5.3, Part II)

RESPONSE

See revised Section 9.5.3.2.

PSB Comments

The applicant's position that lighting is not required in areas containing safety related equipment is being evaluated.

Response To PSB Comments.

8-hour battery pack lighting will be provided in all areas required for safe shutdown and in access and egress routes thereto. See section 9B.10.

Will provide information on Essential lighting circuits which show them to be equivalent to Class 1E

[illegible]

QUESTION F430.46 (9.5.3)

In FSAR Section 9.5.3.3, you state that emergency lighting to essential plant areas is fed from redundant emergency lighting divisions. In Table 9.5.1, you provide a list which shows the percentage of total lighting for various plant areas which is provided by emergency lighting. However, it is not clear (in Table 9.5.1) which areas are fed from redundant divisions, and what percentage of emergency lighting is fed from each division. Revise Table 9.5.1 to provide this information. Also, provide a tabulation of the areas for which emergency lighting is provided and the lighting levels maintained by the emergency lighting system. Show that the lighting levels are adequate to perform all necessary functions in all listed plant areas under design basis seismic event or accident conditions. (SRP 9.5.3, Parts I and II)

RESPONSE

See revised Table 9.5-1.

ISB Comments

Some additional clarification is required:

Ex: Table 9.5-1 page 6 of 9 - lighting data for control room and relay and computer rooms needs explaining.

page 8 of 9 - adequacy of 7 foot candles in DG rooms (NUREG-0700 calls for a minimum of 10)

Response to ISB Comments

a) see revised Table 9.5-1

b) With only the emergency lights on, 11 footcandle will be maintained in the working areas and electrical equipment areas. See revised Table 9.5-1.

REVISED W[illegible]DING

TABLE 9.5-1 (Cont)

Area	Power Source: Normal Percent	Emergency: Percent	Emergency: Level of Illumination From Each Division Foot Candle(10)	Essential Percent	Distribution: Interleave	Distribution: Zonal
Service Building and Foam Room						
El 261'						
General area lighting	100			(1)		X
Auxiliary Boiler Building						
El 261' and 275'						
Hi bay area	100			(1)		X
Working areas	100			(1)		X
Mezzanine area	100			(1)		X
Electrical equipment areas	100			(1)		X
Diesel Generator Building(9)						
El 261'						
General area lighting	90		8-11	10		X
Working areas	70	20(9)	7	10		X
Electrical equipment areas	70	20(9)	8-11	10		X
Operating Personnel Access Between Buildings						
Truck aisle	100			(1)		X
Walkways	100			(1)		X
Electrical Bay						
El 261'	100	(1)	X			
Common Inside Areas						
Stairways		100	X			
Egress paths		100	X			
Exit signs		100	X			
El 214'-6"						
Electrical tunnels	100	(1)	X			
HVAC equipment area	100	(1)	X			

QUESTION F430.47 (9.5.3)

The essential lighting system is non-Class 1E, and cannot be connected to onsite emergency power. Therefore, lighting for passageways to and from safety related equipment areas would be lost immediately following a design basis seismic event, or within a short time (1-2 hours) following a LOOP. This is not in conformance with SRP 9.5.3 recommendations and guidelines. Revise your design to provide access lighting to safety related areas under all accident and/or transient conditions, or provide justification for non-compliance. (SRP 9.5.2, Parts I and II)

RESPONSE

See revised Section 9.5.3.2.

PSB Comments

Not acceptable: Eight hour battery packs are acceptable for egress and personnel safety, provided they are seismically mounted. Access to safety related areas, as well as lighting within those areas, must be Class 1E or equivalent, i.e., capable of operation in excess of 8 hours.

Response to PSB Comments

See revised Section 9B.10

QUESTION F430.48 (9.5.3)

The egress lighting system is non-Class 1E. Therefore, following the design basis seismic event, there would be no egress lighting for evacuation of personnel. This is not in conformance with SRP 9.5.3 recommendations and guidelines. Revise your design to provide egress lighting which will remain functional following the seismic event, or provide justification for non-compliance. (SRP 9.5.3, Part II)

RESPONSE

See revised Section 9.5.3.2.

PSB Comments

Not acceptable. Lighting for safe egress of personnel should be operable during and following any design basis accident and/or transient. The station normal UPS is not Class 1E and is considered to be unavailable following a seismic event. Consequently, egress lighting would also not be available.

Response To PSB Comments

See revised Section 9B.10.

QUESTION F430.49 (9.5.3)

Provide additional discussion on the battery pack-type lighting units around the main control board as described in FSAR Sections 9.5.3.2 and 9.5.3.3. State whether these units are seismically supported, describe their operation, give the illumination levels that these units will provide, and a detail description of the maintenance and periodic testing these units will receive.

RESPONSE

See revised Sections 9.5.3.2 and 9.5.3.3.

PSB Comments

Not acceptable. The question is not completely answered. The applicant must demonstrate that:

(a) battery pack illumination at control room work stations is 10 foot candles or greater, or

(b) battery pack illumination is adequate for any task requiring operator action prior to availability of onsite power (lighting),

(c) no operator action is required for any design basis accident or transient prior to availability of onsite power (lighting).

Response To PSB Comments

See section 9B.10.

8-hour battery pack lighting will be provided in the control room to illuminate to 1 fc. The control room is provided with emergency lighting powered from redundant divisions of the onsite power system. This is restored within 10 seconds from loss of offsite power and no operator action is necessary during this 10 seconds period.

QUESTION F430.50 (9.5.4 through 9.5.8)

The staff requires that emergency diesel generator auxiliary systems piping and components be fabricated and installed in accordance with ASME Section III, Class 3 requirements, and be seismic Category I. The staff requirement is applicable to all auxiliary system piping and components, including engine mounted, up to the diesel engine interface. The diesel engine interface is defined as the first connection off the diesel engine block, be it welded, flanged, or screwed.

The design of the diesel engine auxiliary systems, as discussed in FSAR Sections 9.5.4 through 9.5.8, does not fully comply with the above requirement, and is therefore not acceptable. Revise your design and appropriate FSAR sections to demonstrate compliance with the staff requirements. Show the auxiliary systems piping and component classifications on the appropriate P&ID's, along with the diesel engine interface. (SRP 9.5.4 through 9.5.8, Part III, and Regulatory Guide 1.26)

Insert X →

RESPONSE

See revised Section 9.5.4.1 for a description of the standby diesel generator fuel oil storage and transfer system piping and components. ~~The P&ID will be supplied by the third quarter of 1984.~~

The HPCS diesel engine cooling water heat exchanger and air start system air receivers are in accordance with ASME Section III, Class 3, requirements. All other piping and components of the HPCS emergency diesel generator auxiliary systems conform to ANSI B31.1. Equipment that conforms only to ANSI B31.1 will be pressure tested up to the diesel engine interface at above normal operating pressures. See revised Figures 9.5-43, 9.5-46, and 9.5-48 for system piping and component classifications.

A summary of the HPCS emergency diesel generator auxiliary systems piping and components quality group classifications and seismic categories is given in revised Table 3.2.-1.

PSB Comments

Not acceptable. The staff is concerned with all diesel generator auxiliary systems, but the applicant has addressed only a limited number of these systems. Before this question can be considered closed, we will require the following information:

Insert X

Division I and II DG's

(a) complete P&ID's for all auxiliary systems

(b) engine interface data as requested

(c) verification of design to ASME Section III Class 3 requirements

Division III DG

(a) complete P&ID's for all systems

(b) a comparison which demonstrates that ANSI B31.1, with pressure testing, is equivalent to ASME Section III in terms of system function and inservice reliability. (see Perry and River Bend)

(c) details of Division III auxiliary systems pressure testing

Response

For Div I + II ~~See~~ Revised Figures 9.5-40a thru 9.5-40c and Table 3.2-1

For Div III

a) See Figure 9.5-40d.

b) + c) Table 430.50-1 is a comparison that demonstrates that ANSI B31.1 with pressure testing is equivalent to ASME Code Section III in terms of system function and reliability.

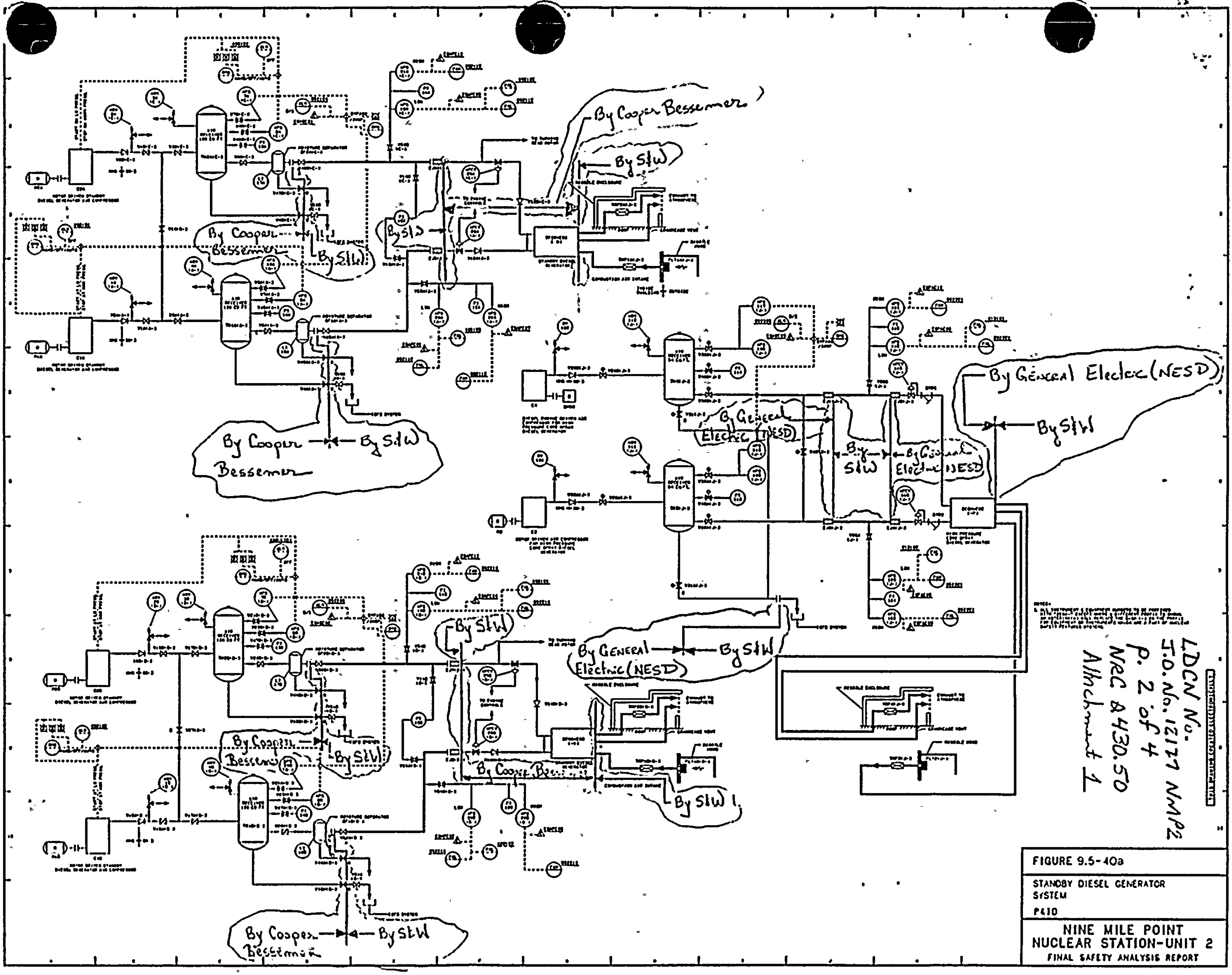


FIGURE 9.5-40a

STANDBY DIESEL GENERATOR SYSTEM

P410

NINE MILE POINT NUCLEAR STATION-UNIT 2

FINAL SAFETY ANALYSIS REPORT

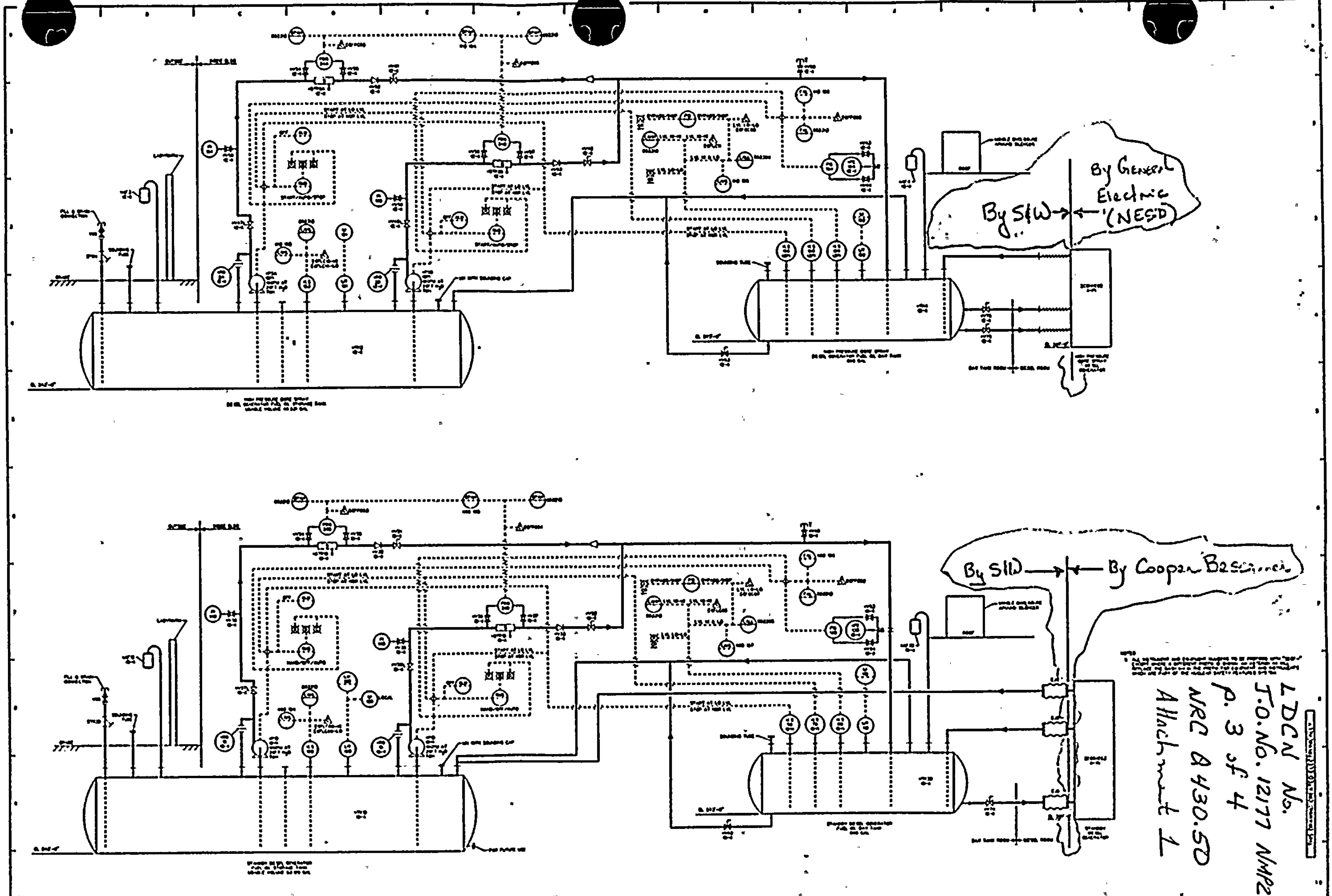


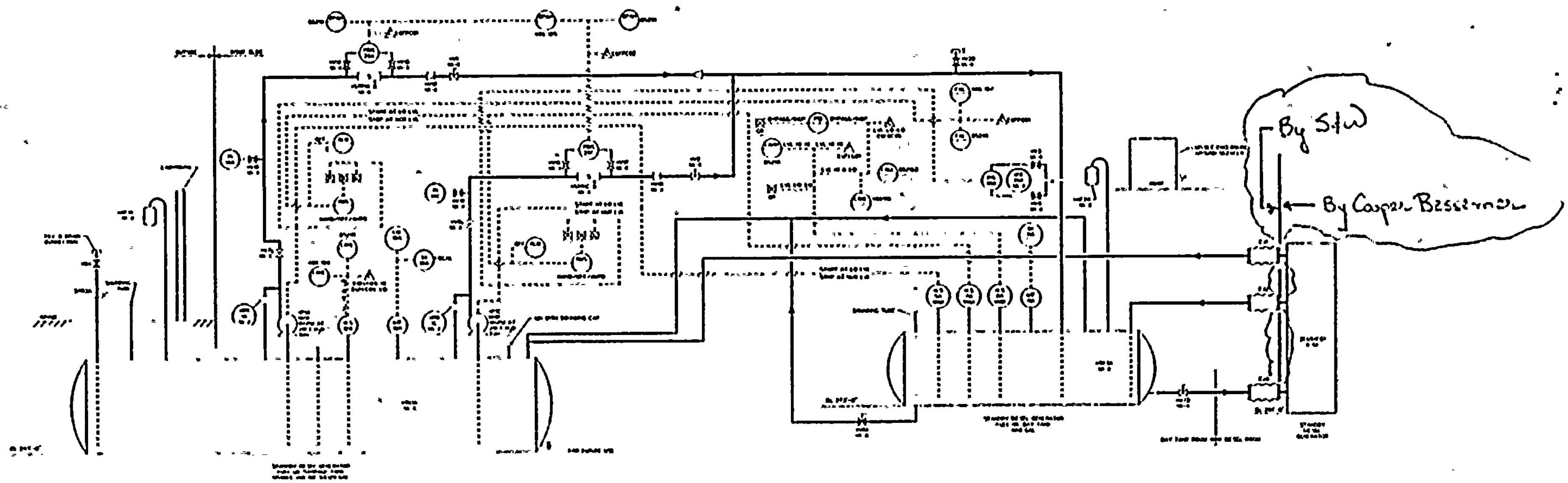
FIGURE 9.5-40b

STANDBY DIESEL GENERATOR SYSTEMS

P&ID

NINE MILE POINT NUCLEAR STATION UNIT-2

FINAL SAFETY ANALYSIS REPORT



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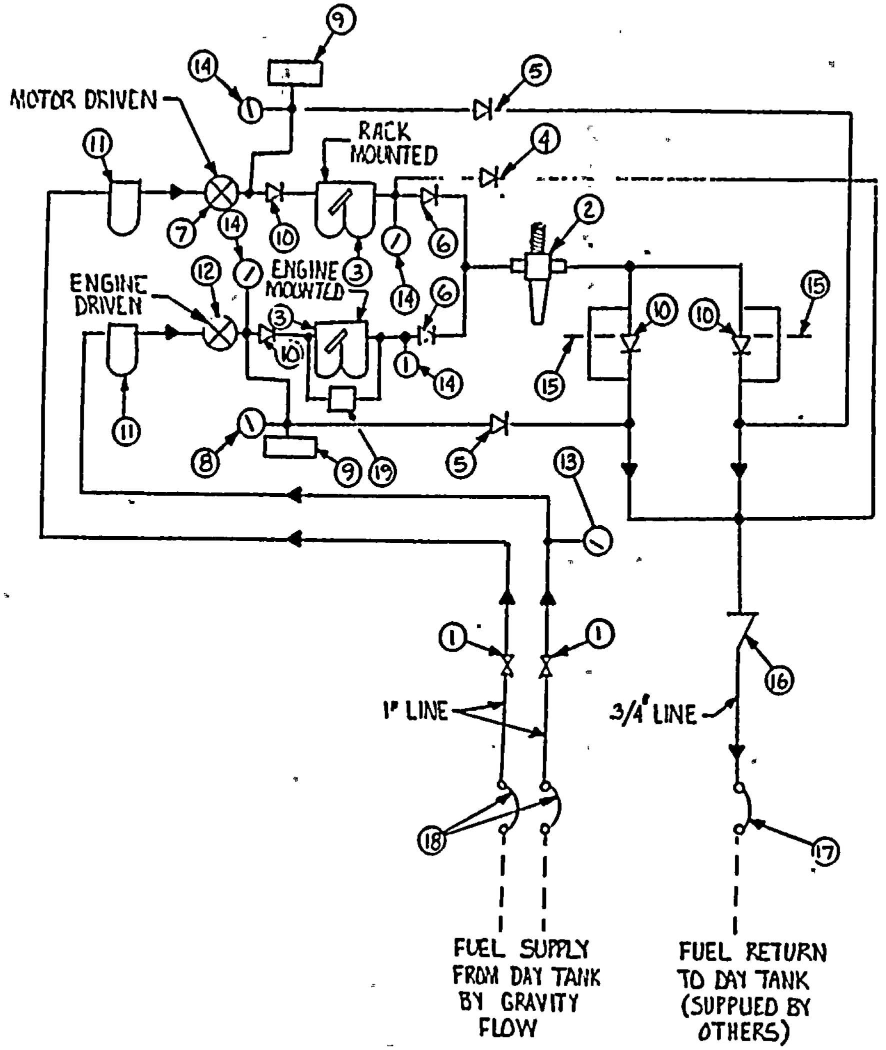
p. 4 of 4.
NRC Q 430.50
Attachment 1

FIGURE [illegible]

STANDBY DIESEL GENERATOR SYSTEMS

P&ID

NINE MILE POINT
NUCLEAR STATION UNIT-2
FINAL SAFETY ANALYSIS REPORT



19		DIFFERENTIAL SWITCH (ALARM), PRESSURE
18	——	FLEX. CONN., C.S., 1"x12" OAL WITH 1" NPTM NIPPLES EACH END
17		FLEX. CONN. C.S. 3/4"x12" OAL WITH 3/4" NPTM NIPPLES EACH END
16		VALVE CHECK 3/4" NPT STEEL
15		ORIFICE 1/16"
14		GAUGE, PRESSURE (0 TO 100 P.S.I) ENGINE MOUNTED
13		FUEL TEMPERATURE GAGE (PANEL MOUNTED)
12		PUMP FUEL ENGINE DRIVEN 4 GPM 60 PSI
11		STRAINER
10		VALVE, RELIEF, 10 PSI
9	[illegible]	SWITCH, ALARM, LOSS OF PRESSURE
8		GAUGE PRESSURE (0 TO 100 PSI) 4 1/2" PANEL MOUNTED
7		PUMP FUEL, ASSY, 4 GPM DRIVEN BY 3/4 HP 115V DC MOTOR
6		VALVE, RELIEF, 1" P.S.I
5		VALVE, RELIEF, 65 P.S.I
4		VALVE, RELIEF, 30 P.S.I
3		FILTER, DUPLEX (ELEMENT PN 8423132 TWO PER FILTER)
2		INJECTOR
1		VALVE FUEL CUT-OFF, 1" NPT

NOTES:

1. ----LINES INDICATES PIPING DONE BY OTHERS.
2. ALL COMPONENTS MOUNTED ON MAIN ENGINE BASE.
3. ITEMS 10 AND 5 COMBINED INTO VALVE ASSEMBLY PN 8432366 WHICH THE FILTERS BOLT TO. TWO OF THESE VALVE ASSEMBLIES ARE USED. THIS REDUCES EXTERNAL PIPING AND FITTINGS.
4. LOCATION OF THE FUEL OIL DAY TANK MUST NOT PUT A POSITIVE HEAD ON ENGINE FUEL INJECTORS WHICH ARE 86 1/4" ABOVE BOTTOM OF ENGINE BASE.
5. ITEM 9 SET POINTS ARE 6" H_2O ALARM & 4" H_2O RESET.
6. ALL PIPING - NON - ASME (ANSI B31.1).

INSERT

FIGURE 9.5-40d
DIESEL GENERATOR
FUEL OIL SYSTEM
DIVISION III

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

Question 50

Table 430.50-1

COMPARISON OF ASME III & B31.1 FOR DG AUXILIARY SYSTEMS

The HPCS diesel generator auxiliary systems are designed to either ASME Code Section III or B31.1 but subjected to seismic Category I qualification and preoperational test requirements. In addition, conservative design pressures were utilized in the auxiliary systems piping design. Verification that correct piping and component materials were used (material certification) during the manufacturing process will eliminate the need for actual mill test reports for piping.

ASME SECTION III, 3	ANSI B31.1
1) Requires ASME materials and mill test reports for piping.	1) Requires only material certifications.
2) Requires seismic design in addition to the B31.1 requirements.	2) Requires design for pressure, temperature, and normal operating loads.
3) Requires liquid penetrant examination for welds over 4" IPS.	3) Requires only visual inspection of welds for design pressure and temperatures of the auxiliaries.
4) Requires hydrostatic test to 1.25 x design pressure.	4) Requires initial service leak test.

The diesel generator auxiliaries are separated into three different segments for design and manufacturing:

a) The auxiliaries that are supplied as a part of the diesel engine skid and diesel starting air skid.

b) The fuel oil storage tanks and day tanks (provided by a tank fabricator).

c) The piping that connects the Diesel Starting Air skid with the engine skid, fuel oil day tank to the engine skid, the cooling service water to the cooling water heat exchanger and the diesel engine air in-take and exhaust.

A discussion of each segment follows.

a) Diesel Engine and Diesel Starting Air (DSA) Skid

The engine-mounted piping and components of the fuel oil, engine cooling water (except heat exchangers which are designed to ASME Section III, Class 3), starting air and lubricating oil systems are seismically qualified to Category I requirements as part of the diesel engine skid. These systems, furnished with the engine, are the standard systems developed by the engine manufacturer in accordance with DEMA standards and have a long history of service and reliability. These systems, piping, and components

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[illegible]

[illegible]

[illegible]

[illegible]

are designed, fabricated, inspected, installed, and tested in accordance with the requirements of ANSI B31.1.

To meet the intent of ASME Section III requirements for the engine skid and DSA-skid, the pressure test will be performed using ASME Section III, Class 3 hydrostatic parameters. The skids are qualified to seismic Category I requirements. Piping over 4 inches, (6" lines between the cooling water heat exchanger, expansion tank and engine block) will be liquid penetrant examined prior to preoperational testing. Furthermore, the expansion tank will be hydrostatically tested at 1.5 times its design pressure.

b) <u>Diesel Oil Storage Tank, Day Tank Supplied by Fabricator</u>

These components are ASME Section III, Class 3.

c) <u>Piping and Components Connecting Skids</u>

The fuel oil piping up to the diesel engine skid and the cooling water system piping and components up to the diesel engine heat exchanger are designed, fabricated, inspected, installed and tested in accordance with ASME Section III, Class 3 requirements.

The piping connecting the diesel fuel oil storage tank and day tank is designed to ASME Section III, Class 3. The piping connecting the DSA skid to the engine skid is designed to ANSI B31.1 and is designated seismic Category I. Hydrostatic testing of 1.5 times design pressure will be accomplished during onsite testing of the auxiliary systems.

Essential components of the air starting system are designed to Section III. The system is classified Safety Class 3 and seismic Category I from the check valve upstream of the receiver tanks.

The air intake and exhaust system, except for the crankcase vent lines and exhaust silencers is classified as seismic Category I Safety Class 3. Piping and components up to the diesel engine interface, are designed to Section III requirements. For both systems, the operating pressure and testing duration are representative of the ASME Code Section III requirements.

QUESTION F430.52 (9.5.4)

Revise FSAR Section 9.5.4 and Figures 9.5-40b and 9.4-40c to include the following information:

(a) A complete description of the fuel oil system from the day tank to the diesel generator, including engine mounted piping and components. The FSAR should identify all system components and describe their operation/function during both normal and emergency operation.

(b) A P&ID for that portion of the fuel oil storage and transfer system described in (a) above.

RESPONSE

See revised Section 9.5.4.2. ~~The P&ID will be provided in the third quarter of 1984.~~

PSB Comments

Not acceptable. The response in revised FSAR Section 9.5.4.2 is acceptable, but the requested P&ID's have not been provided.

Response To PSB Comments

See Figures 9.5-40a thru 9.5-40d.

QUESTION F430.51 (9.5.4 through 9.5.8)

Identify all high and moderate energy lines and systems that will be installed in the diesel generator room. Discuss the measures that will be taken in the design of the diesel generator facility to protect the safety related systems, piping and components from the effects of high and moderate energy line failure to assure availability of the diesel generators when needed. (SRP 9.5.4 through 9.5.8, Parts II and III)

RESPONSE

See revised Sections 9.5.4.3 and 9.5.5.5.

PSB Comments

The response is acceptable.

Note: In section 9.5.5.5, the air start system piping is referred to as a high energy line. This appears to be incorrect, and the FSAR should be revised accordingly.

Response To PSB Comments.

See revised section 9.5.5.5

REVISED WORDING

Should any of the above leakage occur, the operator would be alerted by one or more of the following alarms prior to degradation of engine performance:

7 Jacket water pressure low
Jacket water standpipe/expansion tank level low
Lube oil pressure low
Diesel generator service water discharge pressure low

In addition, the possibility of any tube leakage is minimized by periodic inspection, testing, and maintenance of the systems.

Division I and II diesel generator jacket water heat exchangers are provided with separate and independent service water supply headers and service water discharge headers. The Division III diesel generator jacket water heat exchanger is fed from both Division I and II supply and discharge headers. This arrangement insures that failure in any one division will not jeopardize the safety function of any other division. The service water system design bases are described in Section 9.2.1.

There is no high energy piping in the diesel generator building other than that associated with the diesel generators themselves. The high energy piping associated with the diesel generators is the starting air system piping.

REVISED WORDING

and the combustion air exhaust system piping. Failure of any of these systems can only affect the associated diesel generator. The moderate energy piping systems in the diesel generator building, not associated with the diesel generators, are service air, fire protection, and floor drain piping. Failure of any of these systems cannot jeopardize the safety function of the diesel generator jacket water system. The Division I and II diesel generators are designed and built to operate continuously during a discharge of the fire protection system. The Division III diesel generator is retrofitted with the capability of operating continuously during a discharge of the fire protection system. The moderate energy piping systems associated with the diesel generators themselves are the fuel oil system, starting air system, service water system, and combustion air intake system piping. Failure of the piping of any of these systems will affect the performance of the associated diesel generator alone.

7

Each standby diesel generator is capable of running in a no load condition for 4 hr for Division III and 6 hr for Divisions I and II. After this period they will be loaded according to manufacturer recommendation (for Division III greater than 50 percent load for 30 min, and for Divisions I and II greater than 75 percent for 30 min).

7

The failure modes and effects analysis (FMEA) evaluation of the diesel generator is provided in the Nine Mile Point Unit 2 FSAR FMEA Report.

9.5.6 Diesel Generator Starting System

Each standby diesel generator has two independent, redundant compressed air starting systems, either of which has adequate capacity to assure quick, reliable, automatic starting of the diesel generator following a loss of offsite power.

9.5.6.1 Design Bases

The standby diesel generator starting system is designed to meet the following safety design bases:

1. Each standby diesel generator has independent, redundant air starting systems either of which is capable of starting the engine.

2. The starting air receiver in each of the redundant starting systems has sufficient capacity to start the engine within 10 sec. Each air starting system can crank a cold diesel generator five times without recharging the receiver tanks. Each

QUESTION F430.53 (9.5.4)

Describe the instruments, controls, sensors and alarms provided for monitoring the complete diesel engine fuel oil storage and transfer system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure, and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the system interlocks provided. (SRP 9.5.4, Part III)

Insert PSB Comments next pg →

RESPONSE

See response to Question F430.92.

Response To PSB Comments

a) Monitoring Description is provided in Section 9.5.4.5 and 8.3.1.1.2.

b) See response To 430.16

c) System Description is provided in 9.5.4.2

d&e) Table 7.5-? is applicable To The fuel oil system in That The out of service status light is listed. Table 7.3-15 is applicable To The fuel oil system since instrumentation for fuel oil Storage and Transfer system is listed.

QUESTION 430.53

f) THERE IS A COMMON WINDOW FOR EACH DIVISION. I.E. 852111 – DIVISION I FUEL SYSTEM TROUBLE
852213 – DIVISION II FUEL SYSTEM TROUBLE

THE ALARM SHOWN ON SHT 1 OF FIG 9.5-41 GOING TO PANEL 406 IS A COMMON ALARM, FUEL OIL TRANSFER PUMPS TROUBLE, ~~THE ... PANEL ...~~

EGFFC01 IS THE COMPUTER POINT IDENTIFICATION FOR THE RETRANSMITTED ALARM TO THE COMPUTER WHERE IT WILL INDICATE ON THE ALARM CRT AND PRINT ON THE ALARM TYPER

g. THE ONLY DIFFERENCE IDENTIFIED BETWEEN FIG 9.5-41 AND 9.5-40 IS ON SHEET 3 OF 9.5-41 WHERE AN AMBER LIGHT IS SHOWN OFF OF LS8A FIG. 9.5-40 SHOWS THIS LIGHT AS BEING RED. FIG. 9.5-40 WILL BE CORRECTED IN A FORTHCOMING AMENDMENT

H AIR START SYSTEM LOGIC DIAGRAMS ARE SUPPLIED IN FIG. 9.5-41 SHEETS 4 AND 5

i COOLING WATER SYSTEM AND LUBE OIL SYSTEM ARE VENDOR PACKAGES FOR WHICH NO LOGIC HAS BEEN DONE

j THERE ARE NO CONTROL DEVICES IN THE COMBUSTION AIR INTAKE AND EXHAUST REFER TO FIGURES 9.5-40a, 9.5-49, 9.5-50, 9.5-51

l, see revised section 13.5 – will address that safety D.G. instruments will be on master surveillance schedule.

PSB Comments.

Not acceptable for the following reasons:

(a) The requested information is not provided in FSAR Section 9.5.4.

(b) Logic diagrams in Section 9.5.4 are not complete.

(c) FSAR Section 8.3 provides a list of alarms and annunciators, but does not include a system description.

(d) Table 7.5-1 is not applicable.

(e) Table 7.3-15 is not applicable.

(f) Inconsistency in Figure 9.5-41, Sheet 1 - see note 4 regarding alarms 852111 and 852213 (is there a common trouble alarm for Division I and II: also, is the alarm in panel 406 a common alarm: where does alarm EGFF C01 annunciate).

(g) Figure 9.5-41 does not agree totally with Figure 9.5-40, sheets b and c.

Air Start System

(h) Response is not acceptable because (1) logic diagram does not include controls and alarms on the diesel engine, (2) the FSAR text does not cover engine mounted controls, (3) the FSAR description does not cover abnormal operation, and (4) manual "out-of-service" for start system (Figure 9.5-41, Sheet 4) is not covered.

No data is provided for the Division III DG air start system (logic diagram).

Cooling Water System

(i) No logic diagrams for the Division I, II or III DG's are provided (cooling water system), and item 16 on Division III diagram list is not included on the schematic.

Lube Oil System

(j) No logic diagrams are provided as stated in FSAR Section 9.5.7.3 (refer to Fig. 9.5.41).

Combustion Air Intake & Exhaust

(k) No logic diagrams are provided as stated in FSAR Section 9.5.8.3 (ref. to Fig. 9.5-41)

(l) Testing and calibration of DG auxiliary systems I&C is not adequately addressed. Tech Specs cover monthly surveillance testing, but do not specifically address I&C testing for both normal and abnormal parameters, or for calibrating I&C if an out of spec. condition is found. The response in Q430.92 is not acceptable.

QUESTION F430.54 (9.5.4)

In FSAR Section 9.5.4, you do not address tornado missile protection for the fuel oil storage tank fill, vent, and sounding lines located outside the diesel generator building. This is a staff requirement. Therefore, expand your FSAR to include a discussion on tornado missile protection for these lines, or provide a justification for not complying with staff criteria. (SRP 9.5.4, Part III)

RESPONSE

See revised Section 9.5.4.3.

PSB Comments

Not acceptable. In the event of tornado damage (missile) to the storage tank fill and vent lines, the storage tank would vent into the diesel generator room during filling, which filling would have to be accomplished by pulling a fill hose into the diesel generator room. Other considerations to be addressed include: operating pressure of the vacuum break valve (in inches Hg abs) and the potential effects of this pressure on transfer pump operation (especially as tank level drops): operating pressure of relief valve on day tank vent and the effect of this pressure on transfer pump operation.

Response to PSB Comments.

See revised section 9.5.4.

QUESTION F430.63 (9.5.4)

FSAR Figures 9.5-40b and 9.5-40c show day tank vents which appear to terminate above the diesel generator building roof line. If this is correct, then provide a drawing, or a drawing reference, which shows the day tank vent terminations, and a description of the tornado missile protection provided for these vents. (SRP 9.5.4, Part I)

RESPONSE

See revised Section 9.5.4.3.

PSB Comment

Not acceptable. See comments for Q 430.54.

Response To PSB Comment.

See response To Q 430.54

Association (NFPA) Standard 37, Stationary Combustion Engines and Gas Turbines (1979), which provides for over 1 hr of continuous operation of the diesel generator at full load. Each day tank is isolated in a room enclosed by 3-hr rated fire barriers and protected by automatic sprinkler systems.

Each diesel generator day tank room contains a curb sized to contain the 660-gal volumetric capacity of the fuel oil day tank in addition to an amount of fluid from the fire protection system (30 gal per minute per square foot for a 10-min period). This curb precludes spilling fuel oil into the diesel generator room. Each day tank room curb can be emptied into the diesel generator building floor and equipment drain system. Once fuel oil or cooling water accumulates in the floor drain sump (one sump per diesel generator division), a level switch monitors the quantity of fuel oil or cooling water collected. This fluid is then dispersed to a common oil separator. In addition to the curb arrangement, a low-level storage tank alarm and a low-level day tank alarm also alert the operators to the possibility of a fuel oil leak in the day tank room. 7

In summary, large leaks are detected by low-level alarms in the day tanks. Small leaks are detected by a shorter than normal cycle of the floor drain pumps.

The capped inlet of each storage tank fill line is located above the probable maximum flood level, thereby preventing the entrance of water. Each storage and day tank's vent pipe is also located above the flood level and is designed to prevent rain from entering.

The fuel oil storage tank fill, vent, and sounding lines are located outside the diesel generator building and are exposed to the atmosphere after penetrating 5 ft of fill. In the event of a tornado missile resulting in the obstruction of these fill, vent, and sounding lines, the fuel oil storage tank is vented by a 4-in vacuum relief valve and a 4-in pressure relief valve mounted on a 4-in connection on the storage tank. The vacuum relief valve and pressure relief valve are within the diesel generator building which is designed for missile protection. The fuel oil day tank vent line is located in the diesel generator building day tank room and penetrates through the diesel generator building roof. In the event of a tornado missile accident resulting in the obstruction of the vent line, the fuel oil day tank is vented by a 4-in vacuum relief valve and a 4-in pressure relief valve mounted on the vent line. The vacuum relief valve and pressure relief valve are within 7

Delete & insert 'Insert 1'.

DELETE

7 the diesel generator building which is designed for missile protection.

A sounding rod is utilized periodically to check the accuracy and operation of the tank level indicator by insertion into the sounding tube furnished in each storage and day tank. The possible accumulation of water at the bottom of each diesel fuel oil storage and day tank is also checked by applying a water-indicating paste to the sounding rod. The paste changes color when it comes in contact with water. Should the water level be excessive, water is removed from the storage tanks by the use of a portable pump and from the day tanks by opening a drain valve located near the bottom of each tank.

Adequate sources of diesel quality fuel oil are available in the cities of Oswego (8 mi), Belgium (25 mi), and Syracuse
7 (35 mi). Under extremely unfavorable environmental conditions, fuel oil will be delivered onsite via tanker truck escorted by highway snow removal equipment.

This will permit each standby diesel generator system to supply uninterrupted emergency power. Fuel oil meets or exceeds the quality requirements of ASTM D975-1978 and the diesel engine manufacturer's recommendations.

The growth of algae in the fuel oil storage tank is determined by measuring the oxidative stability in accordance with ASTM D2274-74. If it is more than
7 2 mg/100 ml, the fuel oil in the affected storage tank will be appropriately treated (filtration or biocides) to reduce the level to acceptable concentrations.

9.5.4.4 Inspection and Testing Requirements

The standby diesel generator fuel oil storage and transfer system is designed to permit periodic inspection and maintenance of active components. Local display and indicating devices are provided for periodic inspection of tank oil level and operating parameters such as pump discharge pressure and pressure drop across each fuel oil strainer.

Fuel oil storage and day tanks and piping are hydrostatically tested prior to filling with fuel oil. System operability is tested in conjunction with the diesel generator. Continued system integrity is verified with periodic testing with the diesel generator.

Insert A

In the event of a tornado missle resulting in the obstruction of these fill, vent, and sounding lines, the fuel oil storage tank is vented by a 1-in line routed from a 4-in connection on the storage tank to the 4-in vent line on the fuel oil day tank. The fuel oil day tank vent line is located in the diesel generator building day tank room and penetrates through the diesel generator building roof into a tornado missle enclosure. Therefore, the standby diesel generator fuel oil storage tank and day tank vent lines are protected by a common tornado missile enclosure. Typical common tornado missile enclosures for divisions I, II and III are illustrated in Section 5-5 on Figure 1.2-17.

QUESTION F430.55 (9.5.4)

In FSAR Section 9.5.4.1, you state that the fuel oil storage and transfer system conforms to ANSI Standard N195-1976. Expand your FSAR to include a detailed discussion of the internal and external corrosion protection that is provided for the fuel oil storage tanks. Include the appropriate industry codes and standards that will be followed in the design and application of this protection. Also, include a discussion of the cathodic protection that is provided, or, if cathodic protection is not used, a justification for not having it. (SRP 9.5.4, Part II)

RESPONSE

See revised Section 9.5.4.2.

PSB Comments

The response is acceptable with regard to external corrosion protection provided that:

(a) The complete storage tank is encased in concrete, including the portion which extends beyond the diesel generator building, and

(b) adequate protection is provided for the fill, vent, and sounding lines so as to preclude concentration of corrosion where these lines meet the tank.

The applicant must provide detailed technical information on the function of the fuel oil additive to be used in preventing internal tank corrosion. The applicant must address how free water is prevented, how water is retained in suspension, what gums and tars are prevented from forming, etc. Pending receipt and acceptance of response, this portion of Q430.55 response is not acceptable.

Response to PSB Comments

a) The complete storage Tank is encased in concrete

b) To be provided - a writeup on exterior coating on sounding lines

c) see section 9.5.4.2

[illegible]

[illegible]

1. Provide fuel oil storage capacity for each diesel generator, based on continuous diesel generator operation at rated capacity (4,400 Kw for each of the standby diesel generators, and 2,600 Kw for the HPCS diesel generator) for 7 days, without interconnection to any other onsite fuel oil system.

2. Provide pumps, piping, valves, and strainers that are designed, constructed, and tested in accordance with ASME Boiler and Pressure Vessel Code, Section III, Subsection ND, 1977 Edition. The fuel oil storage tanks and fuel oil day tanks are classified as ASME III, Section I, Class 3, and are constructed in accordance with the rules of ASME III, Section I, Subsection ND. 7

3. Provide a system conforming to ANSI Standard N195-1976, Fuel Oil Systems for Standby Diesel Generators, and meeting Category I and Safety Class 3 requirements.

9.5.4.2 System Description

The standby diesel generator fuel oil storage and transfer system is shown on Figure 9.5-40. The system consists of:

1. Three diesel fuel oil storage tanks, one for each diesel engine. Each storage tank (approximately 53,150 gal. for each of the standby diesel generator fuel oil storage tanks, and 46,850 gal. for the HPCS diesel generator fuel oil storage tank) is sized to store sufficient fuel for continuous operation of its respective diesel engine at rated capacity for 7 days. Interior and exterior surfaces are not coated, but are prepared in accordance with ANSI N45.2.1 - Cleaning of Fluid Systems and Associated Components during Construction of Nuclear Power Plants - June 1, 1973. The cleaning of the internal surfaces of these carbon steel vessels is in accordance with ANSI N45.2.1 (Class C) requirements. A diesel fuel oil stabilizer, such as SDI-35, is added to the fuel oil storage tanks to prevent oxidation of the fuel oil and the formation of gums and tars that would plug fuel lines. The water emulsifier component of SDI-35 keeps any water contamination suspended in the fuel oil and prevents it from settling out in the bottom of the tank where rusting would occur. SDI-35 also 7

Delete and Insert Attachment 1 → (continued)

(continued)
Delete and Insert Attachment 1

contains agents to prevent internal storage tank corrosion and biotic growth in the fuel. The external surfaces of the fuel oil storage tanks require no special coating but are free from oil, grease, loose rust, and loose paint. The tanks are buried in concrete below the diesel generator building. Since galvanic reactions are unlikely to occur in such an environment, cathodic protection of the fuel oil storage tanks is not required. After the interior and exterior surfaces are cleaned, tested, and dried, they are inspected in accordance with Subsection 3.1 of ANSI N45.2.1. The fill of each tank extends below the diesel generator mat beyond the exterior wall line, thereby positioning the tank fill line, sounding line, and vent line outside the building. Each storage tank is filled from its own tank truck fill station located in the yard. The storage tanks are constructed with baffles, 10 reinforcement stiffeners, 4 reinforcement rings, and 15-degree off-center drains to minimize turbulence within the tanks during filling. The 4-in. fill lines for the three divisional fuel oil storage tanks are located 51 ft 3 in. and 55 ft 3 in. from the first and second pump suctions, respectively. Seven 3/4 in. x 8 in. stiffener rings are evenly spaced between the fill line and the first pump suction in the Division I and II fuel oil storage tanks. Five 3/4 in. x 8 in. stiffener rings are evenly spaced between the fill line and the first pump suction in the Division III fuel oil storage tank. Since the fill line and pump suctions are located on opposite ends of each storage tank, sediment agitated between the stiffeners during filling will not affect the pump suction inlets. The separate fill lines are capped when not in use and are each provided with a locked-closed isolation valve and a strainer capable of filtering out sediment. Minor stirring of the sediment may occur in the fuel oil storage tank when fuel oil is recirculated through the 2-in. fuel oil day tank overflow line. For all divisions, the overflow line is located 3 ft 10 in. and 7 ft 10 in. from the first and second pump suctions, respectively. Two 3/4 in. x 8 in. stiffener rings are located in the vicinity of the two pump suctions. These stiffener rings, along with the fuel oil pump stabilizer assembly, minimize any turbulent effects around the pump suctions. Each storage tank also has a manhole for maintenance access from within the diesel generator

ATTACHMENT 1

A diesel fuel oil stabilizer, such as NUCHEM FC-101, is added to the fuel oil storage tanks at a treatment rate of 1 gallon per 2000 gallons of diesel fuel oil and is inhibited at yearly intervals at the same treatment rate. Any make-up fuel is reinhibited at the same rate during diesel fuel oil addition. NUCHEM FC-101 can prevent tank failures indefinitely when this treatment routine is used with a fresh tank. Overtreatment will not adversely affect the storage, flow, or burning properties of the fuel oil. NUCHEM FC-101 contains various multipurpose agents. The preservative additive prevents formation and settling out of organic sludge and, also, acts as a rust preventive agent protecting the storage tanks.

NUCHEM FC-101 contains metal deactivators and metal suppressing agents which retard oxidation and polymerization of the fuel as a result of trace amounts of copper that may be present in the fuel. A water absorptive agent in NUCHEM FC-101 keeps trace amounts of water dispersed in the diesel fuel oil. NUCHEM FC-101 contains a bactericide agent which prevents bacteria and slime formation and destroys any existing organisms. NUCHEM FC-101 with its rigidly formulated multi-purpose agents insures the start-up of the standby diesel generators.

Utilities and both small and larger consumers of No. 2 diesel fuel oil are recognized users of NUCHEM FC-101 and related NUCHEM fuel conditioners.

For info only

NuChem

NuChem Corporation
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Boonton, New Jersey 07005
201-334-8088

April 19, 1984

Mr. Ken Floyd
Stone & Webster
Engineering Corporation
3 Executive Campus
Box 5200
Cherry Hill, New Jersey 08034

Dear Ken:

Thank you for your interest in our products and specifically those products that relate to conditioning of fuels for long term storage. I would just like to mention that NuChem was incorporated shortly after Economics Laboratory made a decision to cease operations at Apollo Technologies. Formally I was Vice President of Apollo having the over-all responsibilities for chemical manufacturing and equipment engineering. We were a major manufacturer and marketer of fuel additives, fuel conditioners, flue gas conditioners, slag modifiers and dust control products to many of the major utility companies throughout the world.

I have enclosed some product information on our fuel conditioners. The NuChem fuel conditioning products are based on accepted and proven products we previously manufactured and marketed under the Apollo tradename. The following is a list of companies that have used NuChem FC-101 or the equivalent product Apollo SDI-35.

Anachemia Canada Inc.
C.P./P.O. Box 147
Lachine, Quebec, Canada
John Gilmour 48S 4A7

Duke Power Company
McGuire Station
Cornelius, North Carolina

Private Tele-Communications Company - Florida
J. Zedalis......This company will not allow us to use there name, however, Mr. Zedalis will vouch for the product and its effectiveness.

Baltimore Gas & Electric Company
Calvert Cliff
Lusby, Maryland

South Central Bell
P.O. 32410
Louisville, Kentucky 40232
John Bushau

Hess Oil Virgin Islands Corp.
Kingshill, P.O. Box 127
St. Croix, Virgin Islands

Hess Oil & Chemical Division
Amerada Hess Corporation
P.O. Box 500
Woodbridge, New Jersey 07095

Tenneco Oil Company
Box 2511
Houston, Texas 77001

The NuChem philosophy is to not simply to be selling a product. We are prepared as may be necessary to provide the service to insure that the product(s) are effective.

We are very pleased to submit this information to you and would hope that when it is appropriate, that you will introduce your customer(s) to us.

If we can be of any further assistance, please do not hesitate to contact us.

Regards,

LeRoi R. Yaffey

LRY/bl

Enclosures: NuChem FC-101

cc: C. Grace

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PROBLEMS OF...	BACTERIA BUILDUP?	WATER IN FUEL LINE?
	PLUGGED FILTERS?	RUSTING OF FUEL TANKS?
	CLOGGED SCREENS?	"NO-HEAT" CALLS?

NUCHEM FC-101

LONG TERM STORAGE FUELS / MILITARY FUELS / MISSILE STATIONS / STANDBY RESERVE FUELS
EMERGENCY DIESELS / GAS TURBINE FUELS / MARINE RESERVE FUELS
INTERRUPTIBLE FUELS / DIESEL FUELS & DOMESTIC FURNACE OILS

KEEPS STORED FUEL OILS
REFINERY-FRESH UP TO 10 YEARS

COMPLETELY ELIMINATES COSTLY WASTAGE PROBLEM OF DUMPING "AGED" FUELS

PROTECTS FUEL STORAGE TANKS AGAINST Corrosion • Bacterial Destruction
• Sludged Fuel Oil • Acid Build-up
• Water Drop-out

ASSURES INSTANT START-UP OF EMERGENCY DIESELS, GAS TURBINES and AUXILIARY POWER SOURCES

CURRENTLY IN USE BY PRIVATE TELECOMMUNICATIONS SYSTEMS

APPROVED FOR USE IN
BELL SYSTEMS

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NUCHEM FC-101

MULTIPURPOSE FUEL CONDITIONER

- For Standby Fuels
- For Regularly Burned Fuels

FOR USE WITH: Diesel Fuels, Kerosene, Furnace Oils, Jet Fuels, #4 Oil and Bunker C

A preservative additive to keep the standby fuels in "ready-to-fire" condition. Standby fuels are routinely inhibited with this product on an annual basis to keep the fuels in "refinery fresh" condition. The additive has been proven to have the capability of keeping such fuels stable as long as 10 years, when reinhibited annually.

MULTIFUNCTIONAL COMPONENTS:

(1) Stabilizer - to prevent the formation of organic sludge.

(2) Dispersing agent - to prevent settling out of any sludge.

(3) Rust preventive agent - to protect the storage tanks in the water bottom layer, as well as in the air layer above the fuel oil.

(4) Metal Deactivators and Metal Suppressing Agents - to retard the oxidation and polymerization of the fuel as a result of trace amounts of copper that may be present in the fuel.

(5) Water absorptive agent - to keep trace amounts of water dispersed in the fuel and prevent burner flameout.

(6) Bactericide agent - to prevent bacteria and slime formation and to destroy any existing organisms. The excellent rust protective properties of the fuel conditioner also prevents bacteria from gaining a "foothold" in the fuel storage tanks.

GENERAL PURPOSES OF FC-101

NuChem FC-101 will maintain the fuel oil in refinery fresh condition even for extended periods of time. By proper reinhibition of the fuels, storage stability of as much as 10 years can be obtained. This is particularly important for standby fuels to be used with emergency diesels or gas turbine generators.

DISPERSANT & PENETRATING SOLVENT:

NuChem FC-101 is a penetrating solvent and dispersant for gums, varnish and hard carbon buildup. It will:

(1) Disperse sludge in fuel tank.
(2) Prevent layering (sludge-out) in #4, #5 and #6 oils.
(3) Clean fuel preheaters, filters and screens.
(4) Clean burner tips.
(5) Promote uniform atomization.

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FC-101 FOR USE WITH DISTILLATE FUELS:

The petroleum refiners in preparing diesel fuel or #2 furnace oils add sufficient stabilizer to the fuel to protect it during the summer months, or at least until it is delivered to the fuel oil dealer or the consumer. However, the amount of stabilizer added to the fuel oil is limited.

It is even more important to note that the refiner is not primarily concerned with tank rusting or tank failure from long term storage.

Water-soluble inhibitors interfere with the storage stability of the fuel, and should not be used.

In order to keep stored fuel in "refinery fresh" condition, it is necessary that a supplementary inhibitor be added to the fuel.

The advantages of the FC-101 inhibitor where used routinely with distillate fuels are:

(1) Prevents tank failures due to rusting. It is estimated that an average lifetime for a fuel storage tank for distillate fuel is 5 to 10 years. The additive should extend this period to 10 to 20 years and indefinitely when treatment is started with a fresh tank.

(2) Less maintenance is required since the fuel is always in ready condition for firing. The screens and nozzles require less frequent cleanout on a continually used basis and the lifetime of the Fulflo filters is extended from one year to three years.

(3) Permits savings in fuel costs by making it possible to substitute lower cost #2 fuel oil in place of kerosene or diesel fuel.

To the above directly realizable economic advantages, one should consider the expenses that occur when a furnace is not operating correctly and loss of power results therefrom. Even if the inhibitor is viewed as a preventive protection against potential failures, it provides a significant margin of safety.

USES WITH HEAVY FUEL OILS:

The FC-101 can also be used with #4 fuel oils and residual fuel oils where advantage can be taken of its dispersing properties. It will prevent sedimentation as well as settle-out.

Residual fuels are manufactured today as a cutback of still bottoms with cutter stock. There are strong tendencies for settle-out to occur. This can be prevented by the use of FC-101.

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POUR POINT DEPRESSANT:

NuChem FC-101 often functions as a pour point improver for #4, #5 and #6 oils, although its effect is unpredictable. Generally it improves the pumpabilities of the fuels at low temperatures and will stabilize the pour point. In some cases reductions of up to 40° F. pour point have been noted.

DISPERSANT INHIBITOR:

NuChem FC-101 prevents wax and sludge deposits in storage tanks containing distillate fuels, #4, #5 and #6 oils. It peptizes and disperses sludge deposits.

TREATMENT RATE:

1 gallon/2,000 gallons of fuel oil.

Reinhibit the fuels at yearly intervals at the same rate of 1 gallon per 2,000 gallons.

Any makeup fuel should be reinhibited at the same rate, i.e. each 1,000 gallons of makeup fuel will require 2 quarts of FC-101.

Overtreating will not adversely affect either the storage, the flow, or the burning properties of the fuel oil.

CLASSIFICATION & CONTAINER:

NOIB - 55 and 30 Gallon containers, 5 Gallon Pails, 1 Gallon Cans (6 per case), 1 Quart Cans (12 per case), and 1 Pint Cans (24 per case).

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NUCHEM PRODUCT DATA SHEET
NUCHEM FC-101

General Description:

NuChem FC-101 is one of a series of Fuel Conditioners manufactured and marketed by NuChem. It maintains the fuel oil in "refinery fresh" condition even for extended periods of time. By proper inhibition of the fuels, storage stability of more than five (5) years can be obtained. This is particularly important for stand-by fuels to be used with emergency diesels or gas turbine generators. The telephone companies, utilities and both small and larger consumer's of No. 2 oil are recognized users for NuChem Fuel Conditioners.

Advantages:

NuChem 101 is a rigidly formulated multi-purpose additive which when properly added and maintained in the fuel will:

* Insure the start-up of emergency diesels, gas turbines and auxiliary power sources.
* Prevent the formation of sludge.
* Prevent tanks failures due to rusting.
* Inhibit the oxidation and polymerization of the fuel.
* Prevent bacteria and slime formation and destroy any existing bacteria.
* Disperse minute amounts of water in the fuel and prevent burner flame-out.

NuChem FC-101 or a modified conditioner can also be successfully used in No. 4, No. 5 and No. 6 oils. Properly added and maintained, the pour point can be depressed while preventing costly problems due to wax and sludge deposition.

Typical Properties:

Appearance	Clear Amber
Odor	Mild
Specific Gravity @60°F.	0.94
Density, lbs./gal. @60°F.	7.84
Viscosity @60°F. Cps.	85
Flash Point COC°F.	185
Pour Point, °F.	-15

Treatment Rate:

The normal treatment rate requires one (1) gallon of NuChem 101 to 2,000 gallons of fuel oil. For stand-by fuels the reinhibition rate should be maintained on a yearly basis.

Packaging and Availability:

NuChem Fuel Conditioners are readily available in bulk, 55 gallon drums and 5 gallon pails, F.O.B., Boonton, New Jersey.

QUESTION F430.56 (9.5.4)

In FSAR Section 1.8, you state that the fuel oil storage and transfer system will comply with Regulatory Guide 1.137, except for those portions dealing with oxidative stability and cloud point. This is not acceptable. The staff requires that you test for oxidative stability, and that the minimum acceptability cloud point be identified in accordance with ASTM D975. Revise your FSAR accordingly.

RESPONSE

See revised Table 1.8-1, Regulatory Guide 1.137.

PSB Comment

The response is acceptable. Applicant should identify the anticipated steady state temperature in the storage tanks.

Response To PSB comment.

The steady state Temperature of the fuel in the storage tank is ground Temperature.

QUESTION F430.57 (9.5.4)

Figures 9.5-40b and 9.5-40c show what appears to be a simplex strainer in the fuel oil transfer pump discharge lines for both the standby diesel generators and the HPCS diesel generator. This is not in conformance with the recommendations of ANSI N195, which recommends use of a duplex strainer with a pressure differential alarm. Revise your design to conform to ANSI N195, or provide justification for noncompliance. (SRP 9.5.4, Part II)

RESPONSE

See revised Section 9.5.4.2.

PSB Comments

Not acceptable. The system design is such that both transfer pumps are in operation at all times. Therefore, it is logical to assume that both strainers will plug up at the same time, thereby causing loss of fuel flow to the DG's. The simplex strainers do not provide the instant change capability of duplex strainers.

Responce To PSB Comments

See revised section 9.5.4

QUESTION F430.62 (9.5.4)

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision will be made in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of the storage tank. Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator. (SRP 9.5.4, Parts I, II, and III)

RESPONSE

See revised Section 9.5.4.2.

PSB Comments

Not acceptable. The following information and/or assurances must be provided before the response can be considered acceptable:

(a) details of fuel tank construction

(b) a procedure is established to limit the fill rate so as to minimize turbulence during filling

(c) it can be shown that corrosion products will not form in the storage tanks

(d) the fuel oil strainer question can be resolved.

Response To PSB Comments

a) Detail drawing of the fuel tank are provided under separate cover.

b) ~~To be provided.~~ NMPC WILL PROVIDE A PROCEDURE THAT WILL LIMIT THE FILL RATE SO AS TO LIMIT TURBULANCE.

c) See response To Question PSB Comments 430.55

d) See response To Question PSB Comments 430.57.

[illegible]

[illegible]

[illegible]

[illegible]

oil by the pumps. Each fuel oil transfer pump discharge line is equipped with a simplex-type sediment strainer sized for full pump flow. Although ANSI Standard N195-1976 recommends the use of duplex strainers in diesel fuel oil systems, one simplex strainer per pump accomplishes the same intent. One simplex strainer and its associated fuel oil transfer pump may be taken out of service for maintenance; this occurs subsequent to an alarm or control room annunciation indicating that the pressure drop across the strainer exceeds an alarm set point. Since each fuel oil pump is redundant and is capable of automatically starting after an associated pump failure, maintenance on the strainer will not discontinue the normal flow of fuel oil to that diesel.

Delete and Insert Attachment 1

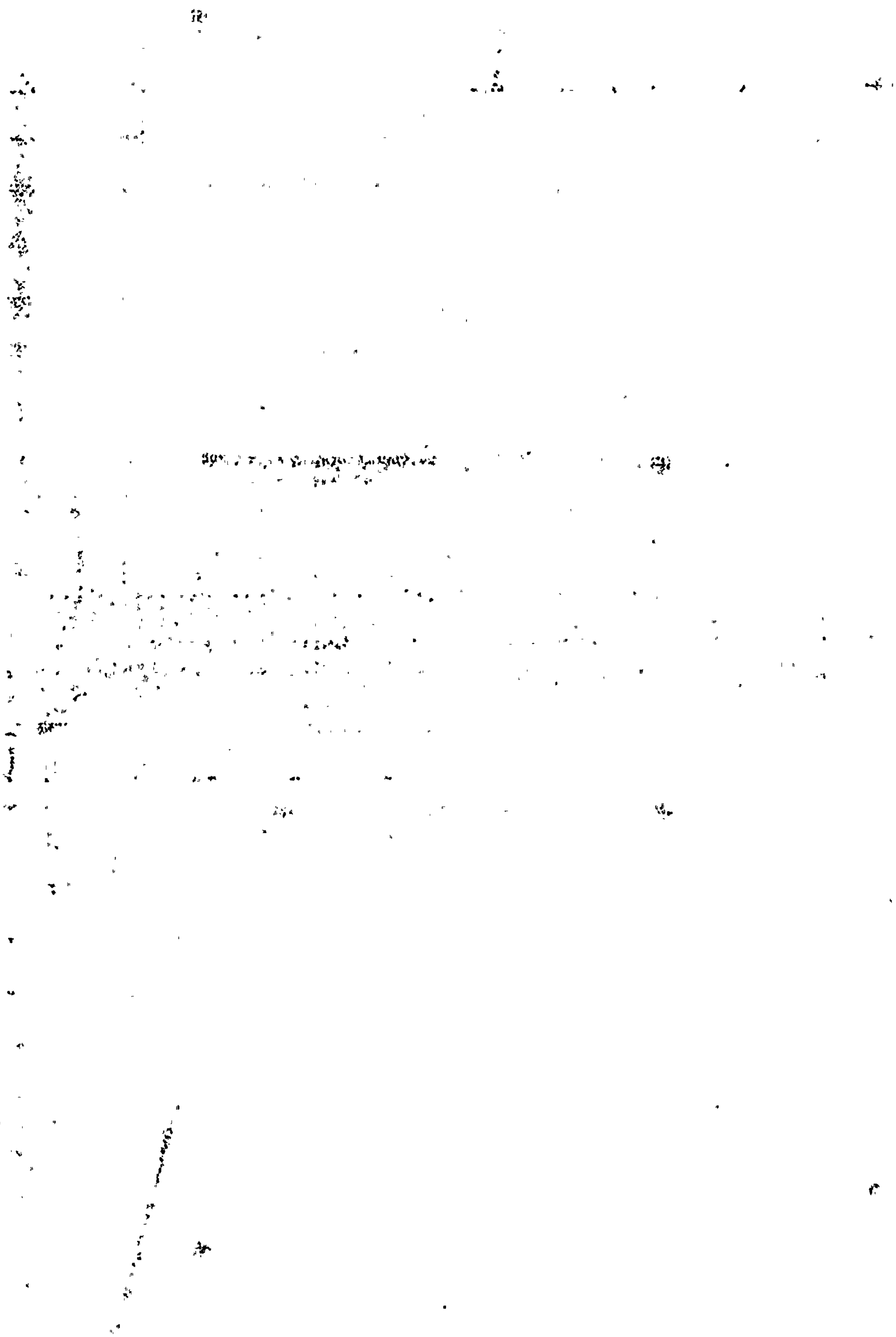
3. Three diesel fuel oil day tanks, one for each diesel engine. Each day tank is located in the day tank room above the engine generator control panel room of its associated diesel generator. The elevated location of the tank provides adequate net positive suction head (NPSH) to the engine-driven fuel pump of the diesel engine. Each day tank is supplied with a manhole for maintenance access, an external vent, a sounding tube for manual confirmation of fuel oil level, and an overflow line for returning excess fuel oil to the fuel oil storage tank.

Delete and Insert Attachment 2

Even though each fuel oil transfer pump is capable of supplying the maximum fuel demand of a standby diesel generator, each duplex set of fuel oil transfer pumps is controlled to start together, automatically, when fuel oil in its respective day tank falls to the pump-on level and stops automatically when fuel oil rises to the pump-off level. Fuel oil from the day tank flows by gravity to the suction of the engine-driven fuel pump which boosts the pressure to that required by the fuel injection header. For the two standby diesel generators, fuel oil is supplied to the engine-driven booster pump and to the standby booster pump through a four-element duplex strainer.

The four-element duplex strainer is located on the base of the engine. Four shells with cleanable type wire mesh elements are attached to a common manifold. A control valve in the center of the manifold permits flow to two elements on either side of the valve, or to all four elements. Normal operating position of the valve exists with two elements in operation and two elements in standby. A differential

7



ATTACHMENT 1

By administrative operating procedure the operation of one diesel fuel oil transfer pump shall serve ~~each divisional~~ the diesel generator with the other pump in standby mode ~~pump~~. When high differential pressure across the transfer pump discharge strainer indicates a clogged condition, an alarm in the control room will alert the operator to initiate the operation of the standby pump. Since approximately 75 gallons of diesel fuel oil are available in the day tank between the low level set point and the diesel generator feed line connection, the diesel generator will not be jeopardized since the ~~unit~~ engine can operate at full load for 15 minutes after the high differential pressure alarm.

[illegible]

Attachment 2

Each fuel oil transfer pump is capable of supplying the maximum fuel demand of a standby diesel generator. By administrative operating procedure one fuel oil tranfer pump starts automatically when fuel oil in its respective day tank falls to the pump-on level and stops automatically when fuel oil rises to the pump-off level.

POWER SYSTEM BRANCH

430.58

QUESTION - ASTM D2274 IS A TEST DESIGNED TO PREDICT THE FORMATION OF SOLID (PARTICULATE) MATTER AS A CONSEQUENCE OF FUEL OXIDATION. ALL SOLIDS, INCLUDING ALGAE, ARE REMOVED PRIOR TO THE TEST. A REVISED RESPONSE IS REQUIRED.

RESPONSE: OUR ANSWER WAS ACCEPTABLE WITH A CLARIFICATION THAT DURING THE FILTERING PROCESS THE FILTER MEDIA WILL BE ANALYZED FOR THE PRESENCE OF ALGAE.

THE NRC WILL PROVIDE AN ADDITIONAL OPTIONAL PROGRAM IN LIEU OF D2274 FOR NMPC REVIEW.

QUESTION F430.59 (9.5.4)

In FSAR Section 9.5.4.4, you discuss periodic testing of fuel oil to ensure its quality meets the requirements of ASTM D975-1978. However, there is no discussion of testing of new fuel per ANSI N195, nor is the term "periodically" defined. The staff requires that all new fuel be analyzed and stored fuel be analyzed on a minimum quarterly basis, in accordance with ANSI N195 and Regulatory Guide 1.137 requirements. Revise your FSAR accordingly. (SRP 9.5.4, Part II)

RESPONSE

See revised Section 9.5.4.4.

[illegible]

7 the diesel generator building which is designed for missile protection.

A sounding rod is utilized periodically to check the accuracy and operation of the tank level indicator by insertion into the sounding tube furnished in each storage and day tank. The possible accumulation of water at the bottom of each diesel fuel oil storage and day tank is also checked by applying a water-indicating paste to the sounding rod. The paste changes color when it comes in contact with water. Should the water level be excessive, water is removed from the storage tanks by the use of a portable pump and from the day tanks by opening a drain valve located near the bottom of each tank.

Adequate sources of diesel quality fuel oil are available in the cities of Oswego (8 mi), Belgium (25 mi), and Syracuse
7 (35 mi). Under extremely unfavorable environmental conditions, fuel oil will be delivered onsite via tanker truck escorted by highway snow removal equipment.

This will permit each standby diesel generator system to supply uninterrupted emergency power. Fuel oil meets or exceeds the quality requirements of ASTM D975-1978 and the diesel engine manufacturer's recommendations.

The growth of algae in the fuel oil storage tank is determined by measuring the oxidative stability in
7 accordance with ASTM D2274-74. If it is more than 2 mg/100 ml, the fuel oil in the affected storage tank will be appropriately treated (filtration or biocides) to reduce the level to acceptable concentrations.

9.5.4.4 Inspection and Testing Requirements

The standby diesel generator fuel oil storage and transfer system is designed to permit periodic inspection and maintenance of active components. Local display and indicating devices are provided for periodic inspection of tank oil level and operating parameters such as pump discharge pressure and pressure drop across each fuel oil strainer.

Fuel oil storage and day tanks and piping are hydrostatically tested prior to filling with fuel oil. System operability is tested in conjunction with the diesel generator. Continued system integrity is verified with periodic testing with the diesel generator.

The quantity of diesel fuel oil available in storage is checked and logged periodically and after each operation of

the respective diesel generator for a period of 1 hr or longer. Water accumulation in the diesel generator fuel oil storage and day tanks is checked monthly and after each operation of the diesel engine. Samples of fuel oil from every tank are analyzed quarterly to ensure that the fuel meets the quality requirements of ASTM D975-1978 and the diesel engine manufacturer's recommendations. New fuel will be tested for specific gravity, the presence of water and
7 sediment, and viscosity prior to addition to ensure that the limits of ASTM D975-1978 are not exceeded. Analysis of the other properties of the fuel oil will be completed within two weeks of the fuel addition.

9.5.4.5 Instrumentation Requirements

Description

Safety-related instruments and controls are provided for automatic and manual control of the standby diesel generator fuel oil storage and transfer system. Except where noted otherwise, controls and the instruments described below are located in the associated diesel generator room. The control logic is shown on Figure 9.5-41.

Operation

Each duplex set of standby diesel generator fuel oil transfer pumps is controlled automatically by the oil level in its associated day tank. Each pump can also be controlled manually.

Monitoring

Indication is provided for each of the following:

1. Fuel oil storage tank level.

2. Fuel oil day tank level.

An alarm is provided for each of the following:

1. Fuel system trouble (annunciated in main control room).

2. Fuel system inoperable (annunciated in main control room).

3. Fuel oil storage tank level low/high.

4. Fuel oil day tank level low-low/high-high.

TABLE 1.8-1 (Cont)

Regulatory Guide 1.137, Revision 1 (October 1979)

Fuel-Oil Systems for Standby Diesel Generators

FSAR Section 9.5.4

Position

The Unit 2 project complies with the Regulatory Position (Paragraph C) of this guide with the following clarification. The minimum fuel temperature in the tank will be the basis for the acceptance criteria. 7

QUESTION F430.61 (9.5.4)

In Section 9.5.4.3 you state that diesel fuel oil is available from local distribution sources. Identify the sources where diesel quality fuel oil will be available and the distances required to be travelled from the source(s) to the plant. Also discuss how fuel oil will be delivered onsite under extremely unfavorable environmental conditions. (SRP 9.5.4, Part I)

Discuss the precautionary measures that will be taken to assure the quality and reliability of the fuel oil supply for emergency diesel generator operation. Include the type of fuel oil, impurity and quality limitations as well as diesel index number or its equivalent, cloud point, entrained moisture, sulfur, particulates and other deleterious insoluble substances; procedure for testing newly delivered fuel, periodic sampling and testing of onsite fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks and periodic system inspection. In your discussion include reference to industry (or other) standard which will be followed to assure a reliable fuel oil supply to the emergency generators. (SRP 9.5.4, Parts II and III)

RESPONSE

See revised Sections 9.5.4.2 and 9.5.4.3 and Table 1.8-1, Regulatory Guide 1.137.

1. Provide fuel oil storage capacity for each diesel generator, based on continuous diesel generator operation at rated capacity (4,400 Kw for each of the standby diesel generators, and 2,600 Kw for the HPCS diesel generator) for 7 days, without interconnection to any other onsite fuel oil system.

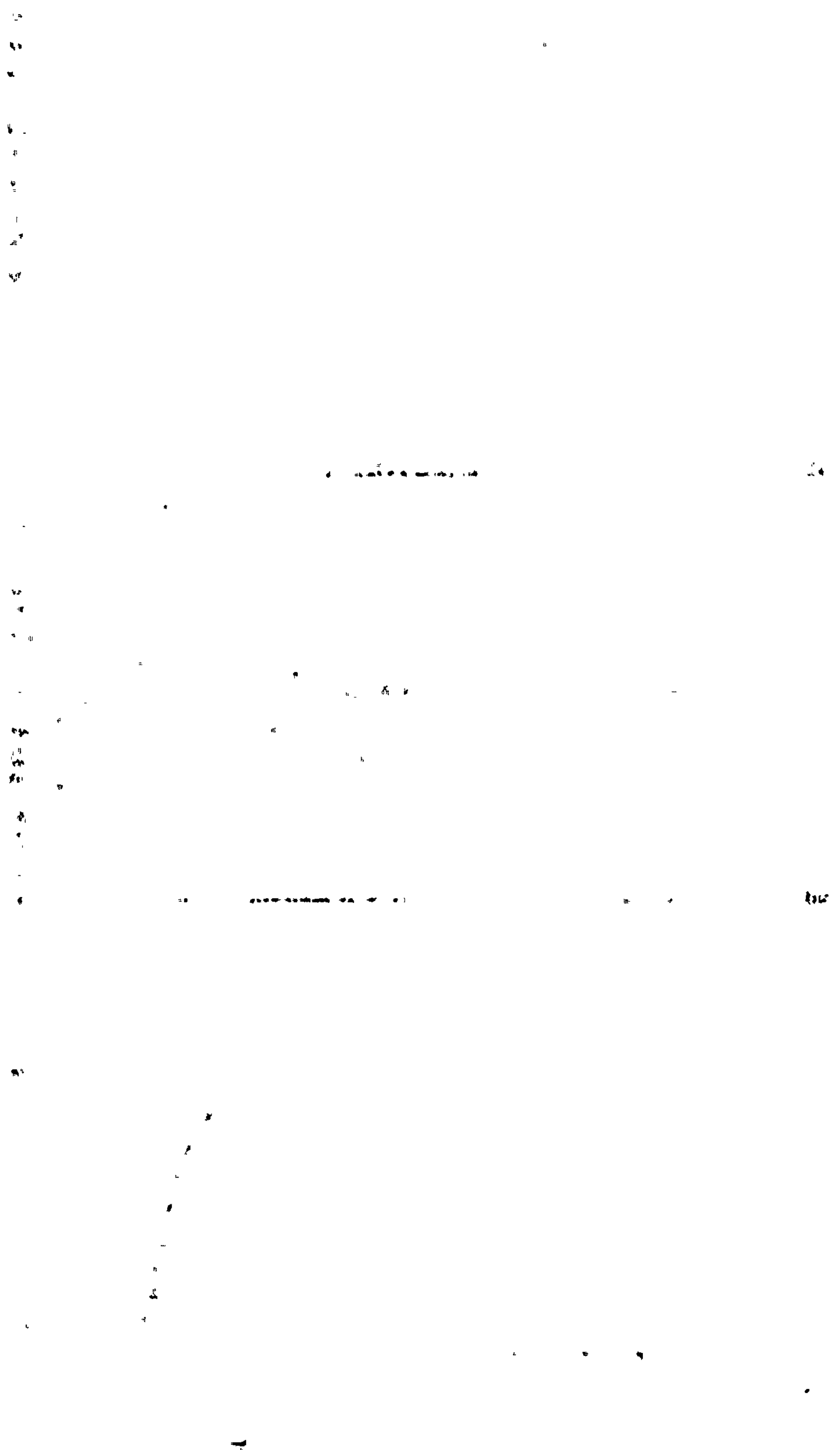
2. Provide pumps, piping, valves, and strainers that
are designed, constructed, and tested in accordance
with ASME Boiler and Pressure Vessel Code,
Section III, Subsection ND, 1977 Edition. The fuel 7
oil storage tanks and fuel oil day tanks are
classified as ASME III, Section I, Class 3, and are
constructed in accordance with the rules of
ASME III, Section I, Subsection ND.

3. Provide a system conforming to ANSI Standard N195-1976, Fuel Oil Systems for Standby Diesel Generators, and meeting Category I and Safety Class 3 requirements.

9.5.4.2 System Description

The standby diesel generator fuel oil storage and transfer system is shown on Figure 9.5-40. The system consists of:

1. Three diesel fuel oil storage tanks, one for each
diesel engine. Each storage tank (approximately
53,150 gal. for each of the standby diesel
generator fuel oil storage tanks, and 46,850 gal.
for the HPCS diesel generator fuel oil storage
tank) is sized to store sufficient fuel for
continuous operation of its respective diesel
engine at rated capacity for 7 days. Interior and
exterior surfaces are not coated, but are prepared
in accordance with ANSI N45.2.1 - Cleaning of Fluid
Systems and Associated Components during 7
Construction of Nuclear Power Plants -
June 1, 1973. The cleaning of the internal
surfaces of these carbon steel vessels is in
accordance with ANSI N45.2.1 (Class C)
requirements. A diesel fuel oil stabilizer, such
as SDI-35, is added to the fuel oil storage tanks
to prevent oxidation of the fuel oil and the
formation of gums and tars that would plug fuel
lines. The water emulsifier component of SDI-35
keeps any water contamination suspended in the fuel
oil and prevents it from settling out in the bottom
of the tank where rusting would occur. SDI-35 also

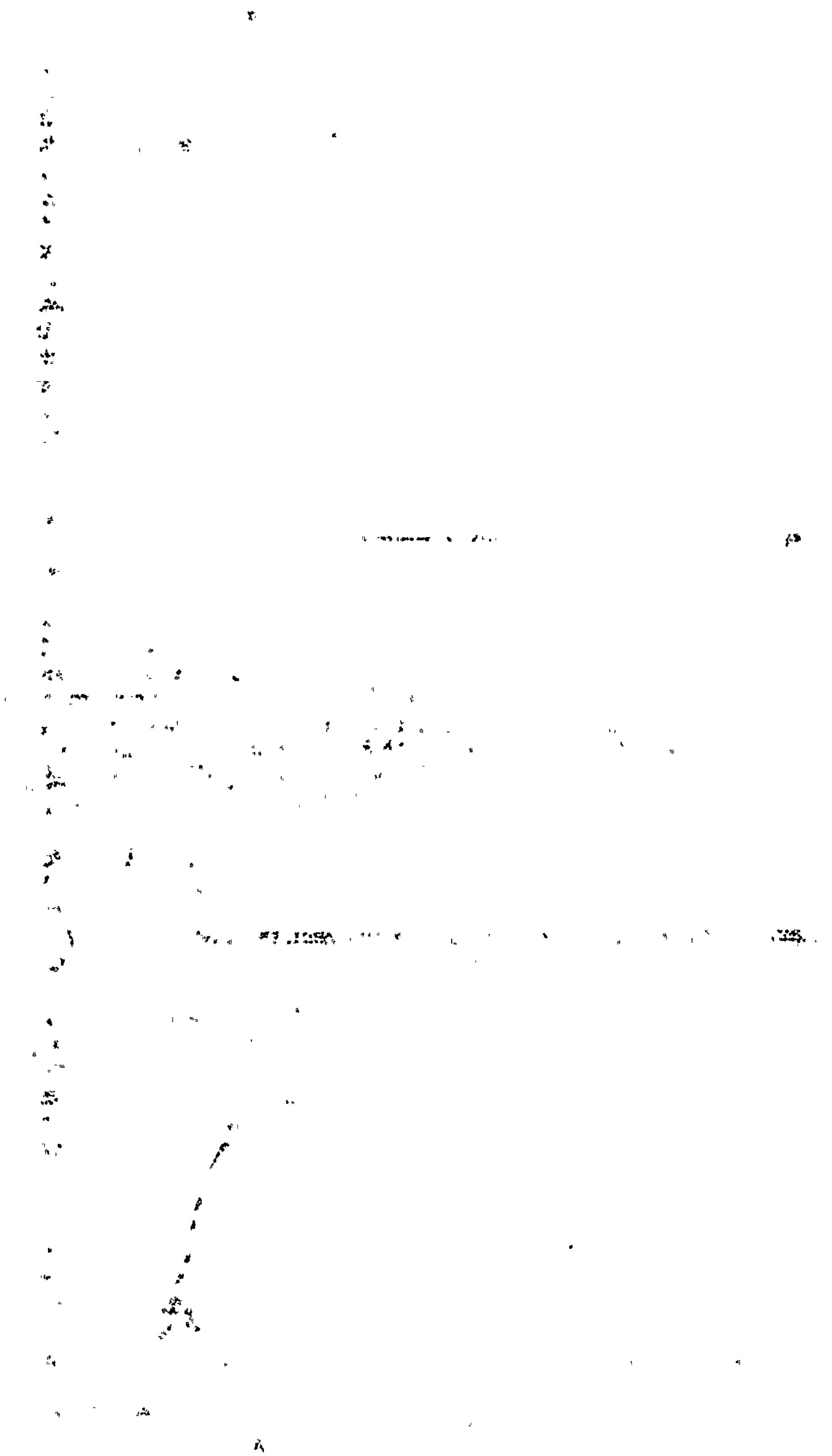


contains agents to prevent internal storage tank corrosion and biotic growth in the fuel. The external surfaces of the fuel oil storage tanks require no special coating but are free from oil, grease, loose rust, and loose paint. The tanks are buried in concrete below the diesel generator building. Since galvanic reactions are unlikely to occur in such an environment, cathodic protection of the fuel oil storage tanks is not required. After the interior and exterior surfaces are cleaned, tested, and dried, they are inspected in accordance with Subsection 3.1 of ANSI N45.2.1. The fill of each tank extends below the diesel generator mat beyond the exterior wall line, thereby positioning the tank fill line, sounding line, and vent line outside the building. Each storage tank is filled from its own tank truck fill station located in the yard. The storage tanks are constructed with baffles, 10 reinforcement stiffeners, 4 reinforcement rings, and 15-degree off-center drains to minimize turbulence within the tanks during filling. The 4-in. fill lines for the three divisional fuel oil storage tanks are located 51 ft 3 in. and 55 ft 3 in. from the first and second pump suctions, respectively. Seven 3/4 in. x 8 in. stiffener rings are evenly spaced between the fill line and the first pump suction in the Division I and II fuel oil storage tanks. Five 3/4 in. x 8 in. stiffener rings are evenly spaced between the fill line and the first pump suction in the Division III fuel oil storage tank. Since the fill line and pump suctions are located on opposite ends of each storage tank, sediment agitated between the stiffeners during filling will not affect the pump suction inlets. The separate fill lines are capped when not in use and are each provided with a locked-closed isolation valve and a strainer capable of filtering out sediment. Minor stirring of the sediment may occur in the fuel oil storage tank when fuel oil is recirculated through the 2-in. fuel oil day tank overflow line. For all divisions, the overflow line is located 3 ft 10 in. and 7 ft 10 in. from the first and second pump suctions, respectively. Two 3/4 in. x 8 in. stiffener rings are located in the vicinity of the two pump suctions. These stiffener rings, along with the fuel oil pump stabilizer assembly, minimize any turbulent effects around the pump suctions. Each storage tank also has a manhole for maintenance access from within the diesel generator

7

building, an external vent, and a sounding tube for manual confirmation of fuel oil level. Each storage tank has a 1/16-in. corrosion allowance.

2. Six electric motor-driven, vertical, turbine-type fuel oil transfer pumps. The pumps are mounted in duplex sets on top of each fuel oil storage tank and each duplex set is connected in parallel to its respective day tank to permit the transfer of fuel



oil by the pumps. Each fuel oil transfer pump discharge line is equipped with a simplex-type sediment strainer sized for full pump flow. Although ANSI Standard N195-1976 recommends the use of duplex strainers in diesel fuel oil systems, one simplex strainer per pump accomplishes the same intent. One simplex strainer and its associated fuel oil transfer pump may be taken out of service for maintenance; this occurs subsequent to an alarm or control room annunciation indicating that the pressure drop across the strainer exceeds an alarm set point. Since each fuel oil pump is redundant and is capable of automatically starting after an associated pump failure, maintenance on the strainer will not discontinue the normal flow of fuel oil to that diesel.

3. Three diesel fuel oil day tanks, one for each diesel engine. Each day tank is located in the day tank room above the engine generator control panel room of its associated diesel generator. The elevated location of the tank provides adequate net positive suction head (NPSH) to the engine-driven fuel pump of the diesel engine. Each day tank is supplied with a manhole for maintenance access, an external vent, a sounding tube for manual confirmation of fuel oil level, and an overflow line for returning excess fuel oil to the fuel oil storage tank.

Even though each fuel oil transfer pump is capable of supplying the maximum fuel demand of a standby diesel generator, each duplex set of fuel oil transfer pumps is controlled to start together, automatically, when fuel oil in its respective day tank falls to the pump-on level and stops automatically when fuel oil rises to the pump-off level. Fuel oil from the day tank flows by gravity to the suction of the engine-driven fuel pump which boosts the pressure to that required by the fuel injection header. For the two standby diesel generators, fuel oil is supplied to the engine-driven booster pump and to the standby booster pump through a four-element duplex strainer.

The four-element duplex strainer is located on the base of the engine. Four shells with cleanable type wire mesh elements are attached to a common manifold. A control valve in the center of the manifold permits flow to two elements on either side of the valve, or to all four elements. Normal operating position of the valve exists with two elements in operation and two elements in standby. A differential

7

pressure indicator and alarm monitor this strainer with an annunciator on the unit control panel. When the alarm occurs at 5 psi differential, an operator turns the valve handle to clean the elements that were in operation while placing the two standby elements into operation.

The engine-driven booster pump is located on the left side of the engine and is driven off the back of the jacket water pump drive at 1750 rpm. Pump output at full speed is approximately 12.5 gpm at 50 psig.

The standby booster pump is mounted on the left side of the engine near the filters and strainers and is driven by a 1-hp motor at 1800 rpm. Oil is circulated at 12.5 gpm @ 50 psig. The pump starts and primes the engine-driven pump when the start signal is given for the engine to start. The pump stops from a speed signal given from the engine. The pump also starts if fuel pressure in the main header at the low pressure control downstream of the engine-driven pump falls to 25 psi. A relief valve set at 50 psi directs oil from the pump outlet back to the inlet side. A bypass line and a check valve around this pump allow the main pump to pick up fuel from the main header.

A 50-psi relief valve and a 35-psi relief valve in the booster pumps' discharge lines regulate the supply to the fuel pumps. A four-element duplex filter ensures clean fuel to the pumps and nozzles. 7

Duplex fuel filters are located beside the strainers on the engine and are alike except for the elements. Fuel oil is filtered just prior to entering the engine supply header. A differential pressure indicator and alarm monitor this filter with an annunciator on the unit control panel. When the alarm occurs at 10 psi differential, the operator will place the other filter in service and replace the other filter.

Fuel injection nozzle injects high pressure fuel from the pump into the cylinder. Because of the timing of the fuel pump, this fuel is released in the cylinder during the compression stroke. Spray holes in the tip of the nozzle atomize the fuel into a very fine mist in a symmetrical pattern. This mist mixes with the air in the cylinder to form a combustible mixture. This mixture is then ignited by the heat of compression caused by the piston compressing the air and fuel in the cylinder.

A small head tank (5-gal. capacity) is located on the generator end of the engine above and between the cylinder

banks. In the system it is between the fuel pump headers. A flowing vent is located in the top of this tank and joins the flowing vents from the fuel pumps at the flowing vent reservoir to return draining fuel to the day tank.

Fuel oil supply pressure, after the filter, is indicated by a pressure indicator on the engine gauge panel. A 1:1 ratio relay transmits a signal to another pressure indicator on the unit control panel located in the diesel generator control room to indicate fuel oil pressure at the end of the injection pump fuel heater. A low-pressure alarm switch set at 10 psig in the supply header announces a low supply pressure on the unit panel.

A small shell-tube fuel oil cooler located on the end of the engine cools the fuel oil that is bypassed by the 35-psi relief valve.

The fuel oil cooler is located on the front of the engine below the engine-driven lube oil pump and is primarily required to cool oil bypassed by the 35-psi relief valve when the engine is running at idle speed. The cooler will handle 6 gpm of fuel on the shell side and 11 gpm of water
7 on the tube side. Fuel entering at 170°F will exit at 125°F using 100°F water at full capacity.

The fuel system for the high pressure core spray diesel generator is similar to the fuel system for the standby diesel generators as described above.

Fuel oil is supplied to the engine-mounted fuel pump from the fuel oil day tank by gravity flow. Fuel under low pressure then passes through a 10-psi relief valve and the filter elements to the fuel manifold supply line and injector inlet filter at each cylinder into the injector. A small portion of this fuel supplied to each injector is pumped into the cylinder at very high pressure through the needle valve and spray tip of the injector. The quantity of fuel injected depends upon the rotative position of the plunger as set by the injector rack and the governor. The excess fuel not used by the injector flows through the injector serving to lubricate and cool the working parts.

The fuel leaves the injector through the return fuel filter. From the return fuel filter in the injector, the excess fuel passes through the fuel return line in the manifold to the relief valve inlet of the "return fuel" through a swing check valve. This relief valve restricts the return fuel, maintaining a back pressure on the injectors. The swing check valve prevents reversal of flow and siphoning. The

fuel continues into the "return fuel" sight glass, filling the glass, down through the standpipe under the glass and through the return line to the fuel oil day tank. Any excess fuel oil in the day tank is returned by gravity flow to the fuel oil storage tank through the day tank overflow piping. 7

9.5.4.3 Safety Evaluation

The system is designed in accordance with Category I, Safety Class 3 criteria. The failure modes and effects analysis (FMEA) of the standby diesel generator fuel oil storage and transfer system is provided in the Unit 2 FSAR FMEA report.

Details of the missile enclosures for Diesel Generator Divisions I, II, and III appear on Figure 1.2-17. The diesel generator divisions are designed to seismic and tornado criteria and are isolated from one another by a reinforced, concrete barrier. The barrier consists of a 2-ft-thick reinforced wall with No. 9 bars at 5 in. each way each face (EWEF) and is in compliance with SWEC 07703. SWEC 07703 is a Missile Barrier Interaction Stone and Webster Topical Report submitted to the NRC in September 1977.

An opening exists in the 12 1/2 column line wall which is closed off by a hollow concrete block. Although this hollow concrete block is not designed to provide missile protection, missile effects to an adjacent diesel are eliminated by the hollow concrete block's placement in reference to the barrier. The opening does not introduce a straight line from one diesel to an adjacent diesel or from one division's starting air receiver to another division's starting air receiver. Also, high and moderate energy lines are not in the line of possible missiles through this opening. 7

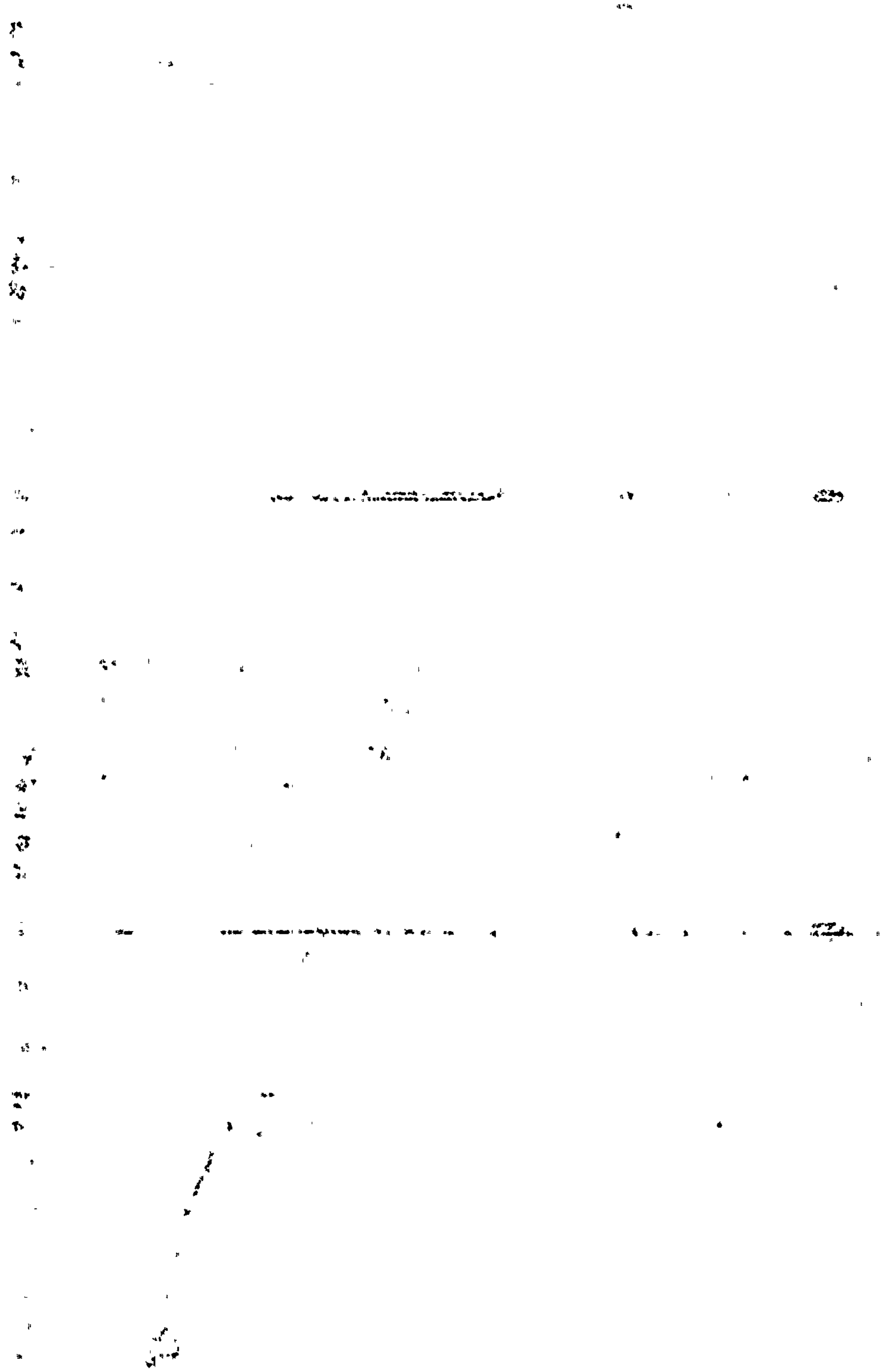
In the event of fuel oil or cooling water leakage or flooding in the diesel generator building, fluid from all three divisions is collected in the floor drain system. Normally open drain valves direct the fluid to the valve pit. From the valve pit, other open drain valves direct the fluid to an oil separator.

The following systems have lines in the diesel generator room: breathing air, air startup-standby diesel generator, standby diesel generator fuel, fire protection - water, control building chilled water, diesel generator building ventilation, instrument air, service air, service water, and water treating. All of these system lines are classified as moderate energy lines having design temperatures and design

pressures less than 200°F and 275 psig, respectively. Since
the diesel generator can operate in conjunction with the
7 operation of the fire protection sprinklers, the diesel
generator is also available under water spray conditions
from surrounding moderate energy lines.

The minimum fuel oil storage capacity for each diesel generator is based on continuous operation of the diesel generator for a period of 7 days at its rated capacity.

Each diesel generator fuel oil day tank has a capacity in accordance with requirements of the National Fire Protection



Association (NFPA) Standard 37, Stationary Combustion Engines and Gas Turbines (1979), which provides for over 1 hr of continuous operation of the diesel generator at full load. Each day tank is isolated in a room enclosed by 3-hr rated fire barriers and protected by automatic sprinkler systems.

Each diesel generator day tank room contains a curb sized to contain the 660-gal volumetric capacity of the fuel oil day tank in addition to an amount of fluid from the fire protection system (30 gal per minute per square foot for a 10-min period). This curb precludes spilling fuel oil into the diesel generator room. Each day tank room curb can be emptied into the diesel generator building floor and equipment drain system. Once fuel oil or cooling water accumulates in the floor drain sump (one sump per diesel generator division), a level switch monitors the quantity of fuel oil or cooling water collected. This fluid is then 7
dispersed to a common oil separator. In addition to the curb arrangement, a low-level storage tank alarm and a low-level day tank alarm also alert the operators to the possibility of a fuel oil leak in the day tank room.

In summary, large leaks are detected by low-level alarms in the day tanks. Small leaks are detected by a shorter than normal cycle of the floor drain pumps.

The capped inlet of each storage tank fill line is located above the probable maximum flood level, thereby preventing the entrance of water. Each storage and day tank's vent pipe is also located above the flood level and is designed to prevent rain from entering.

The fuel oil storage tank fill, vent, and sounding lines are located outside the diesel generator building and are exposed to the atmosphere after penetrating 5 ft of fill. In the event of a tornado missile resulting in the obstruction of these fill, vent, and sounding lines, the fuel oil storage tank is vented by a 4-in vacuum relief valve and a 4-in pressure relief valve mounted on a 4-in connection on the storage tank. The vacuum relief valve and 7
pressure relief valve are within the diesel generator building which is designed for missile protection. The fuel oil day tank vent line is located in the diesel generator building day tank room and penetrates through the diesel generator building roof. In the event of a tornado missile accident resulting in the obstruction of the vent line, the fuel oil day tank is vented by a 4-in vacuum relief valve and a 4-in pressure relief valve mounted on the vent line. The vacuum relief valve and pressure relief valve are within

7 the diesel generator building which is designed for missile protection.

A sounding rod is utilized periodically to check the accuracy and operation of the tank level indicator by insertion into the sounding tube furnished in each storage and day tank. The possible accumulation of water at the bottom of each diesel fuel oil storage and day tank is also checked by applying a water-indicating paste to the sounding rod. The paste changes color when it comes in contact with water. Should the water level be excessive, water is removed from the storage tanks by the use of a portable pump and from the day tanks by opening a drain valve located near the bottom of each tank.

Adequate sources of diesel quality fuel oil are available in the cities of Oswego (8 mi), Belgium (25 mi), and Syracuse (35 mi). Under extremely unfavorable environmental conditions, fuel oil will be delivered onsite via tanker truck escorted by highway snow removal equipment.

This will permit each standby diesel generator system to supply uninterrupted emergency power. Fuel oil meets or exceeds the quality requirements of ASTM D975-1978 and the diesel engine manufacturer's recommendations.

The growth of algae in the fuel oil storage tank is determined by measuring the oxidative stability in accordance with ASTM D2274-74. If it is more than 2 mg/100 ml, the fuel oil in the affected storage tank will be appropriately treated (filtration or biocides) to reduce the level to acceptable concentrations.

9.5.4.4 Inspection and Testing Requirements

The standby diesel generator fuel oil storage and transfer system is designed to permit periodic inspection and maintenance of active components. Local display and indicating devices are provided for periodic inspection of tank oil level and operating parameters such as pump discharge pressure and pressure drop across each fuel oil strainer.

Fuel oil storage and day tanks and piping are hydrostatically tested prior to filling with fuel oil. System operability is tested in conjunction with the diesel generator. Continued system integrity is verified with periodic testing with the diesel generator.

TABLE 1.8-1 (Cont)

Regulatory Guide 1.137, Revision 1 (October 1979)

Fuel-Oil Systems for Standby Diesel Generators

FSAR Section 9.5.4

Position

The Unit 2 project complies with the Regulatory Position (Paragraph C) of this guide with the following clarification. The minimum fuel temperature in the tank will be the basis for the acceptance criteria. 7

QUESTION
430.67

(9.5) Provide the results of a failure mode and effects analysis to show that failure of a piping connection between subsystems (engine water jacket, lube oil cooler, governor lube oil cooler, and engine air intercooler) will not degrade engine performance or cause engine failure. (SRP 9.5.5, Part I).

RESPONSE

Cross leakage of engine coolants resulting from minor piping connection failure between diesel engine subsystems will not degrade the engine performance or reliability. Permissible leakage limits are discussed in question/response 430.73. Any major piping failure between line lube oil and jacket water subsystems could degrade engine performance or cause engine failure during standby or operating modes. This major piping failure that will cause substantial subsystem cross leakage will be detected either by means of alarms, or during routine visual and laboratory checks of the engine oil or cooling systems. Should a detrimental piping failure render a diesel engine inoperable, the plant operating procedures will be followed to meet the applicable Technical Specifications.

[illegible]

QUESTION F430.68 (9.5.5)

You state in Section 9.5.5.2 that the diesel engine cooling water is treated with a corrosion inhibitor in accordance with the manufacturer's recommendations to preclude corrosion and organic fouling. Provide additional details of your diesel engine cooling water system chemical treatment with regards to organic fouling and corrosion, and discuss how your treatment complies with the engine manufacturers recommendations. (SRP 9.5.5, Part I)

RESPONSE

See revised Sections 9.5.5.2.1 and 9.5.5.2.2. 9

PSB Comments

Not acceptable. No response provided.

Response To PSB Comments.
See Revised sections 9.5.5.2.1 and 9.5.5.2.2 which ~~The Response~~ were provided in amendment 9.

QUESTION F430.69 (9.5.5)

In FSAR Section 9.5.5.3, you provide a list of indicators and alarms associated with the Division I/II, and Division III diesel generators. For the Division I/II system, control room alarms are provided for "diesel generator mechanical failure." The function of these alarms is not clear. Expand your FSAR discussion to include an explanation of these alarms and how and when they function. If these alarms are a type of "common trouble" alarm, such as provided for the Divison III diesel generator, then so state, and identify the alarms and/or trips associated with each. Also, identify how and where the Division III diesel generator trip(s) is/are annunciated. (SRP 9.5.5, Part I)

RESPONSE

See revised Section 8.3.1.1.2 concerning Division III diesel trips annunciations.

For Divisions I and II, see revised Section 9.5.5.3. 9

PSB Comments

Not acceptable. No response provided for Division I and II. The response for Division III will be acceptable when I&C logic diagrams are provided.

Response to PSB Comments:

For Divisions I and II see revised section 9.5.5.3 which was submitted in Amendment 9.

Logic diagrams for the Division III air start system, cooling water system, and lube oil system have been provided in the response to 430.92.

QUESTION F430.71 (9.5.5)

The diesel generators are required to start automatically on loss of all offsite power and in the event of a LOCA. The diesel generator sets should be capable of operation at less than full load for extended periods without degradation of performance or reliability. Should a LOCA occur with availability of offsite power, discuss the design provisions and other parameters that have been considered in the selection of the diesel generators to enable them to run unloaded (on standby) for extended periods without degradation of engine performance or reliability. Expand your FSAR to include and explicitly define the capability of your design with regard to this requirement. (SRP 9.5.5, Part III)

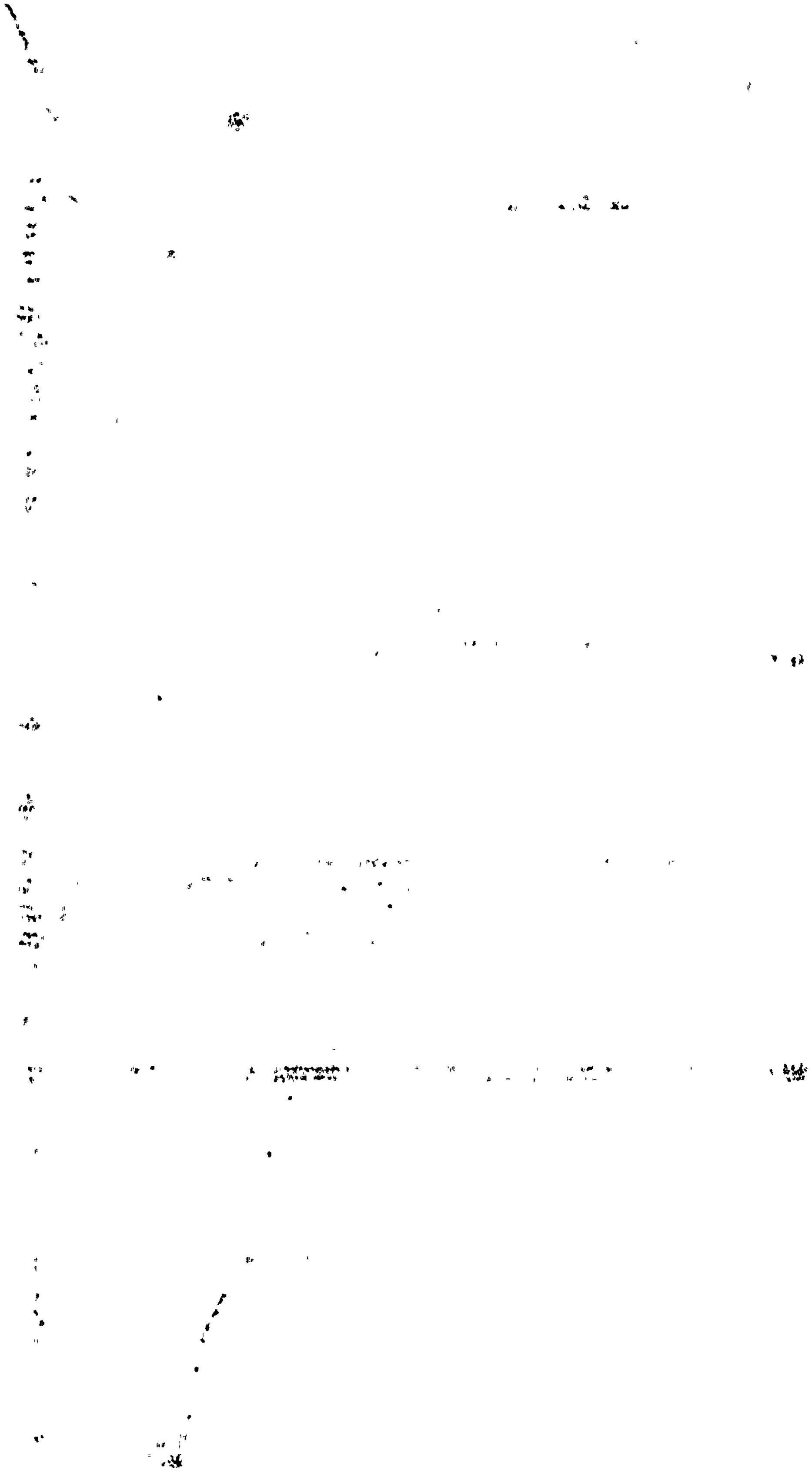
PSB Comments on 430.71

The question has been answered. However, the acceptability of the response has not been determined. The staff is concerned that operation of diesel generators at rated speed and no load for prolonged periods during a LOCA with offsite power available will result in diesel engine degradation to an extent that the diesel generators will not be able to accept load in the event of a subsequent LOOP. Therefore, the applicant must demonstrate that the Division I,II,and III diesel generators can be adequately loaded to ensure continued reliable operation within 6 and 4 hours following a SI signal, respectively.

RESPONSE

Division III deisel generator (DG) will be upgraded with a high capacity turbocharger, which is designed to withstand the rigor of light load operation.. This turbocharger is capable of 3000 cumulative hours of operation at less than 20% load before overhaul is required. The Division III DG can run four hours in no-load condition with a subsequent loading as specified in manufacturer's engine light load operation instruction. Moreover, procedures will be employed to control the DG during LOCA event with offsite power available. The procedures are consistent with the emergency operating procedure.

See revised Section 9.5.5.5.



and the combustion air exhaust system piping. Failure of any of these systems can only affect the associated diesel generator. The moderate energy piping systems in the diesel generator building, not associated with the diesel generators, are service air, fire protection, and floor drain piping. Failure of any of these systems cannot jeopardize the safety function of the diesel generator jacket water system. The Division I and II diesel generators are designed and built to operate continuously during a discharge of the fire protection system. The Division III diesel generator is retrofitted with the
7 capability of operating continuously during a discharge of the fire protection system. The moderate energy piping systems associated with the diesel generators themselves are the fuel oil system, starting air system, service water system, and combustion air intake system piping. Failure of the piping of any of these systems will affect the performance of the associated diesel generator alone.

INSERT

Each standby diesel generator is capable of running in a no load condition for 4 hr for Division III and 6 hr for
7 Divisions I and II. After this period they will be loaded according to manufacturer recommendation (for Division III greater than 50 percent load for 30 min, and for Divisions I and II greater than 75 percent for 30 min).

The failure modes and effects analysis (FMEA) evaluation of the diesel generator is provided in the Nine Mile Point Unit 2 FSAR FMEA Report.

9.5.6 Diesel Generator Starting System

Each standby diesel generator has two independent, redundant compressed air starting systems, either of which has adequate capacity to assure quick, reliable, automatic starting of the diesel generator following a loss of offsite power.

9.5.6.1 Design Bases

The standby diesel generator starting system is designed to meet the following safety design bases:

1. Each standby diesel generator has independent, redundant air starting systems either of which is capable of starting the engine.

2. The starting air receiver in each of the redundant starting systems has sufficient capacity to start the engine within 10 sec. Each air starting system can crank a cold diesel generator five times without recharging the receiver tanks. Each

Division III diesel generator will be upgraded with a high capacity turbocharger, which is designed to withstand the rigor of light load operation. This turbocharger is capable of 3000 cumulative hours of operation at less than 20% load before overhaul is required.

QUESTION F430.72 (9.5.5)

You state in Section 9.5.5.1 and Table 9.5-2 of the FSAR that each diesel engine cooling water system is provided with a standpipe or an expansion tank to provide for system expansion, for venting air from the system to provide for minor system leaks at pump shafts seals, valve stems and other components for up to 30 days. In addition to the items mentioned, the expansion tanks are to maintain required NPSH on the system jacket water and intercooler water pumps. Provide the location of the standpipes and expansion tank. Demonstrate by analysis that the standpipes and expansion tank size are adequate to maintain required pump NPSH and make up water for days continuous operation of the diesel engine at full rated load without makeup, or provide a seismic Category I, safety Class 3 makeup water supply to the diesel generators (SRP 9.5.5, Parts I, II, and III)

RESPONSE

See revised Section 9.5.5.2.2.

PSB Comments

Not acceptable. The applicant has not provided a basis for the position that there is adequate inventory of cooling water for seven days of operation of the Division III DG. Also, Division I and II DG's have not been addressed.

Response to PSB Comments

For Division I and II see revised section 9.5.5.2.1

For Division III see revised section 9.5.5.2.2

~~adequately maintain the required pump NPSH~~ the tank capacity will adequately maintain the required pump NPSH and makeup water for 7 days of continuous operation of the diesel engine at full load.

The expected loss of cooling water within 7 days is less than 40 gallon per the equipment manufacturer

through Ports B and C to maintain the temperature at approximately 170°F. The two-way thermostatic valve is designed to ensure circulation of water to coolers during startup. This valve is opened at startup and closes at approximately 165°F. This would not prevent the system from reaching operating temperature. This valve ensures proper jacket water circulation until the jacket water reaches operating temperature.

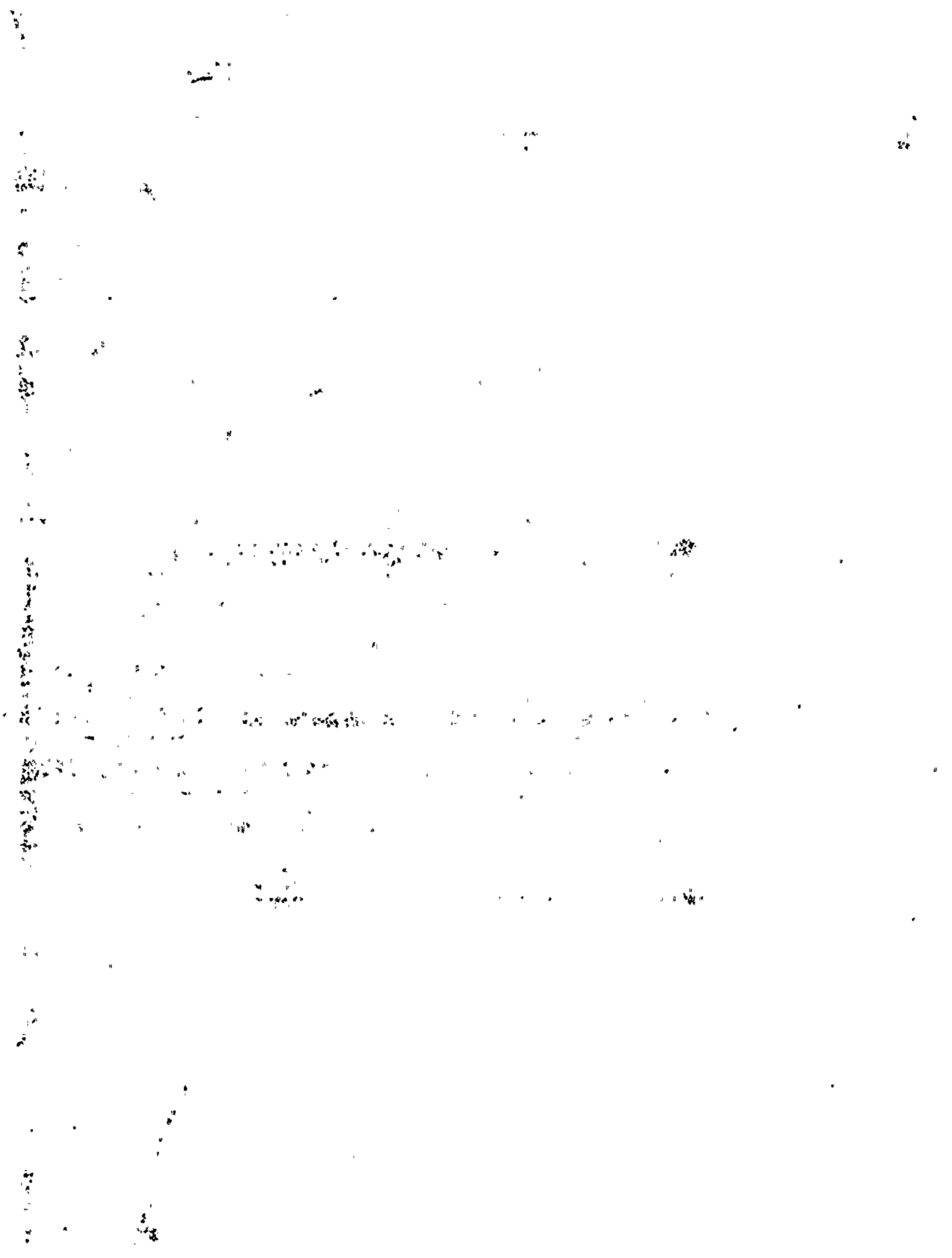
From the coolers or thermostatic valve water flows into two main jacket water headers. Jacket water flows from the main headers to each cylinder through individual connections and also to the turbocharger and the heater portion of the combustion air intercoolers. Water flows to the heater portion of the combustion air intercoolers constantly and provides cooling when the engine is in full operation. The motor-driven circulation pump and heater circulate warm water through the engine jackets, intercoolers, and turbocharger when the diesel generator is in standby condition.

To preclude long-term corrosion, treatment of the water used in the jacket water system includes the use of silicate 9 nitrate inhibitors, in agreement with the engine manufacturer's recommendations, and periodic testing of the water to ensure that the water quality is maintained at the level recommended by the manufacturer. Since the entire jacket water system is enclosed, maintained in warm condition by the circulating pump and heater, and installed in a heated building, use of any antifreeze compound is not required.

Any leakage in the system causes loss of jacket water pressure or low level in the jacket water standpipe and is annunciated by the low pressure or low level alarm.

The capacity of the system will adequately maintain the required pump NPSH and makeup water for 7 days of continuous operation of the diesel engine at full load. Add Attachment-A Any loss of water through seepage, leakage, or flow out of the system will be noticed through routine checks. If needed, the cooling water system can be manually refilled.

Locating the jacket water standpipe on the engine provides a positive suction head for the jacket water pumps. The two-way thermostatic valve passes jacket water to all coolers during engine startup. The butterfly valve bypasses water through the engine at all times during engine operation. These systems ensure that



Attachment-A

Per vendor calculation, the NPSH available in the system when it is full is about 28.9 feet with water temperature at 170°F. The required NPSH for the pump is about 10 feet. Even with @ the loss of about 40 gal. of water, where the jacket water standpipe low level alarm is set, there is more than adequate suction head available on the pump to refrain from any pump cavitation or loss of flow.

The expected loss of cooling water for seven days is less than 40 gallons.

[illegible]

QUESTION F430.73 (9.5.5)

Recent licensee event reports have shown that tube leaks are being experienced in the heat exchangers of diesel engine jacket cooling water systems with resultant engine failure to start on demand. Provide a discussion of the means used to detect tube leakage and corrective measures that will be taken. Include jacket water leakage into the lube oil system (standby mode), lube oil leakage into the jacket water (operating mode), jacket water leakage into the engine air intake and governor systems (operating or standby mode). Provide the permissible inleakage or outleakage in each of the above conditions which can be tolerated without degrading engine performance or causing engine failure. The discussion should also include the effects of jacket water/service water systems leakage.

RESPONSE

The response for Divisions I and II is described in revised Section 9.5.5.5. The response for Division III ~~will be provided in the second quarter of 1984~~ see revised Section 9.5.5.5 | 11

PSB Comments:

The response is acceptable. The applicant should expand the response to address detection of lube oil leakage into the cooling water system.

Response To PSB Comments

See revised Section 9.5.5.5

430.73

with additional cooling capacity and a conservative fouling factor to account for various service conditions.

Each jacket water system has a separate loop with a heater to heat the circulating water during engine standby condition. This ensures that the engine is warm and increases first-try starting reliability of the engine. For the Division I and II jacket water system, this loop consists of a motor-driven circulating pump and a heater. For the Division III system, this consists of an immersion heater. The heater heats the jacket water that circulates through the lube oil cooler by thermosyphon action and heats the lube oil. The warm lube oil circulates through the engine and keeps it warm.

The jacket water system operates within the ranges of pressure and temperature and at the flow rate recommended by the engine manufacturer.

The jacket water quality is maintained at the level recommended by the engine manufacturer. The jacket water is treated with inhibitor compounds recommended by the manufacturer to prohibit long-term corrosion and organic fouling. Continued quality of the jacket water is ensured by periodic sampling and analysis of the water.

The system is protected against any leakage. Any external leakage will be detected by a visual inspection. Any leakage within the system is detected by a decrease in the Division III expansion tank water level or by a drop of pressure in the system. Any leakage within Division I and II is detected by a decrease in the jacket water standpipe. These conditions are automatically monitored and annunciated in the diesel generator control room as well as in the main control room.

For Divisions I and II, the jacket water pressure is always lower than the lube oil pressures during both standby and operating mode. Therefore, any tube failure at this interface would cause leakage of oil into the jacket water.

For Division I, II and III

Service water pressure is higher than the jacket water pressure. Therefore, any tube leakage at the jacket water cooler would cause leakage of service water into the jacket water. This leakage would cause dilution of the jacket water inhibitor concentration and will be detected during periodic sampling and analysis of the water. 7

Any tube leakage at the heat exchanger interface between jacket water and combustion air would cause jacket water leakage into the combustion air system.

For Division III, jacket water leakage into the lube oil will be detected during periodic analyses of the lube oil

For Divisions I, II, and III

Should any of the above leakage occur, the operator would be alerted by one or more of the following alarms prior to degradation of engine performance:

Jacket water pressure low
Jacket water standpipe/expansion tank level low
Lube oil pressure low
Diesel generator service water discharge pressure low

In addition, the possibility of any tube leakage is minimized by periodic inspection, testing, and maintenance of the systems.

Division I and II diesel generator jacket water heat exchangers are provided with separate and independent service water supply headers and service water discharge headers. The Division III diesel generator jacket water heat exchanger is fed from both Division I and II supply and discharge headers. This arrangement insures that failure in any one division will not jeopardize the safety function of any other division. The service water system design bases are described in Section 9.2.1.

There is no high energy piping in the diesel generator building other than that associated with the diesel generators themselves. The high energy piping associated with the diesel generators is the starting air system piping

For Division III, jacket water leakage into the governor is not a concern as the fluid used for the governor is self-contained and has no connection to the cooling water system.

QUESTION F430.74 (9.5.5)

In FSAR Section 9.5.5.2, you state that antifreeze compounds are not used in the diesel generator cooling water systems because they are located in a heated building. Consider a loss of heating to one or more diesel generator rooms, and describe the provisions in your system(s) design to prevent freezing of the diesel engine cooling water.

RESPONSE

Each diesel generator room is provided with multiple nonsafety-related electric unit heaters, designed to maintain a space temperature of not less than 65°F in the winter. The unit heaters are controlled with thermostats. Each room also has a separate QA Category I thermostat, with dual high (120°F) and low (65°F) temperature settings, for the purpose of annunciating an alarm in the main control room if space temperature falls below 65°F or rises above 120°F.

In the unlikely event that all unit heaters in a given room are inoperable due to mechanical/electrical failure, and this happens concurrent with a subfreezing outdoor condition, either additional portable heating will be used or the associated diesel engine would be started and run to maintain the temperature. Should loss of offsite power occur, concurrent with a subfreezing outdoor condition, the diesel engines will start automatically, thereby maintaining temperature.

PSB Comments

The response will be acceptable if

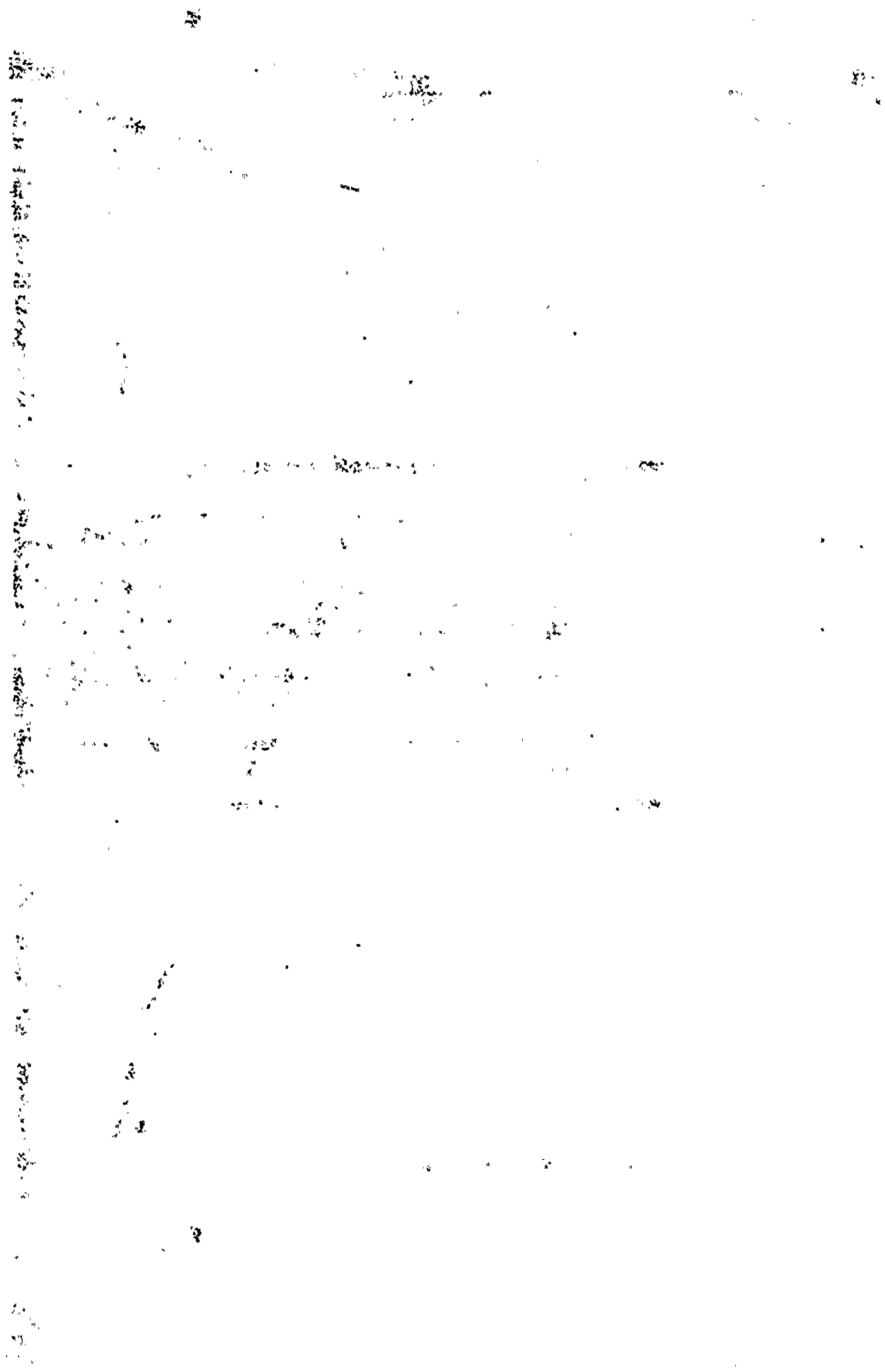
(a) the applicant will establish procedures to start and adequately load the DG's to maintain proper engine temperature in the event DG room heating is lost, and

(b) the NMP design is such that DG's in test mode will isolate from the grid and revert to automatic mode, ready to accept safety loads, on a LOOP and/or SI signal.

Response To PSB Comments

a) Procedures will be ~~provided~~ developed

b. NMP2 emergency diesel generators controls are so designed that an emergency start signal will isolate the diesel generator from test mode and put it on automatic mode. See section 8.3.1.1.2.



QUESTION F430.78 (9.5.6)

The air starting system for the Division I and II diesel generators has two receivers, each sized for three engine starts. However, the design of the system is for both redundant compressed air trains to operate in parallel, thereby giving only three start capability, total for the redundant trains. As stated in SRP Section 9.5.6, the staff requires that each diesel generator be provided with a starting system that is capable of providing a minimum of five starts in the normal operation mode. Revise your design accordingly or justify the present design. (SRP 9.5.6, Part II)

RESPONSE

See revised Section 9.5.6.2.1.

PSB Comments

Not acceptable. The applicant's response in FSAR Section 9.5.6.2.1 is not clear. Additional information must be provided as follows:

(a) does each air receiver contain sufficient air to start the engine five times USING BOTH STARTING BANKS, or only one starting bank

(b) the total no. of 10 second starts using only one bank, and the no. using both banks in parallel

(c) the receiver pressure from which the starting capability is determined: i.e., 240 psig, 245 psig ?

Response to PSB Comments.

a. See section 9.5.6.2.1
b. See section 9.5.6.2.1
c. See section 9.5.6.2.1

[illegible]

QUESTION F430.79 (9.5.6)

For the Division I, II, and III diesel generators, expand your FSAR to provide the following information:

(a) Define what constitutes a successful engine cranking cycle, i.e., a given number of diesel engine revolutions, reaching a preset engine RPM, a specified period of cranking time, a given receiver pressure drop, etc, and does this conform with manufacturer's recommendations.

(b) What is the minimum receiver pressure required to allow the requisite number of starts (i.e., 5) without recharging?

(c) What is the lowest point to which the receiver pressure can drop and still be capable of starting the diesel generator?

(d) Assuming the diesel engine fails to start in the required 10 seconds, or at the conclusion of a "start cycle," does the engine continue to crank until compressed air is exhausted, or does cranking stop automatically?

RESPONSE

See revised Section 9.5.6.2.

PSB Comments

The applicant's response addresses the staff's question adequately. However, the following problems must be resolved.

(a) The Div. I and II DG's air start system provides for five starts, but not all are 10 second starts: i.e., crank, fire, and accelerate to rated speed and voltage within 10 seconds.

(b) The Div. III DG five start capability appears to be based on a receiver pressure of 250 psig. In normal operation, however, the receiver pressure can drop as low as 225 psig, and this means that five start capability no longer exists.

Resolution of the above problems is required.

430.79

Response To FSB Comments

a) SRP 9.5.6 requires 5 starts, not specifically 5, 10 second starts. Unit 2 Division I and II diesel generators have 5 start capability from each starting system.

b) See revised section 9.5.6.2

430.79

ponents fabricated from carbon steel. The piping on the engine is fabricated from stainless steel. The entire starting air system is designed to Category I requirements.

9.5.6.2.2 Division III Diesel Generator Starting System

The Division III standby diesel generator starting system consists of two independent, redundant subsystems, either of which is capable of starting the diesel generator. Each subsystem consists mainly of the following equipment with interconnecting piping, valves, filters, or strainers: 1) an air compressor, 2) an aftercooler, 3) an air receiver tank, 4) a starting air relay valve, and 5) two starting air motors. The air compressor, air receiver tank, and aftercooler are located on the starting air ~~skid,~~ ~~whereas~~ the starting air relay valve, and starting air motors are located on the engine.

The Division III diesel generator starting system has one motor-driven air compressor and one diesel engine-driven air compressor. Each air compressor is a two stage, air-cooled compressor with a 20 scfm rating and is capable of recharging the associated 64-cu ft air receiver from 150 psig minimum operating pressure to 250 psig maximum operating pressure in less than 30 min. One of the compressors is driven by a 7 1/2-hp, 575-V, 3-phase ac motor fed from the Division III emergency 600-V ac bus. The other compressor is engine driven with a 125-V dc starting circuit. The 125-V dc power is drawn from the Division III emergency 125-V dc bus.

We will evaluate new operating pressure say 250 & 260 psig

The air compressor supplies compressed air to the air receiver through an aftercooler, a check valve, a relief valve, and a service valve. The check valve prevents depressurization of the loop back through the compressor when it is not operating. The relief valve protects against system overpressurization. The service valve is provided for isolating the compressor from the rest of the system. The air-cooled aftercooler ensures dry air in the air receiver.

Each air receiver has a volume of 64 cu ft. The air receivers are initially charged to 250 psig and have sufficient capacity to start the engine five times (normal starts) without recharging. The air receiver's pressure can drop to 100 psig and still provide a single start of the diesel generator. The air receivers are mounted vertically on the starting air skid. Each air receiver has a top-mounted pressure-relief valve for protection against overpressurization and a bottom-mounted drain valve for

At a receiver pressure of 225 psig, three start capacity is available.

QUESTION F430.80 (9.5.6)

The design of the air start systems for the Division I, II, and III diesel generators does not include air dryers. This is not acceptable. The staff requires air dryers in the system with the capability of producing dry air (to the receivers) at a dewpoint a minimum of 10°F below the lowest possible ambient temperature in the diesel generator rooms. Revise your design accordingly. (SRP 9.5.6, Part III)

RESPONSE

See revised Section 1.12.2, Licensing Issue 16.

<PSB Comment>

Not acceptable. Air dryers are required (Div. I & II).

Air dryer design for Div. III will be reviewed on receipt of information. The Div. III air start system is not acceptable pending receipt of this information.

Response to PSB comments.

For the Division I and II emergency diesel generators justification for not providing air dryers is provided in Section 1.9. air dryers are not considered essential for Division I and II

Con't next page

The Division III standby diesel generator air start system is being retrofitted with air dryers. FSAR section 9.5.6.2.2 will be updated upon completion of the air dryer design.

The following is the description of the air dryer design:

The air dryers to the air start system are provided to reduce the moisture content of the air, and to minimize condensation in the starting air system. This is to improve the reliability of the air start function of the DG and to minimize the formation of the rust and scale in the receiver and piping.

DG starting air system is upgraded with desiccant type, dual tower, air dryer system, each including two vessels, air after cooler, moisture separator, pre-and post filters, absorbent medium, piping, valves and necessary controls.

The main components of the air dryer system function as follows:

Aftercooler-Moisture Separator

The air-cooler type aftercooler-moisture separator delivers the compressed air within 15-21°F above room ambient temperature. The separator condenses up to 90% of the inlet air moisture content and removes the condensate with an automatic trap and drain.

Pre-filter

The coalescing type pre-filter is used to remove entrained liquid oil and water particles from the compressed air. The pre-filter is capable of removing minimum of 98% liquid oil from mist-laden air. Pre-filter is capable to withstand and perform efficiently up to maximum rated flow from air surges or backflow. The pre-filter is furnished with the bypass valves for maintenance.

Air Dryer

The heatless type dual-tower air dryer system is furnished with active alumina type desiccant. Incoming compressed air is dried by passing through the desiccant in one tower while the other tower is regenerating. The desiccant regeneration is accomplished by using a small portion of the dried air exiting from the drying tower. The purge air exhausts to the atmosphere. The drying time and regeneration time of 5 minutes each combine to complete the 10 minute cycle. The switching between towers is automatic and does not interrup the dry air supply. Valves, controls and piping required to accomplish automatic operation are furnished with the unit suitably mounted on the equipment. Electrical controls and circuits are installed in NEMA Type 4 enclosure and wired in accordance with the National Electrical Code requirements.

The dryer control is electrically interlocked with the air compressor operation. The system is maintained at line pressure and ready to dry the compressed air upon restarting of the air compressor.

The dryer is designed for 300 psi and hydrotested at 450 psig. Each set of air dryers is equipped with a bypass piping and valves for maintenance. Pressure gages are furnished as required to monitor the dryer operation. The air dryer is introduced between air compressor and an air receiver.

The following is the design basis used for air dryer performance requirements:

Inlet Flow Rate	32 scfm
Inlet Pressure	250 psig
Inlet Temperature	125°F
Inlet Moisture Content	Saturated (at inlet pressure)
Outlet Moisture Content	-40°F (Dew point at line pressure)
Operation	Automatic with locally mounted instrumentation and chamber pressure gauge
Dryer Cycle	10 minutes (per NEMA Std. AD1-1964)
Drying Time	5 minutes
Absorbent Type	Active alumina 10.8
Chamber Regeneration	5 minutes
Purge Flow	2 scfm (nominal)
Dryer Design Pressure	300 psi
Vessel Design Pressure	300 psig

After-filter

A particulate type after-filter is furnished downstream of the air dryers to remove particulate matter that may excape the pre-filter and dryer. The after-filter is capable to trap and remove particules of 1 micron and larger in size.

The air dryer system is designed to ANSI/B31.1 code requirements.

QUESTION F430.81 (9.5.6)

Describe the instrumentations, controls, sensors, and alarms provided for monitoring the diesel engine air starting system, and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors, and alarm system and where the alarms are annunciated. Identify the temperature, pressure, and level sensors which alert the operator when the parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided. Revise your FSAR accordingly. (SRP 9.5.6, Part III)

RESPONSE

See Sections 8.3.1.1.2, 9.5.6.4, 9.5.6.5, and revised Section 9.5.6.2.

Operator actions and surveillance testing program are described in response to Question F430.92.

PSB Comments

The response is acceptable with regard to system description, P&ID's, and logic diagrams.

The response is not acceptable with regard to system test and calibration. See comments for Q 430.53.

Response To PSB comments

See response To 430.53

[illegible]

QUESTION F430.82 (9.5.6)

The diesel generators at NMP II utilize air pressure or air flow devices to control diesel generator operation and/or emergency trip functions. The air for these controls is supplied from the emergency diesel generator air starting system. Provide the following:

(a) Expand your FSAR to discuss any diesel engine control functions supplied by the air starting system or any air system. The discussion should include the mode of operation for the control function (air pressure and/or flow), a failure modes and effects analysis, and the necessary P&IDs to evaluate the system.

(b) Since air systems are not completely air tight, there is a potential for slight leakage from the system. The air starting system uses a nonseismic air compressor to maintain air pressure in the seismic Category I air receivers during the standby condition. In case of an accident, a seismic event, and/or loop, the air in the air receivers is used to start the diesel engine. After the engine is started, the air starting system becomes nonessential to diesel generator operation unless the air system supplies air to the engine controls. In this case the controls must relay in the air stored in the air receivers, since the air compressor may not be available to maintain system pressure and/or flow. If your air starting system is used to control engine operation, with the compressor not available, show that a sufficient quantity of air will remain in the air receivers, following a diesel engine start, to control engine operations for a minimum of seven days assuming a reasonable leakage rate. If the air starting system is not used for engine control describe the air control system provided and assure that it can perform for a period of seven days or longer.

RESPONSE

For Divisions I and II, the response is provided in revised Section 9.5.6.5. For Division III, the response is provided in revised Section 9.5.6.2.2. 8

PSB Comments

Not acceptable. The required P&ID's are not provided.

Response to PSB Comments

See revised Figure 9.5-40a provided in Q430.50.

QUESTION F430.83 (9.5.6)

The Division I and II diesel generator starting systems utilize a number of "shuttle valves." Expand your FSAR to include their purpose, and a discussion of these valves and how they operate (a) with pressure balanced on both sides, and (b) with air pressure unbalanced on either side of the valves.

RESPONSE

See revised Section 9.5.6.2.1. 9

PSB Comments

Not acceptable. No response provided. The review of the air start system cannot be completed without this information.

Response to PSB Comments

See section 9.5.6.2.1 which was revised in amendment 7.

QUESTION F430.84 (9.5.7)

Your description of the turbocharger lubrication system for the Division I and II diesel generator is not clear. Expand your FSAR to include a more detailed discussion of this system and its components as shown on FSAR Fig. 9.5-47. Start at the turbocharger pressure regulatory and describe the oil flow through the ratio relay and on to the oil header. Identify the post lube valve, as well as all other valves and components in this system, and describe their functions. This includes the air controls associated with the system controls. Describe how excessive prelubrication to the turbocharger is precluded. Revise your FSAR and P&ID accordingly (SRP 9.5.7, Part III)

RESPONSE

See revised Section 9.5.7.2.1 and revised Figure 9.5-47.

PSB Comments

The response is acceptable. However, some additional information is required:

(a) Is the pilot valve air operated, spring return?

(b) What causes the post lube valve to close - control air? or fuel control air?

(c) Assuming the pilot valve is shifted to allow control air to the post lube valve following engine shutdown, how is the turbocharger lubrication continued for two to three minutes.

Since the turbocharger is not lubricated during engine standby, provide vendor data which states that is acceptable relative to bearing wear (turbocharger) on rapid starts.

This response must be coordinated with the response on engine air controls in Section 9.5.6.

Response to PSB Comments.

a) Yes; see revised section 9.5.7.2.1

b) Control air. See revised section 9.5.7.2.1

c) See revised section 9.5.7.2.1

d) Information will be provided. to address turbo concerns related to drystarts and diesel gen. starting, and committing to testing with prelubrication.

[illegible]

[illegible]

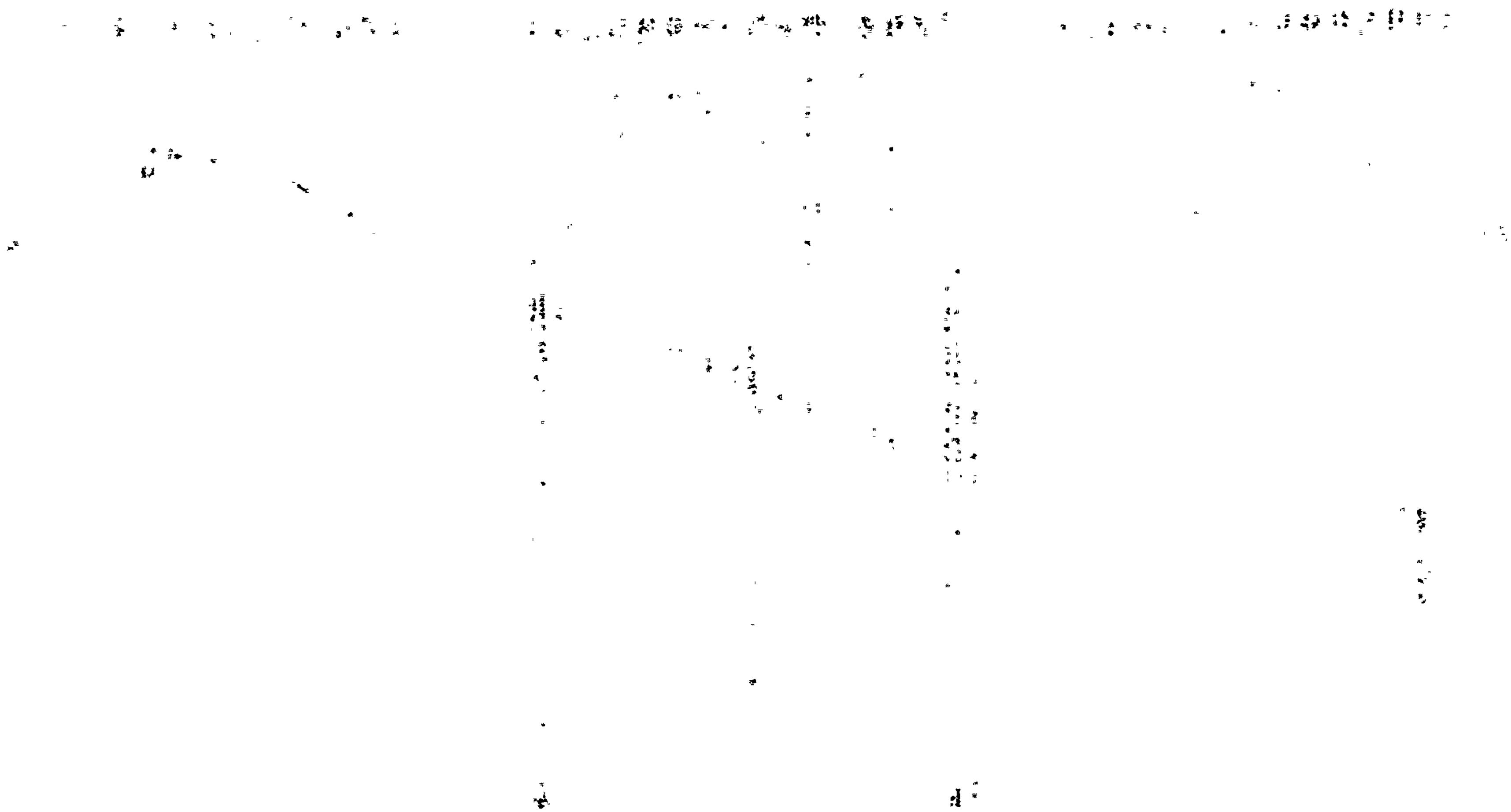
[illegible]

Add Attachment A

to the post-lube control valve. This pilot valve ~~is controlled by the air~~ supply from the fuel control panel overspeed shutdown. A spring force opposes this air pressure.

7 11. Turbocharger Low-Pressure Shutdown Valve The low oil pressure shutdown valve is a two-way, diaphragm-operated, normally open valve located on the oil header to the turbocharger. The valve protects the turbocharger bearings by stopping the engine if oil pressure drops below 3 psi with zero bias pressure.

The circulating oil pump and the main oil pump are piped in parallel. During engine startup and shutdown, the motor-driven circulating oil pump takes oil from the engine sump and circulates it through the lube oil heater, the thermostatic valve, the lube oil cooler (if necessary,) the lube oil filter, the strainers, and to the main header in the engine. When the engine starts and reaches 280 rpm, the



circulating oil pump stops and the main engine-driven oil pump takes oil from the sump and pumps it to the thermostatic valve. The thermostatic valve, which is set at 165°F, controls the oil inlet temperature to the engine. Oil entering the valve at 160°F or lower goes directly to the filter bypassing the cooler. Oil entering the valve at 170°F and higher goes to the cooler and then to the filter. Check valves prevent oil from flowing backwards through the circulating pump. From the filter, oil passes through the strainers to the engine main supply header.

The main header runs the length of the inside of the engine. From this header, flexible lines supply oil to the main bearings through the bearing caps. From the main bearings, oil flows through drilled passages in the crankshaft to the connecting rod bearings and through the connecting rods and pins into the pistons for cooling. From the pistons, oil drains back to the sump. The cylinders and pistons are lubricated by oil thrown from the crankpins and by oil vapor in the crankcase. Other headers tapped from the main header carry oil to the other moving parts of the engine including the turbocharger. Oil from all moving parts, except the turbocharger, drains directly back to the sump by gravity.

The turbocharger lube oil system provides a regulated supply of lube oil whether the engine is idling during a test or running at rated speed. Oil is supplied from the engine oil header at 50 psi to the turbocharger filters. From the filters, oil flows to the regulator. The regulator is set at 5 psi at zero bias. The bias pressure required for the regulator comes from the 1:2-ratio relay. Air pressure from the left bank air pressure header supplies a signal to the relay which doubles this signal in control air and applies it to the shuttle valve and then to the regulator. From the regulator, oil flows to the turbocharger via a post-lube valve which controls the flow of oil from the regulator to the turbocharger. During normal operation, the post-lube valve allows lube oil to flow straight to the turbocharger. When a shutdown occurs for any reason, control air passes
7 from the fuel control via the volume bottle and the pilot valve. This cuts off the oil flow to the turbocharger. The post-lube valve allows oil to flow to the turbocharger for 2 to 3 min after an engine shutdown to cool the turbocharger bearings. During starting, air from the pilot valve and the volume bottle is vented through a quick release valve. When air from the post-lube valve is vented through the pilot valve, this allows oil to flow to the turbocharger. Air pressure from the right bank air inlet header is applied to the shuttle valve, and if control air is lost, this pressure will reposition the shuttle valve and flow to the regulator,

Add Attachment-B

Attachment-A

The pilot valve opens with air pressure and closes with spring pressure. It is controlled by the air supply from the fuel control panel overspeed shutdown.

Attachment-B

. . . air is fed slowly through the orifice portion of the turbo post lube valve located on the fuel control panel. Volume bottle is filled and air is applied to diaphragm of the pilot valve opening it. Control air flows through the pilot valve to the post lube valve shutting off oil flow. Thus, the post lube valve allows oil to flow to the turbocharger for 2 to 3 minutes after an engine shutdown to cool the turbocharger bearings.

QUESTION F430.85 (9.5.7)

In FSAR Section 9.5.7.3, you provide a list of indicators and alarms associated with the Division I/II and Division III diesel generators. For the Division I/II system, control room alarms are provided for "diesel generator shutdown, mechanical failures," and "diesel generator mechanical failure." The function of these alarms is not clear. Expand your FSAR to include an explanation of these alarms and how and when they function. If these alarms are a type of "common trouble" alarm, such as provided for the Division III diesel generator, then so state, and identify the alarms and/or trips associated with each. Also identify how and where the Division III diesel generator trips are annunciated. (SRP 9.5.7, Part III)

RESPONSE

See Section 8.3.1.1.2 for Division III diesel trip annunciations. 10

For Divisions I and II, see Section 9.5.5.3.

PSB Comments

Not acceptable. No response provided.

Response To PSB Comment:
For Division I & II also see response To 430.68

For Division III

Alarms and indications associated with the Division III DG Lubrication System are described in Section 9.5.7.3.

A complete description of all Division III alarms, trips and annunciators is given in revised Section 8.3.1.1.2.

QUESTION F430.86 (9.5.7)

Your discussion of the prelubrication systems for the Division I/II and Division III diesel generators indicates that prelubrication is provided to the upper parts of the diesel engines (valves, rocker arms, rocker shafts, etc). For some diesel engine designs, excessive or continuous prelubrication to the upper engine areas could result in lube oil entering and collecting in the cylinders with the potential for causing extensive engine damage when called on to start. Revise your FSAR to specifically address the design of all diesel generators with regard to this potential problem, and the applicable design considerations to preclude this from occurring.

RESPONSE

See revised Section 9.5.7(2.2) 5 for Division I and II. Response for Division III, will be provided by the second quarter of 1984. see 9.5.7.3

PSB Comments

Not acceptable. The revised FSAR Section referenced in the response does not address the question (for Division I & II). No response is provided for the Division III DG.

Response to PSB Comments

For Division I and II see 9.5.7.5

For Division III diesel generator, EMD recommended Maintenance Instruction 9644 will be implemented in accordance with NUREG/CR-0660.

CREATORS OF ELECTRICAL
POWER SUPPLY SYSTEMS

POWER SYSTEMS
A [illegible] DIVISION

[illegible] ROAD / POST OFFICE BOX [illegible]
ROCKY MOUNT, NORTH CAROLINA [illegible]
PHONE [illegible] ; TWX [illegible]
TELEX [illegible]

April 28, 1981

SUBJECT: MI 9644 (EMD Lube Oil Modification) Lube Oil Circulating Pump System for Immersion Heater - Lube Oil Circulating Pump System for Emergency Fast Start Installations

1. Figura 1A - Schematically shows the standard EMD Lube Oil System:

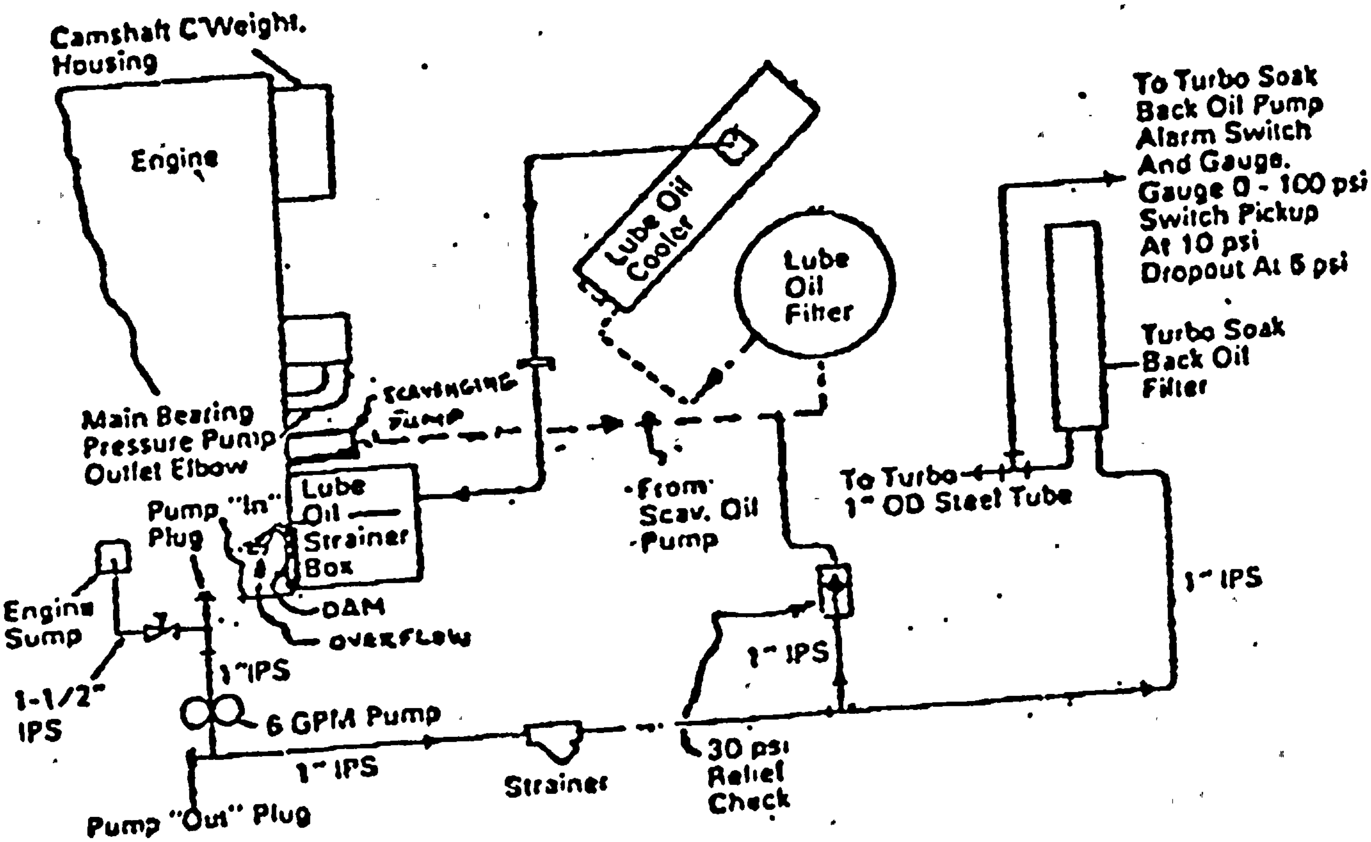


Fig.1A System Schematic Diagram, "S" Units
UNMODIFIED

(a) Lube oil is drawn from the engine sump by a 6 gpm soakback motor driven pump which pumps lube oil through a line strainer to a point where the flow divides (at standby oil temperatures) approximated equally into two systems. Part of the oil flow goes to the preheat system through a 30 psi spring loaded check valve and the other part of the oil flow goes through the soakback filter to the turbocharger for turbo bearing lubrication. The part that goes to the preheat system is discharged into a pipe connection between the scavenging pump and the main lube oil filter. The scavenging pump is a gear type and acts as a check valve so the lube oil does not flow back into the engine oil pan. The lube oil then flows thru the filter and then thru the lube oil cooler where the oil picks up heat from the water and then back into the strainer mounted on the engine. The strainer has a dam so that it contains a supply of oil and excess oil overflows back into the oil pan.

(b) During extensive test conducted by EMD and PSD, it was found that when the oil was close to operating temperature (hot):

(1) The scavenging pump no longer acted like a check valve and oil would flow back thru it into the oil pan at a rate of approximately 3 gpm due to the lower oil viscosity.

(2) The pressure required to pump oil thru the turbo was reduced to about 10 psi so now all the 6 gpm went to the turbo and none to the preheat system.

(3) It was found that during engine operations, the lube oil picked up air which when under pressure was not noticeable. But when the engine stopped, the pressure went essentially to atmospheric and the air expanded inside the lube oil filter and the lube oil cooler displacing the oil. This air could not escape and therefore, these components were only 3/4 full of oil which had to be filled during the next engine start.

(c) The conditions stated in 1(b-2) above caused EMD to issue MI 9644. The net result is that during a fast start after 15 minutes of a shutdown and prior to 3 hours after shutdown, the delivery of lube oil to the turbocharger was delayed for 8 to 10 seconds and this could cause a loss of the turbo bearings, particularly the thrust bearing.

2. Figure 1B schematically shows the EMD modification per MI 9644 designed to overcome the conditions in 1(b-2).

2--219

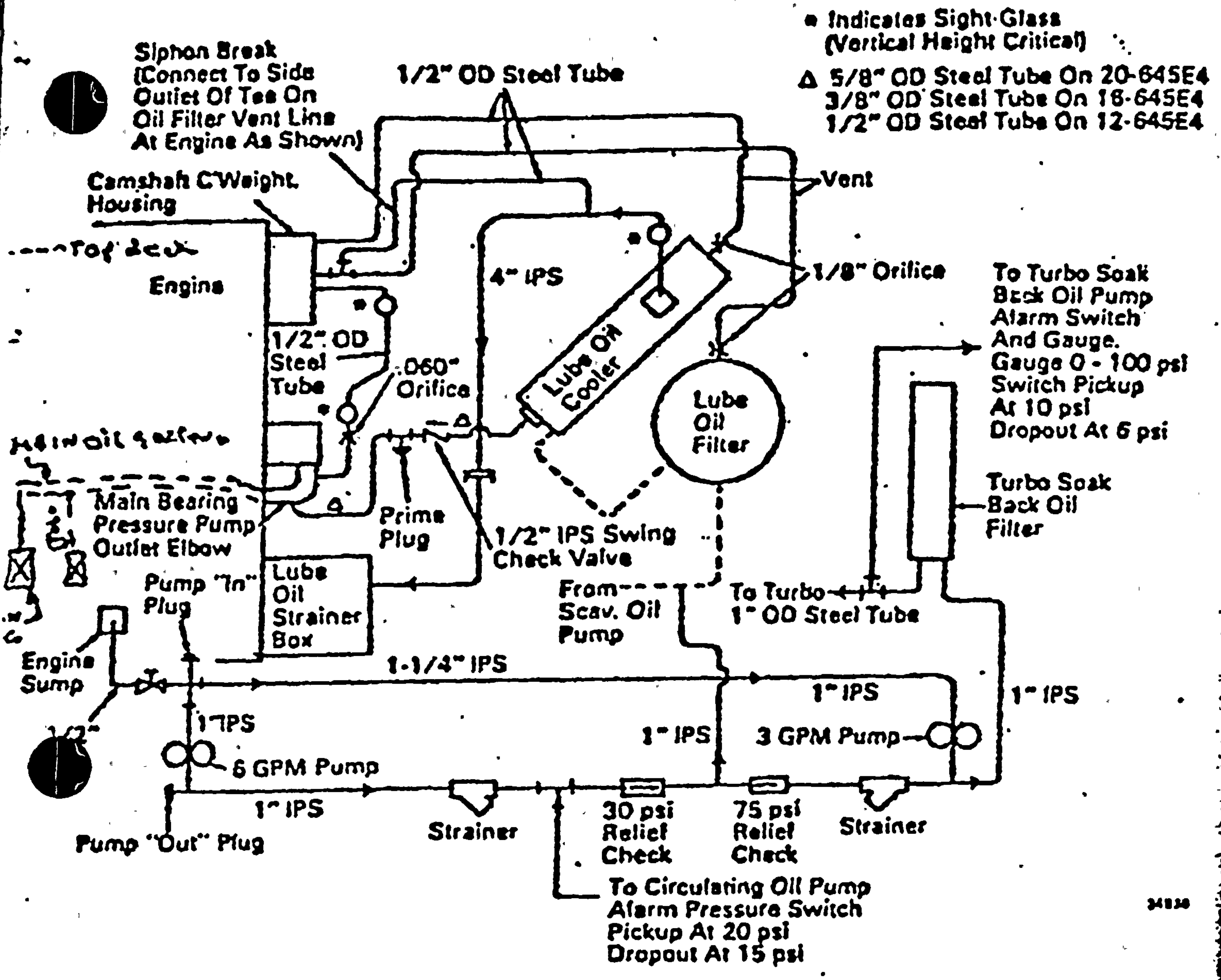


Fig.1 B System Schematic Diagram, "S" Units

MODIFIED

(a) First the flow to the preheat system and to the turbocharger now pass thru separate pumps insuring 6 gpm to the preheat system and 3 gpm to the turbocharger. The 30 psi spring loaded check-valve is there to furnish a pressure level for monitoring purposes since the pressure during standby is around 3 to 5 psi. The check valve also prevents back flow during engine operation (30-50 psi) should the 6 gpm not be operating.

The 75 psi spring loaded check valve is to provide a relief valve for

the turbo pump. It discharges into the preheat system but also could have been taken back to the oil pan.

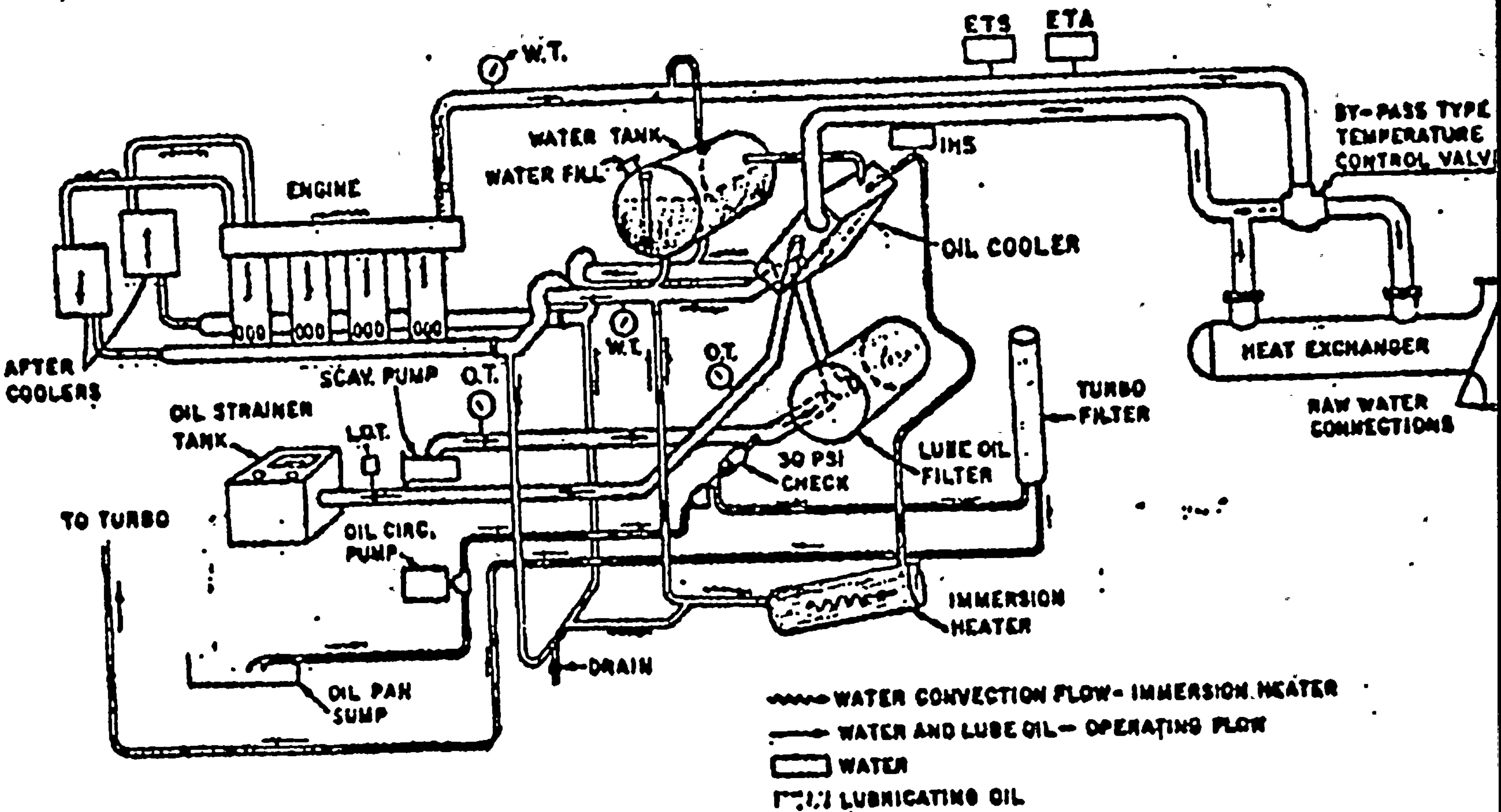
(b) Vents with orifices were added to the lube oil filter and lube oil cooler to bleed off entrapped air and the vents were connected to the engine camshaft housing and discharged whatever oil flowed back into the engine. A vent was also added to the lube oil cooler discharge pipe to prevent a syphon effect that would draw oil out of the cooler into the strainer.

(c) Another improvement is to flood the main oil gallery which supplies oil to the main bearing, the accessory drive, the turbo and the top deck. This would also minimize the time for oil to reach these components during a fast start as well as maintain lubrication of the main bearings.

To accomplish this, the head of oil in the cooler is used as the pressure to fill this system. First, the cooler discharge pipe was changed and now forms an inverted "U" connection to establish the height of oil in the cooler and therefore the pressure head. The head is sufficient to flood the gallery, but not high enough to get to the top deck. A small pipe is connected to the bottom of the cooler to permit oil flow from the cooler thru a check valve to the pressure pump discharge connection and then into the gallery. The check valve prevents back flow when the engine is in operation.

Two bulls-eye sight glasses are added for visual monitoring of the oil level during standby. The lower bulls-eye should be full and the upper should empty. If there is oil in the upper bulls-eye, oil is getting to the top deck and the cause must be found.

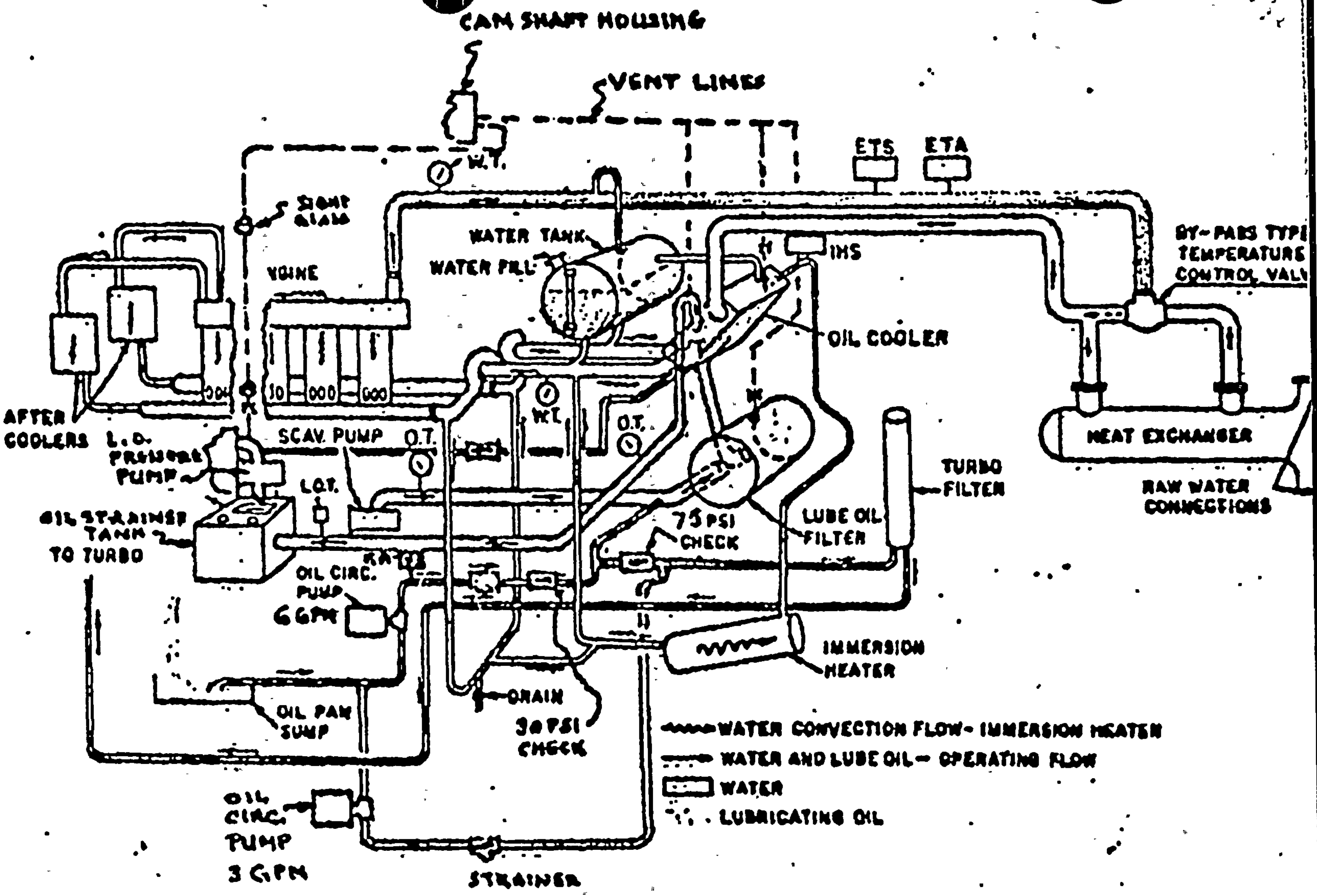
3. Figures 2A and 2B show the systems in an illustrative manner and may provide a better visualization.



UNMODIFIED LUBRICATING OIL SYSTEM
AND ENGINE COOLING WATER SYSTEM
WITH IMMERSION HEATER SYSTEM - TURBOCHARGED UNITS

FIG 2A

Page 5 of 9



MODIFIED LUBRICATING OIL SYSTEM
AND ENGINE COOLING WATER SYSTEM
WITH IMMERSION HEATER SYSTEM - TURBOCHARGED UNITS

FIG 2B

ELECTRO MOTIVE

MAINTENANCE INSTRUCTION

MODERNIZATION RECOMMENDATION

IMMERSION HEATER — LUBE OIL CIRCULATING PUMP SYSTEM FOR EMERGENCY FAST START INSTALLATIONS

PURPOSE: To provide an improved immersion heater lube oil circulating system, Figs. 1 and 10, that will consistently supply oil to the turbocharger and crankshaft in anticipation of an emergency start.

APPLICATION: All turbocharged "S", "999", and MP45 emergency fast start installations.

DISCUSSION: Wear is minimized if lube oil is supplied to engine and turbocharger bearings prior to and during high speed emergency starts.

EMD's original immersion heater system provided a parallel lube oil circuit whereby oil is supplied to the turbocharger bearings via one path and the oil cooler and filters are flooded via another path. However, following a load run, the branched oil flow is unbalanced because of the thinner viscosity of hot oil. As a result, the oil level in the cooler and filter is not replenished to the full level until the oil cools sufficiently (approximately 3 hours following shutdown). High speed starts during this period do not have the wear minimizing benefits of continually abundant oil supply.

Owners of EMD nuclear standby units have previously been notified of the unnecessary wear caused by equipment exercise or test schedules that routinely call for restarting engines without first allowing for a cooling interval from a previous load run. Although a few random starts under these adverse conditions are not expected to cause difficulty, the cumulative wear from repeated routine starts is likely to affect equipment reliability. EMD recommended that exercise and test schedules be revised to avoid restarting engines until they have had a three hour cooling period following shutdowns.

The primary benefit to be gained from this modification is continual oil replenishment of the oil cooler and filters to the full level regardless of oil temperature and viscosity. It would also remove restart restrictions imposed on exercise or test schedules.

Page 7 of 9

However, other benefits provided by this improvement make this modification attractive even when exercise or test schedules can be carefully controlled. Oil systems modified in accordance with this instruction provide consistent oil circulation through the engine crankshaft bearings in addition to the turbocharger. As a result, engines very rapidly approach operating oil pressures following start up. Trapped air which may impede oil flow is vented from the system.

Proper performance of this improved system depends on operation of AC motor driven oil pumps. If start-ups are delayed for more than 5 seconds after loss of AC power, we recommend that DC backup pumps be provided with suitable protection against reverse flow through the use of check valves.

Although oil flows through the crankshaft bearings, the standby oil level in the engine is kept below the camshafts and valve rocker arm assemblies. Sight glass indicators, Fig. 2, are used so that the operator can visually ascertain if the system is operating properly under standby conditions.

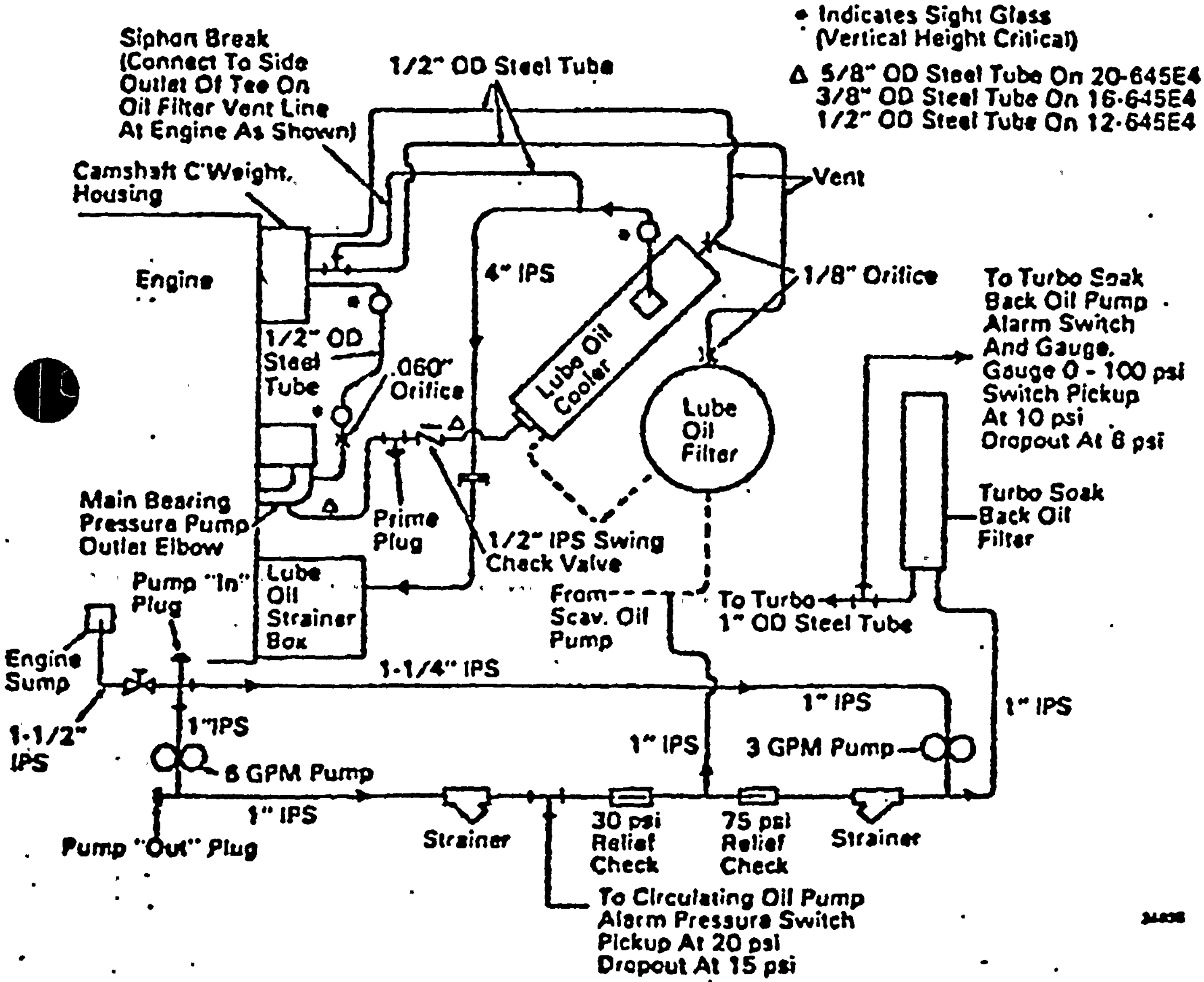


Fig.1 – System Schematic Diagram, "S" Units

Page 8 of 9

[illegible]

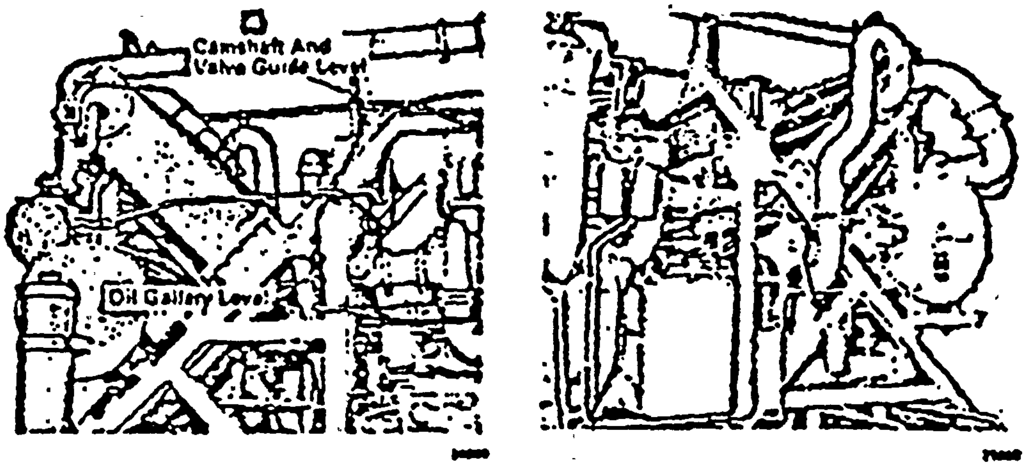


Fig.2 – Vent And Sight Glass Piping, Typical Installation

Twenty Cylinder Unit Only: In addition three stiffeners 9325479 must be added to the lube oil cooler tanks as shown in Fig. 4. Existing stiffeners can remain in place.

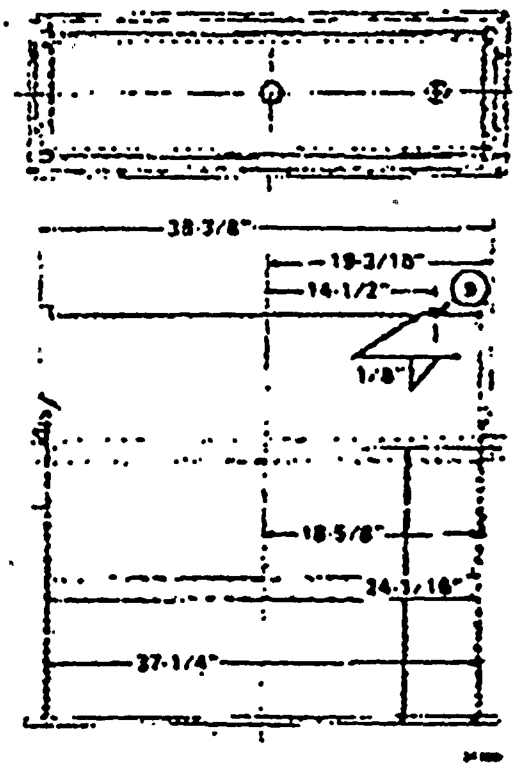


Fig 3 - "S" Unit Oil Cooler Tank Flange Application

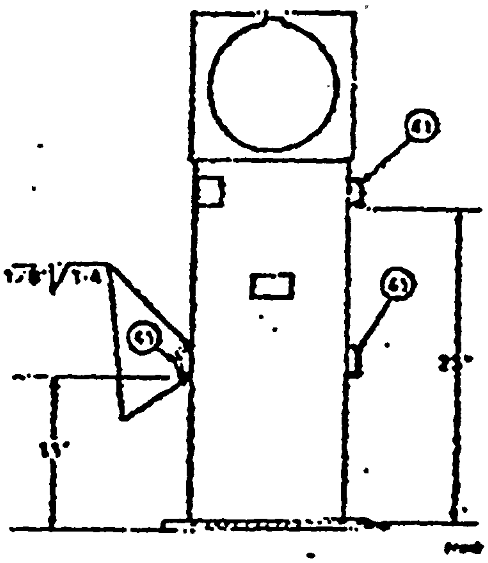


Fig.4 - "S" Unit Oil Cooler Tank Stiffener Application

Page 9 of 9

QUESTION F430.76 (9.5.5)

For the Division III diesel generator, describe the provisions made in the design of the diesel engine cooling water system to assure that all components and piping are filled with water. Show how your design will preclude long term corrosion of piping with attendant system degradation. (SRP 9.5.5, Part I & II)

RESPONSE

Response to PSB Comments.

This response will be provided in the second quarter of 1984. | 11

PSB Comments

Not acceptable. No response provided.

The engine cooling water system is designed to operate as a "flooded" system. Venting is provided between engine coolant outflow piping, the lube oil cooler and the cooling water expansion tank. As shown in Figure 9.5-43 the entrapped air is vented via vent lines from the engine block, lube oil cooler water side piping and the expansion tank. Venting of the heat exchanger is not required.

The engine cooling water is treated with inhibitor. Thus each time the engine is run, all parts of the cooling system are wetted with inhibitor which provides a protective coating inside the pipes. Running the engine once a month will provide adequate corrosion protection, and no decrease in cooling system life is anticipated.

QUESTION F430.77 (9.5.5)

For the Division III diesel generator, provide the results of a test which demonstrates that the "thermosyphon" design in your keep warm system will maintain a uniform temperature within the diesel engine jacket water and throughout the cooling water system of at least 120°F. Provide the lowest ambient temperature (diesel generator room) at which the keep warm system can maintain this temperature. Also, what provisions have been made to warn the operator if room ambient falls below the above minimum temperature?

RESPONSE

See revised Section 9.5.5.2.2.

PSB Comments

Not acceptable. The referenced FSAR Section does not answer the question.

Response To PSB Comments

EMD's test data has shown that the EMD diesel can be started in a 66°F environment while the engine jacket cooling water was heated by the immersion heater through natural circulation.

see Section 9.5.5.2.2.

430.77 For Info

7. An immersion heater to heat the jacket water when the engine is in standby condition. A heater control switch turns the heater on when the water temperature falls to 125°F and off when water temperature rises to 155°F. The heater is 15 kW, 575 V, 3 phase, ac.

The jacket water system is a closed loop system. During engine running condition, heated water from the engine discharge manifold flows to the temperature regulating valve. The temperature regulating valve regulates the flow of water through the jacket water heat exchanger and maintains the engine jacket water at a constant temperature. If the water temperature is below 165°F, all water passes directly to the lube oil cooler. At water temperatures between 165°F and 180°F, the valve regulates the flow through the jacket water cooler and the bypass line. Jacket water flows from the lube oil to the engine-driven centrifugal pumps that pump the water into the engine jacket water main headers. From the main headers, jacket water also flows through the aftercoolers located in the turbocharger air discharge duct to cool the air before it enters the engine air box.

When the engine is in standby condition, the immersion heater heats the jacket water. The heated jacket water circulates through the lube oil cooler by thermosyphon action to warm the lubricating oil that is being circulated through the engine to keep the engine warm. The immersion heater maintains the lube oil temperature between 125°F and 155°F. For the keep-warm system to maintain a uniform temperature within the diesel engine jacket water and throughout the cooling water system, the Division III diesel generator ambient temperature is kept above 66°F.

To preclude long-term corrosion, treatment of the water used in the jacket water system includes the use of silicate nitrate inhibitors, in agreement with the engine manufacturer's recommendations, and periodic testing of the coolant to ensure that the water quality is maintained at the level recommended by the engine manufacturer. 9

Use of an antifreeze compound is not required since the entire cooling water system is enclosed, located indoors, and maintained warm by the immersion heater when the engine is in standby condition.

Any loss of water through seepage, leakage, or flow out the pressure relief cap will be noticed through routine checks of the expansion tank sight glass. If needed, the cooling water system can be manually refilled through the filler opening at the top of the expansion tank.

QUESTION F430.87 (9.5.7)

For all three diesel generators, provide additional information on the design of the crankcase breathers. Provide the piping quality, design standard and seismic qualification, state where the breather is located on each engine, describe what happens to the vapors which are vented from the crankcase, and discuss the provisions in your design to prevent crankcase vapors from creating an explosion hazard in the diesel generator room. Also, describe the features included in your diesel engine design to prevent and mitigate a crankcase explosion. (SRP 9.5.7, Part II)

RESPONSE

For Division I and II see revised Section 9.5.7.2. 9

For Division III the response will be provided by second quarter of 1984.

PSB Comments

Not acceptable. The applicant has not addressed (a) the seismic and quality group classifications of the crankcase breather, and (b) design provisions to mitigate the consequences of a crankcase explosion. In addition, the applicant has not provided a response for the Division III DG.

For clarification, the applicant should provide details on the crankcase breather design, including location on the engine, and design and operation of the "filters" and condensate drain trap.

Response to PSB comment

See section 9.5.7.1 and revised Table 3.2-1 for seismic and quality group classification of the lube oil system.

See revised section 9.5.7.2.1 for details of the crankcase breather for Div. I and II.

REVISED W[illegible]ING

TABLE 3.2-1 (Cont)

	Scope of Supply	Location	Electrical Classification	Seismic Category	Quality Group Classification	Quality Assurance Requirement(31)	Tornado Protection	Notes	
Compressors, air startup	P,42	S	Non-1E -7	NA	D	NA	P		
Receivers, air startup	P,42	S	NA	I	C	I	P		
Standby diesel-generators	P,GE	S	1E	I	B	I	P		
HPCS diesel-generator	GE	S	1E	I	B	I	P		
HPCS Diesel Generator Cooling Water System									
Heat exchanger	GE	S	NA	I	C	I	P		
Piping and valves, engine mounted	GE	S	NA	I	(25)	I	P	(26)	9
Piping and valves, other	P	S	NA	I	C	I	P		9
HPCS Diesel Generator Lube Oil System									
Heat exchanger	GE	S	NA	I	(25)	I	P	(26)	9
Piping and valves	GE	S	NA	I	(25)	I	P	(26)	9
Pumps, motors	GE	S	1E	I	(25)	I	P	(26)	9
HPCS Diesel Generator Combustion Air Intake and Exhaust System									
Silencers	GE	S	NA	I	NA	I	P		9
Piping	P	S	NA	I	C	I	P		
Filter	GE	S	NA	I	(25)	I	P	(26)	9
Lube oil cooler,	P	S	N/A	I	C	I	P	X	
piping and valves	P	S	N/A	I	C	I	P	X	
pumps, motors	P	S	1E	I	C	I	P	X	

QUESTION F430.88 (9.5.7)

In FSAR Section 9.5.7.2, you state that there is adequate lube oil in the sump of the Division I and II diesel generators for seven days of operation without adding lube oil. Expand your FSAR discussion to include details as listed below. Also, provide similar information for the Division III diesel generator.

(a) Provide the normal lube oil usage rate for each diesel engine under full load conditions. Also provide the lube oil usage rates which would be considered excessive.

(b) Show with the lube oil in the sump tank at the minimum recommended level that the diesel engine can operate without refilling the lube oil sump for a minimum of seven days at full rated load. If the sump tank capacity is insufficient for this condition, show that adequate lube oil will be stored onsite for each engine to assure seven days of operation at rated load. Also provide the lube oil sump capacity. (SRP 9.5.7, Parts II and III)

RESPONSE

Response to PSB comments

See revised Section 9.5.7.2. 11

PSB Comments

The response is acceptable for Division I and II. No response for Division III is provided. This is not acceptable.

QUESTION F430.89 (9.5.7)

What measures have been taken to prevent entry of deleterious materials into the engine lubrication oil system due to operator error during recharging of lubricating oil or normal operation. (SRP 9.5.7, Part II)

RESPONSE

Lubricating oil in the Division III diesel generator (DG) is recharged with new oil qualified for use. Oil is added through a filter opening in strainer housing that prevents solid particles from entering the engine lubricating oil system.

Lubrication procedures are incorporated as a portion of the preventive maintenance program for the unit. Procedure steps include items for safety of both the operator and the equipment during performance of the activity. Special instructions included in operating procedures for addition or checking of lubrication products reference these preventive maintenance lubrication instructions. Steps include cleanliness of the equipment and fittings, pumps, hoses, etc, used to add the lube product; verification of proper lubrication oil; and steps to properly add the oil to the equipment.

PSB Comments

Not acceptable. The information regarding the Division III DG is acceptable. However, there is no indication that the response is also applicable to the Division I and II DG's.

Response to PSB comments:

The procedures established above apply to Division I, II and III diesel generators.

QUESTION F430.92 (9.5.7)

Describe the testing and calibration program that will be used to ensure a highly reliable instrumentation, control, sensors, and alarm system for the diesel generators lubricating oil systems. (SRP 9.5.7, Part II)

RESPONSE

Descriptions of instruments, controls, sensors, and alarms associated with the Division I, II, and III diesel generators and their auxiliary systems as well as their function and locations of annunciators as well as system interlocks are described in Sections 8.3.1.1.2, 9.5.4 through 9.5.8, and Tables 7.3-15 and 7.5-1. Operator actions to various alarm conditions will be included in the annunciator response sections of the associated operating procedures. Periodic testing to maintain and ensure highly reliable instrumentation will be scheduled in accordance with surveillance test requirements specified in the technical specifications.

PSB Comments

Not acceptable. See comments for Q 430.53

Response To PSB Comments

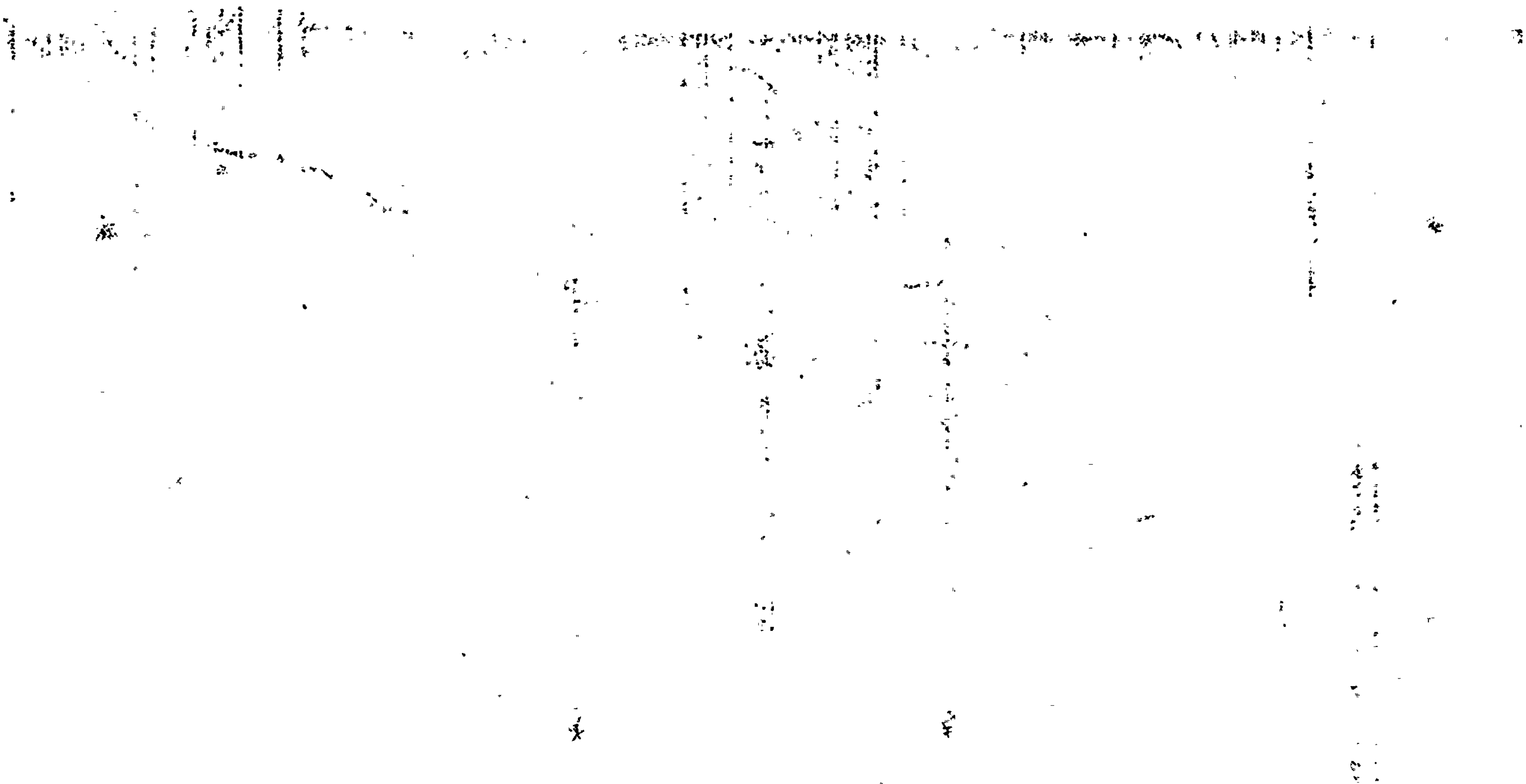
See response to 430.53

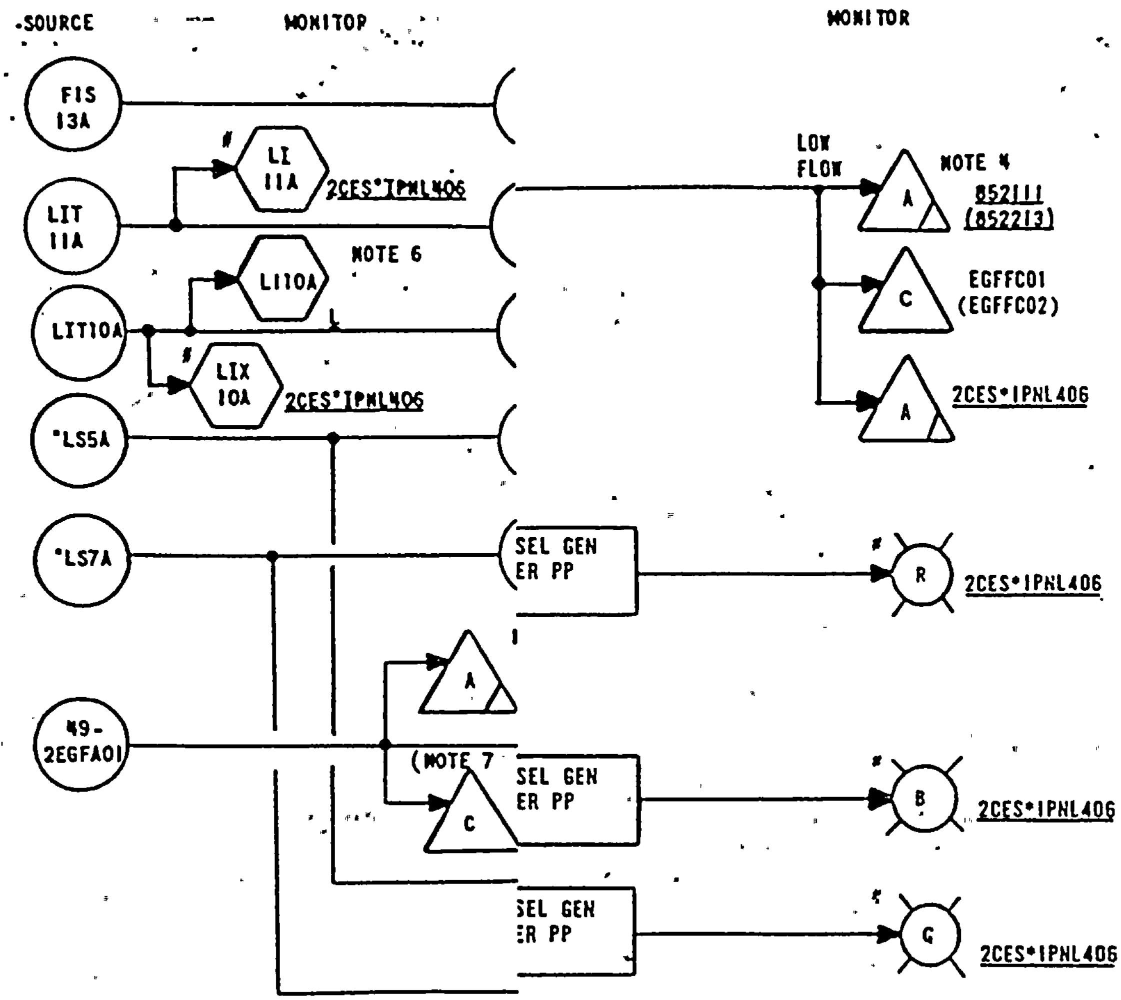
For Division III DG.

(h) See the newly added Figure 9.5-41c.

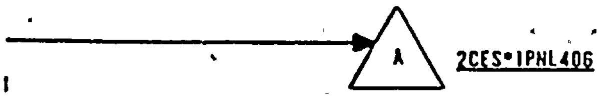
(i) See the newly added Figure 9.5-41b for cooling water system logic diagram. Item 16 is shown on Figure 9.5-43.

(j) See the newly added Figure 9.5-41d for the lubrication system logic diagram.





NOTES:
1. ALL INSTRUMENT AND EQUIPMENT NUMBERS TO
"2EGF-" EXCEPT WHERE A DIFFERENT PREFIX
ASTERISK (*) WILL REPLACE THE DASH (-) I
EQUIPMENT OR INSTRUMENTS WHICH ARE A PAI
SAFETY FEATURES SYSTEM.



2. LOGIC SHOWN FOR FUEL OIL TRANSFER PUMP *
FUEL OIL TRANSFER PUMPS *P1B, *P1C, AND
3. ASSOCIATED EQUIPMENT MARK NUMBERS:

DIV I	DIV II
*TK1A	*TK1B
*TK3A	*TK3B
*LS5A	*LS5B
*LS7A	*LS7B
FIS13A	FIS13B
*P1A	*P1B
*P1C	*P1D
LIT10A	LIT10B

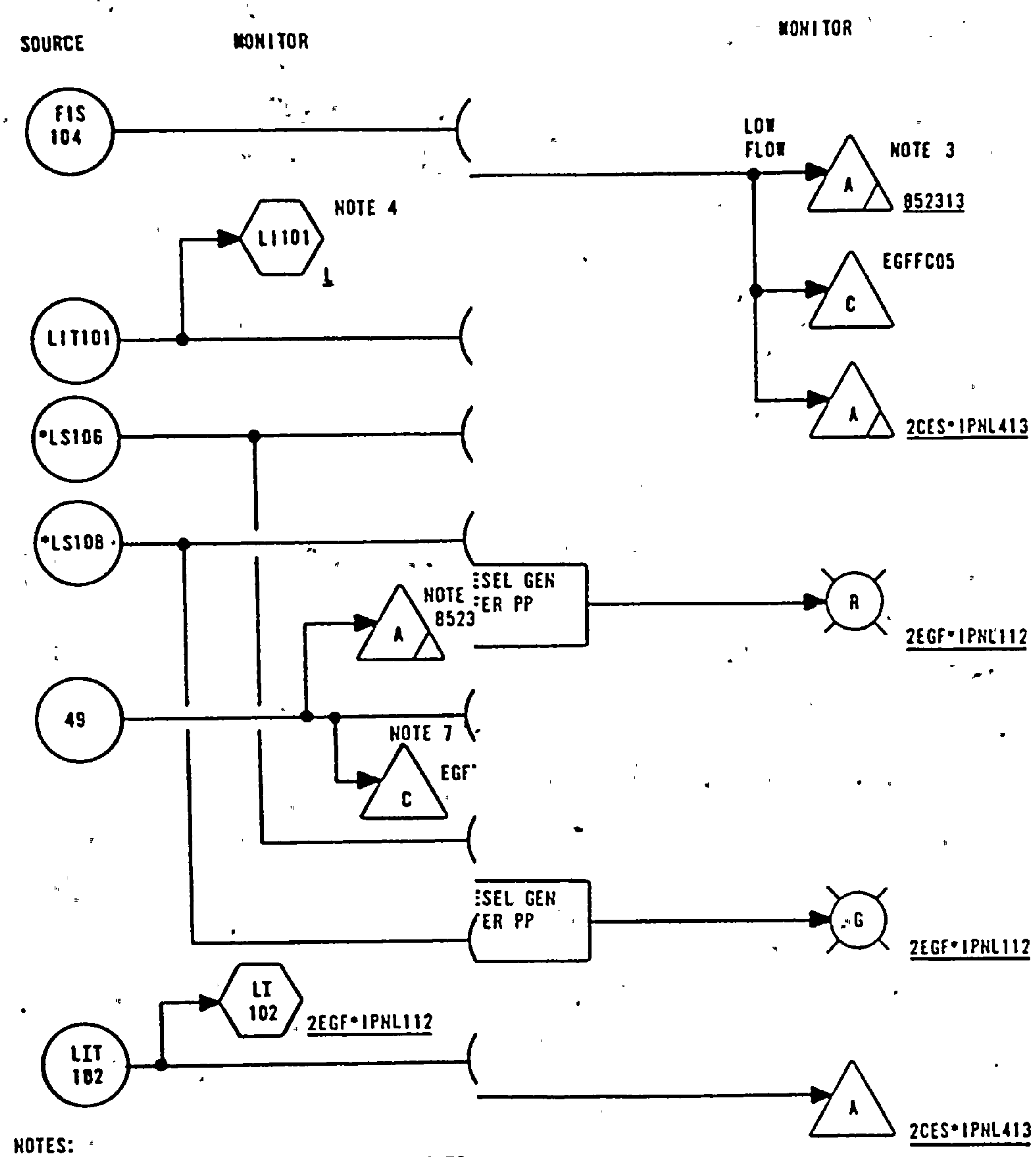
SOURCE: 12177-LSK-8-9A REV. 4

FIGURE 9.5-41a

DIESEL GENERATOR FUEL OIL STORAGE
AND TRANSFER SYSTEM
LOGIC DIAGRAM SHEET 1 OF 5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

430.92



NOTES:

1. ALL INSTRUMENT AND EQUIPMENT NUMBERS TO WHERE A DIFFERENT PREFIX IS SHOWN. AN AS (*) IN THE PREFIX FOR EQUIPMENT OR INSTR SAFETY FEATURES SYSTEM.
2. LOGIC SHOWN FOR FUEL OIL TRANSFER PUMP * PUMP *P2B IS SIMILAR.
3. COMMON ANNUNCIATOR IS SHOWN FOR DIV III.
4. LOCATED ON BUILDING EXTERIOR WALL NEAR T
5. THIS LOGIC IS FOR DIV III HPCS DIESEL GE
6. COMPUTER POINT EGFTC05 IS FOR *P2A, EGFT

OURCE: 12177-LSK-8-9B REV.4

FIGURE 9.5-41a

DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM LOGIC DIAGRAM SHEET 2 OF 5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

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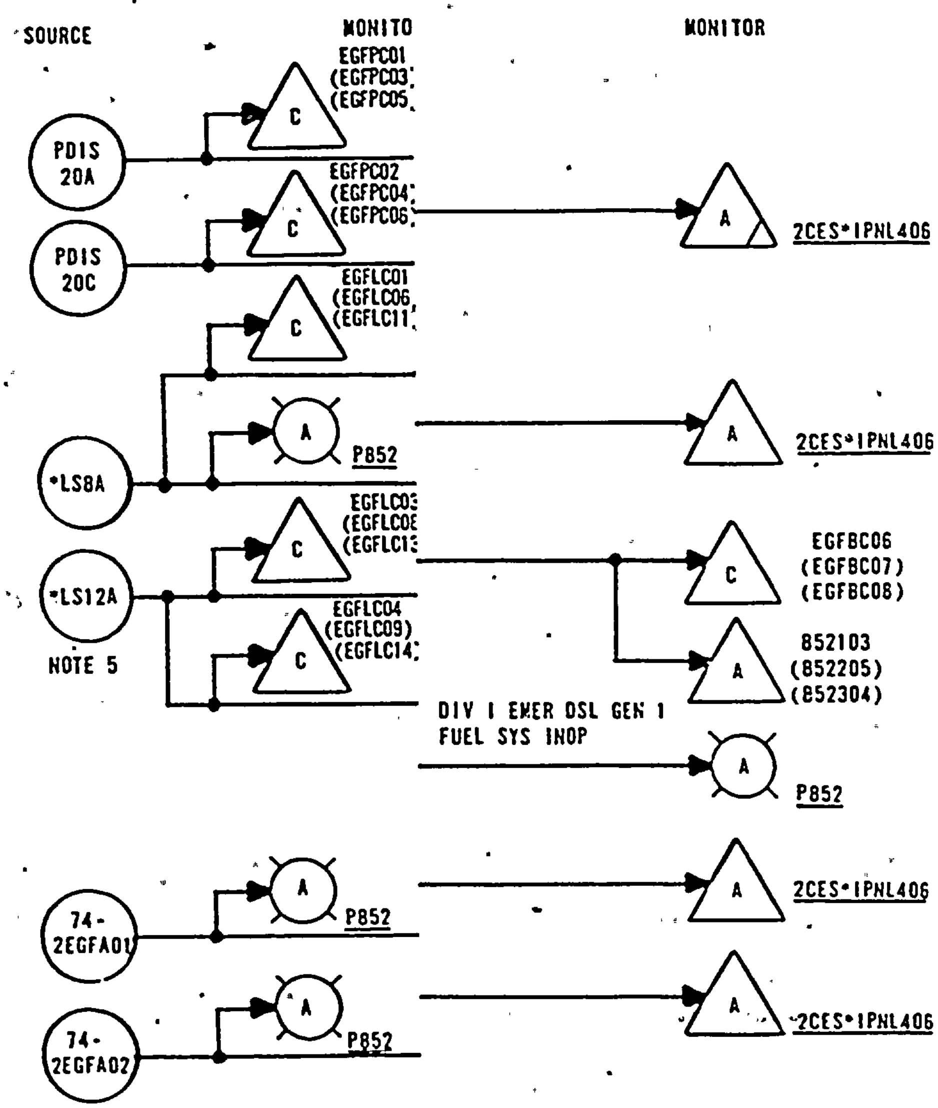


NOTES:
1. ALL INSTRUMENT AND EQUIPMENT NUM
WHERE A DIFFERENT PREFIX IS SHOW
2. LOGIC IS SHOWN FOR DIVISION I DI
SIMILAR FOR DIVISIONS 2 & 3.
3. ASSOCIATED EQUIPMENT MARK NUMBER

DIV I	DIV II
*LS8A	*LS8B
*LS12A	*LS12B
*TK1A	*TK1B
*TK3A	*TK3B
PDIS20A	PDIS20B
PDIS20C	PDIS20D
*P1A	*P1B
*P1C	*P1D
74-2EGFA01	74-2EGFB
74-2EGFA02	74-2EGFB
2CES*IPNL406	2CES*IPN

4. COMMON ANNUNCIATORS SHOWN FOR DI
5. ASTERISK IS SHOWN ON *LS12A BECA

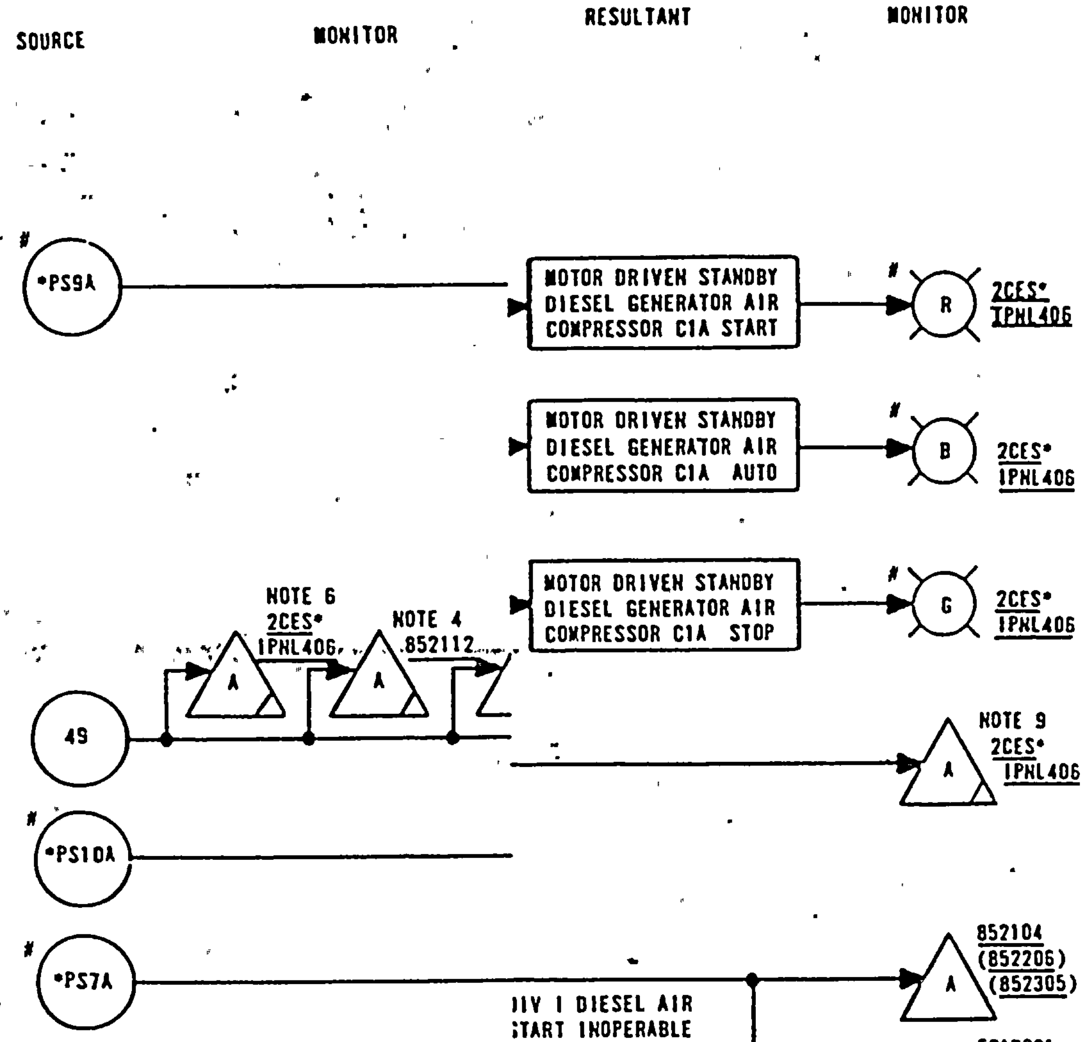
OURCE: 12177-LSK-8-9C REV. 4

FIGURE 9.5-41a

DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM LOGIC DIAGRAM SHEET 3 OF 5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

430.92



NOTES:

1. ALL INSTRUMENT AND EQUIPMENT NUMBERS T(
   A DIFFERENT PREFIX IS SHOWN. AN ASTERI:
   PREFIX FOR EQUIPMENT OR INSTRUMENTS WHI
   FEATURES SYSTEM.
2. LOGIC FOR MOTOR DRIVEN STANDBY DIESEL (
   LOGIC FOR COMPRESSORS C2A, C1B & C2B IS
3. ASSOCIATED EQUIPMENT NUMBERS:

DIVISION I	DIVISION II	DIVISIOI
*TK1A	*TK1B	*TK3
*TK2A	*TK2B	*TK4
*PS10A	*PS10B	*PS11(
*PS7A	*PS7B	*PS11;
*PS9A, 6A	*PS9B, 6B	
2CES*IPNL406	2CES*IPNL408	

4. COMMON ANNUNCIATOR FOR STANDBY DIESEL (
5. # - INDICATES FURNISHED BY DIESEL GENEI
6. COMMON ANNUNCIATOR FOR AIR COMPRESSOR (
7. ASSOCIATED MOTOR OVERLOAD COMPUTER POII

DIVISION I	DIVISION I
C1A EGATC01 852112	C1B EGATC0:
C2A EGATC03 852112	C2B EGGTCO/

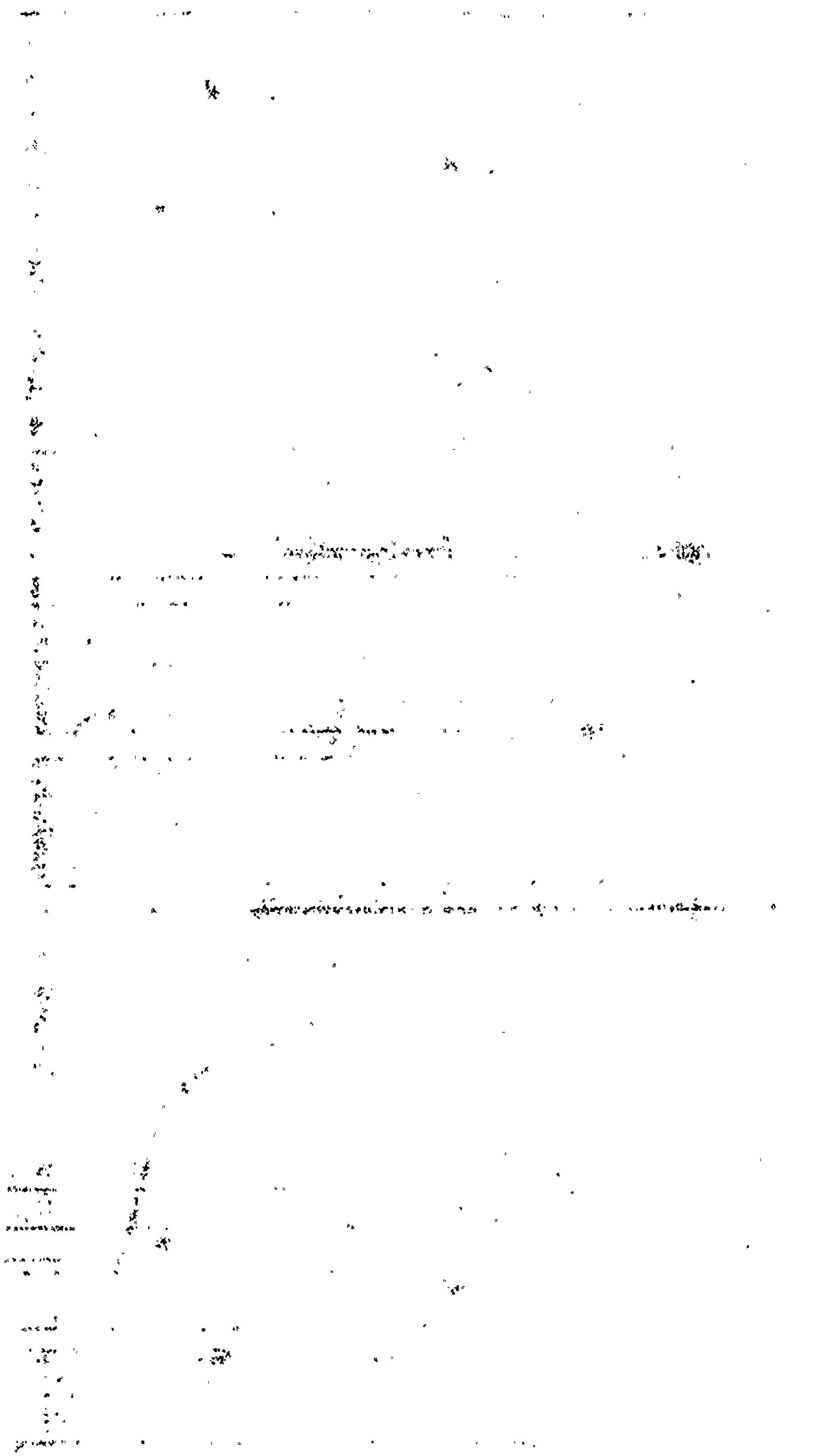
8. ALL PRESSURE SWITCHES ARE QA CAT I (SE
9. COMMON ANNUNCIATOR FOR AIR COMPRESSOR I

OURCE: 12177-LSK-12-4A REV. 5

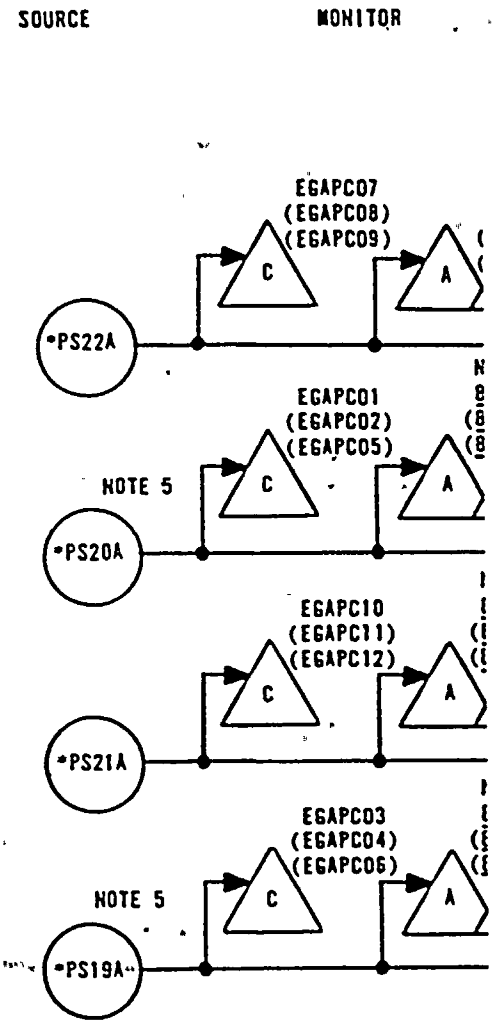
FIGURE 9.5-41a

DIESEL GENERATOR STARTING SYSTEM
LOGIC DIAGRAM SHEET 4 OF 5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



430.92



NOTES:

1. ALL INSTRUMENT AND EQUIPMENT NUMBERS T
   DIFFERENT PREFIX IS SHOWN. AN ASTERISK
   FOR EQUIPMENT OR INSTRUMENTS WHICH ARE
2. COMMON ANNUNCIATOR FOR STBY DSL GEN AI
3. ASSOCIATED EQUIPMENT NUMBERS:

DIVISION I	DIVISION II	DIVISI
*PS22A	*PS22B	*PS122
*PS20A	*PS20B	*PS120
*PS21A	*PS21B	*PS121
*PS19A	*PS19B	*PS119
2CES*IPNL406	2CES*IPNL408	2CES*I

4. ALL PRESSURE SWITCHES ARE QA CAT I (SE
5. LOW PRESSURE ALARMS TO BE SET 10 PSIG
   START.

OURCE: 12177-LSK-12-4B REV. 5

FIGURE 9.5-41a

DIESEL GENERATOR STARTING SYSTEM
LOGIC DIAGRAM SHEET 5 OF 5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

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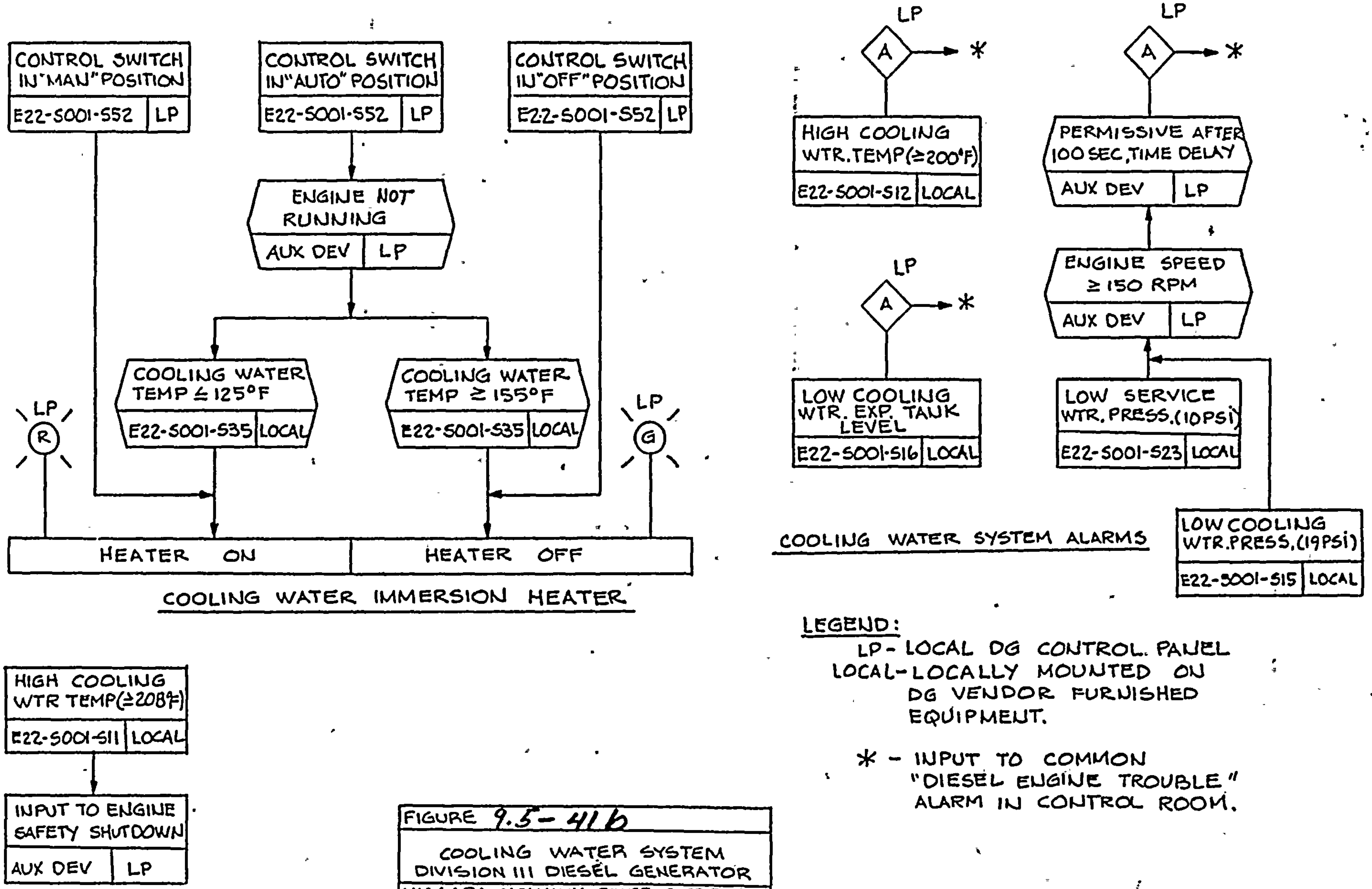


FIGURE 9.5-41b

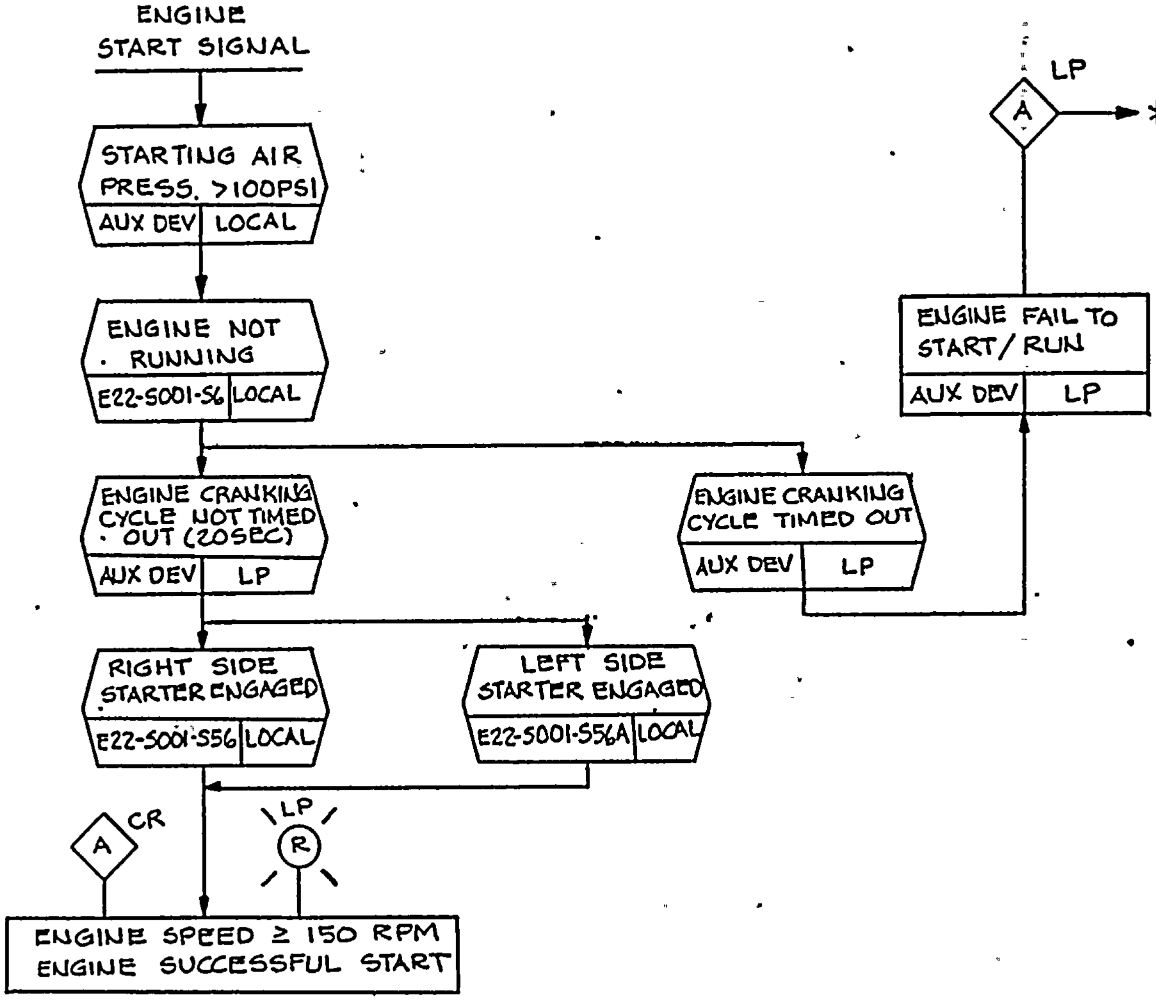
COOLING WATER SYSTEM
DIVISION III DIESEL GENERATOR

NIAGARA MOHAWK POWER CORPORATION

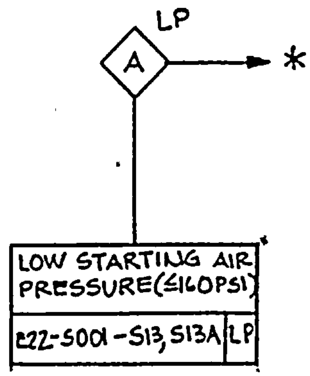
NINE MILE POINT-UNIT 2

FINAL SAFETY ANALYSIS REPORT

430.92



ENGINE AIR STARTING SYSTEM



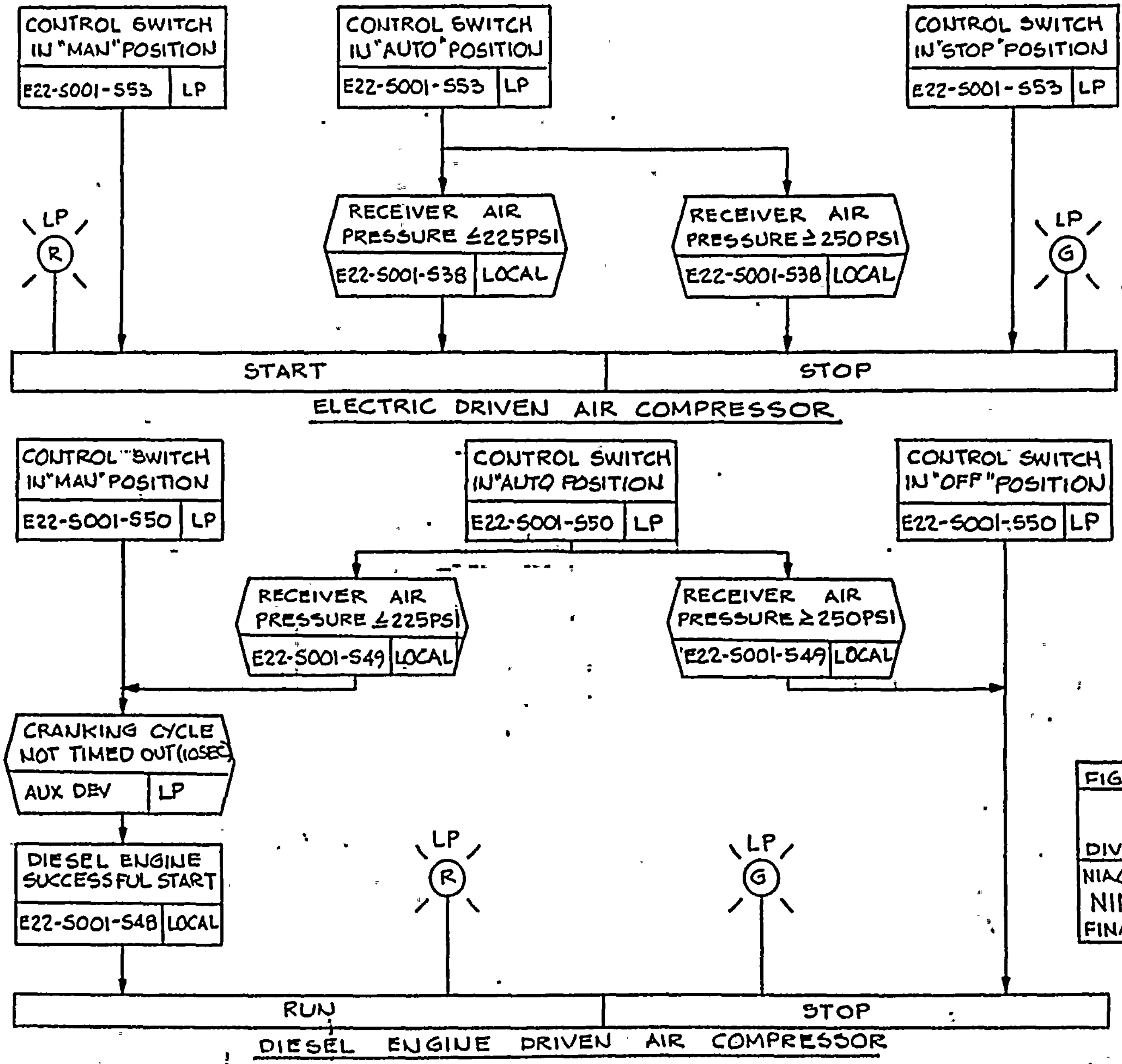
ENGINE AIR START SYSTEM ALARMS

LEGEND:

LP - LOCAL DG CONTROL PANEL
LOCAL - LOCALLY MOUNTED ON
- DG VENDOR FURNISHED EQUIPMENT
* - INPUT TO COMMON "DIESEL ENGINE TROUBLE" ALARM IN CONTROL ROOM.

4/30/92

FIGURE 9.5-41C
AIR START SYSTEM
SH. 1 OF 2
DIVISION III DIESEL GENERATOR
NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



LEGEND:
LP - LOCAL DG CONTROL PANEL
LOCAL - LOCALLY MOUNTED ON DG VENDOR FURNISHED EQUIPMENT.

FIGURE 9.5-4C
AIR START SYSTEM
SH. 2 OF 2
DIVISION III DIESEL GENERATOR

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

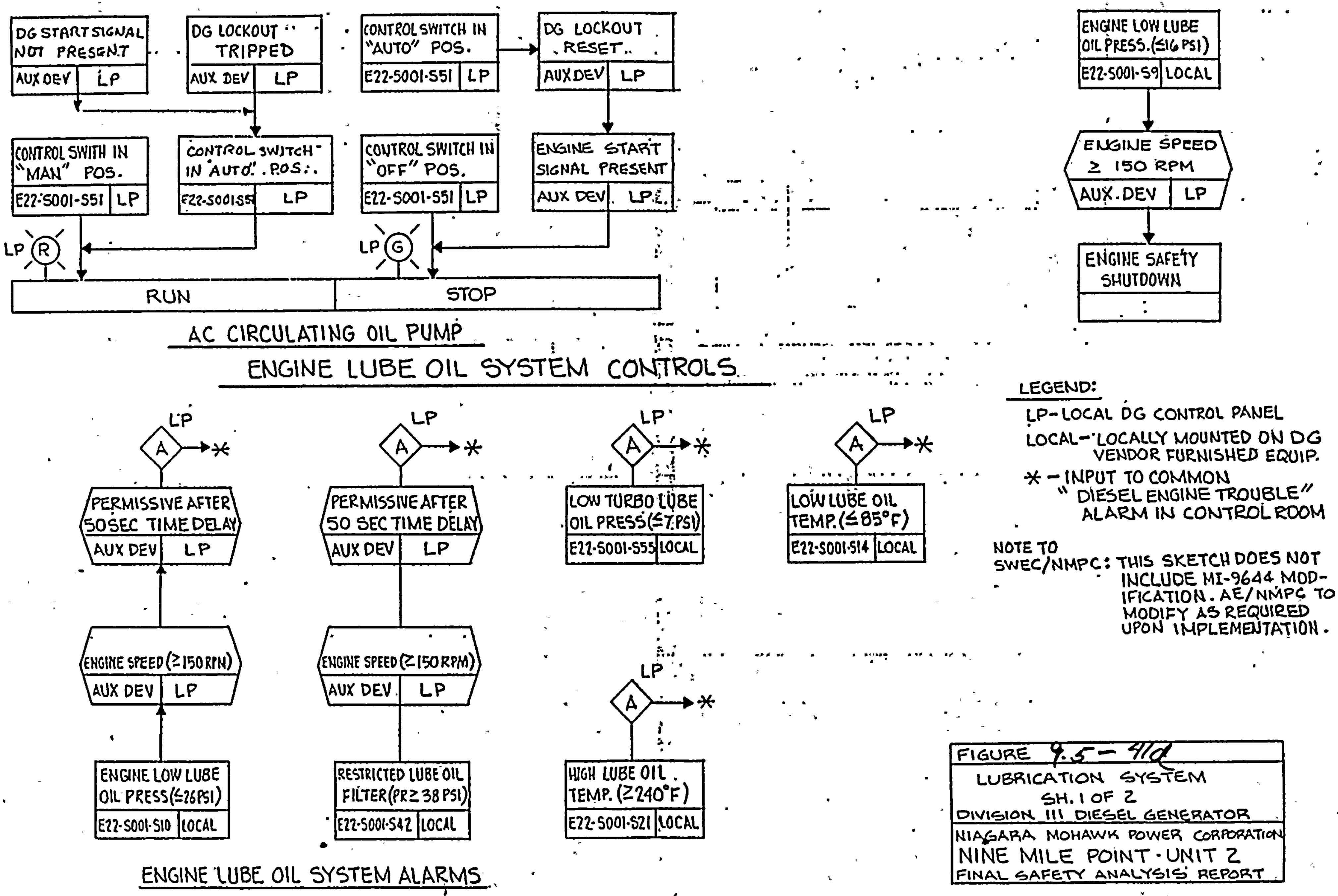
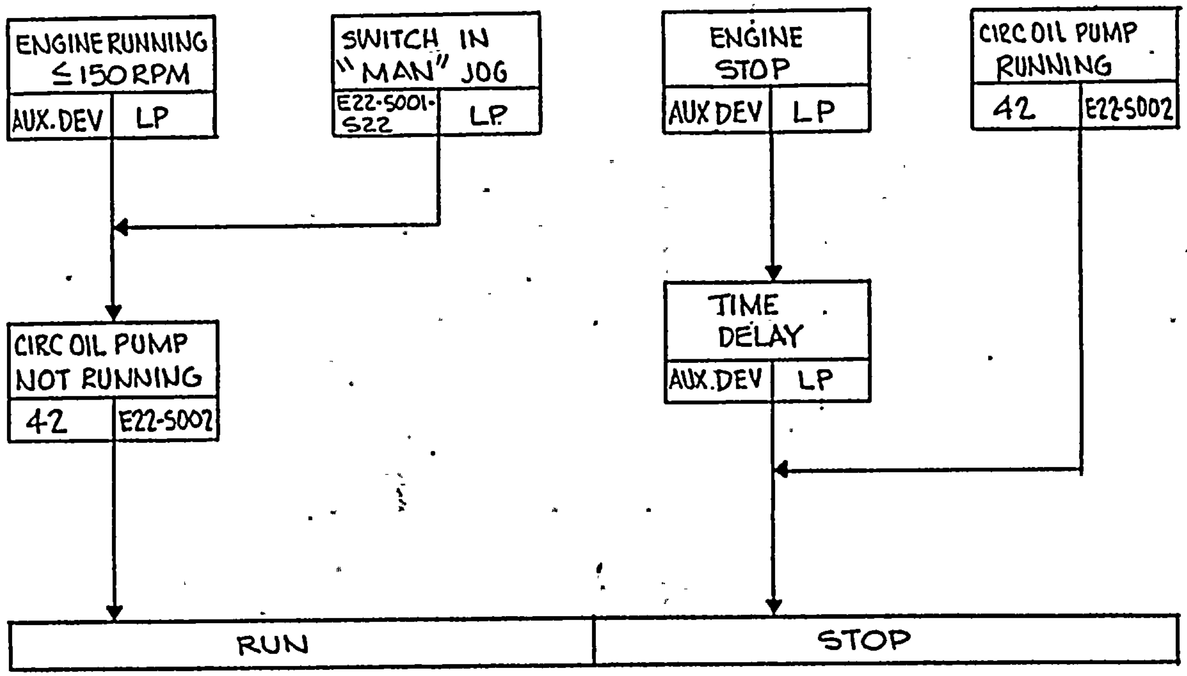


FIGURE 9.5-41d
LUBRICATION SYSTEM
SH. 1 OF 2
DIVISION III DIESEL GENERATOR
NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



DC TURBO SOAKBACK PUMP

FIGURE 9.5-41d
LUBRICATION SYSTEM
SH. 2 OF 2
DIVISION III DIESEL GENERATOR

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

[illegible]

[illegible]

QUESTION F430.90 (9.5.7)

Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of lube oil without interrupting operation of the diesel generator. Provide the following:

(a) What provision has been made in the design of the lube oil system to add lube oil to the sump. These provisions shall include procedures or instructions available to the operator on the proper addition of lube oil to the diesel generator as follows:

1. How and where lube oil can be added while the equipment is in operation.

2. Particular assurance that the wrong kind of oil is not inadvertently added to the lubricating oil system, and

3. That the expected rise in level occurs and is verified for each unit of lube oil added.

(b) Verification that these operating procedures or instructions will be posted locally in the diesel generator rooms.

(c) Verification that personnel responsible for the operation and maintenance of the diesel are trained in the use of these procedures. Verification of the ability of the personnel on the use of the procedures shall be demonstrated during preoperational tests and during operator requalification.

(d) Verification that the color coded, or otherwise marked, lines associated with the diesel generator are correctly identified and that the line or point for adding lube oil (when the engine is on standby or in operation) has been clearly identified. (SRP 9.5.7, Part II)

Insert X →

RESPONSE

The diesel generator lube oil sumps are designed with capacity such that oil should not have to be added during operation for at least 7 days. Operation of all diesels for extended periods would not be required during loss of off-site power and a LOCA condition. Loads would be transferred from one division diesel to another to allow for addition of lube oil, inspection of the unit, etc.

[illegible]

In the unlikely event that lube oil must be added to a diesel while it is running, special instructions will be included in the procedures covering the diesel generators. Lube oil can be added to the sumps, following safe procedures to prevent injury to the operator or damage to the diesels. Provisions are made on the diesel sump to allow the operator to observe the normal standby and the normal operating level of the lube oil.

Lube oil is obtained from qualified vendors in properly labeled drums. Lube oil is always transferred from these drums to the diesel and transfers to other holding devices are not utilized, to preclude the possible mixing or use of improper oil. Instructions for adding lube oil require verification of the product prior to addition. Copies of procedures will not be posted locally to preclude the use of unapproved or out-of-date procedures. Points of addition for lube oil will have a caution tag affixed directing the operator to read the applicable portion of procedures prior to adding lube oil. Instructions will detail procedures for adding oil in the standby and the operating condition.

Training of personnel responsible for operation and maintenance of the diesel is provided in the response to Question F430.37.

PSB Comments on Question 430.90

The response is acceptable for the Division I&II DG's. However, the response is not acceptable of the Div III DG because no response is given for the Div III DG in Question 430.88.

RESPONSE To PSB Comments

See Question 430.88 for the Division III Diesel Generator.

QUESTION F430.94 (9.5.7)

The description of the Division III diesel generator circulating and soak back pumps operation is not clear. The piping arrangement shown on Figure 9.5-48 shows oil flow paths that are not consistent with the FSAR written description. Specifically, there is oil flow to the turbocharger at all times, rather than only on startup as indicated in the FSAR. Revise the FSAR and/or Figure 9.5-48, as required, to correct this inconsistency.

RESPONSE

See revised Section 9.5.7.2.2.

PSB Comments

Not acceptable. The system as described in the FSAR text and shown on Figure 9.5-48 does not provide diesel engine prelubrication in compliance with the recommendations of NUREG/CR-0660.

Response To PSB Comments

See response to Question 430.86.

QUESTION F430.95 (9.5.7)

In the FSAR, you state that the Division III lube oil circulating pump is rated at 6 GPM and is used only when the diesel generator is in the standby mode. At 6 GPM, the amount of oil circulated through the engine during standby is substantially less than that circulated by the main lube oil pump during operation. The purpose of circulating lube oil during standby is to enhance first try start reliability by ensuring an oil film on all moving parts, as well as maintaining these parts at recommended preheated temperature. Therefore, demonstrate that the standby circulating pump has adequate capacity to (1) maintain an adequate oil film, on the engine moving parts, and (2) that this capacity is sufficient to maintain the moving parts at recommended preheat temperature. (SRP 9.5.7, Part II and III)

RESPONSE

See revised Section 9.5.7.2.2.

PSB Comments

Not acceptable. The system as described in the FSAR text and shown on Figure 9.5-48 does not provide diesel engine prelubrication in compliance with the recommendations of NUREG/CR-0660.

RESPONSE To PSB Comments

See response to Question 430.86.

QUESTION F430.96 (9.5.7)

Discuss the interlocks on the Division I and II standby circulating oil pumps, and the Division III standby circulating and soak back pumps. (SRP 9.5.7, Part III)

RESPONSE

See revised Sections 9.5.7.2.1 and 9.5.7.2.2.

PSB Comments

The response will be acceptable pending resolution of Question 430.94 and Question 430.95. Some revision to the response may be required.

RESPONSE To PSB Comments

See response to Question 430.86.

QUESTION F430.97 (9.5.8)

FSAR Figures 9.5-49 through 9.5-51, and 1.2-17 through 1.2-19, do not provide adequate details of the missile protection provided for the diesel generator combustion air intake and exhaust systems. Provide additional plan elevation, and section views, as required, which clearly show what the missile protection consists of, where it is located relative to the intakes and exhaust, and the relationship of the protective devices with the diesel generator building and other buildings, as appropriate. (SRP 9.5.8, Part I)

RESPONSE

See revised Section 9.5.4.3.

PSB Comments

Not acceptable. It is still not clear from the FSAR text or figures how tornado missile protection is provided for the combustion air intake and exhaust systems. The requested additional plan, elevation and/or section views have not been provided.

Response To PSB Comments

See revised section 9.5.8.1 and Fig 1.2-17

QUESTION F430.100 (9.5.8)

Discuss the provisions made in your design of the diesel engine combustion air intake and exhaust system to prevent possible clogging, during standby and in operation, from abnormal climatic conditions (heavy rain, freezing rain, dust storms, ice and snow) that could prevent operation of the diesel generator on demand. (SRP 9.5.8, Part II)

RESPONSE

See revised Section 9.5.8.1.

PSB Comments

Not acceptable. The response will be acceptable when details of tornado missile protection (Q 430.97) have been provided, reviewed, and found acceptable.

Response to PSB comments

see revised section 9.5.8.1 and Fig. 1.2-17

QUESTION F430.105 (9.5.8)

Provide a P&ID for the diesel engine combustion air intake and exhaust system. Identify all system components and provide the design classification for same. Identify the diesel engine interface. (SRP 9.5.8, Section I)

RESPONSE

Response to PSB Comment

The P&ID will be provided by the third quarter of 1984. 8

See Figure 9.5-40

PSB Comments

Not acceptable. The requested information has not been provided.

[illegible]

[illegible]

Delete & Insert Attachment 1

the exhaust piping melts upon exposure to these operating temperatures. If the exhaust piping is clogged by snow, ice, or dust while the diesel generator is not in operation, the diesel exhaust valves function to open and relieve the excess
7 pressure when the back pressure exceeds a preset level. Therefore, abnormal climatic conditions will not prevent the operation of the diesels on demand.

10. The missile enclosures appear in Figure 1.2-17 for diesel generator divisions I, II, and III.

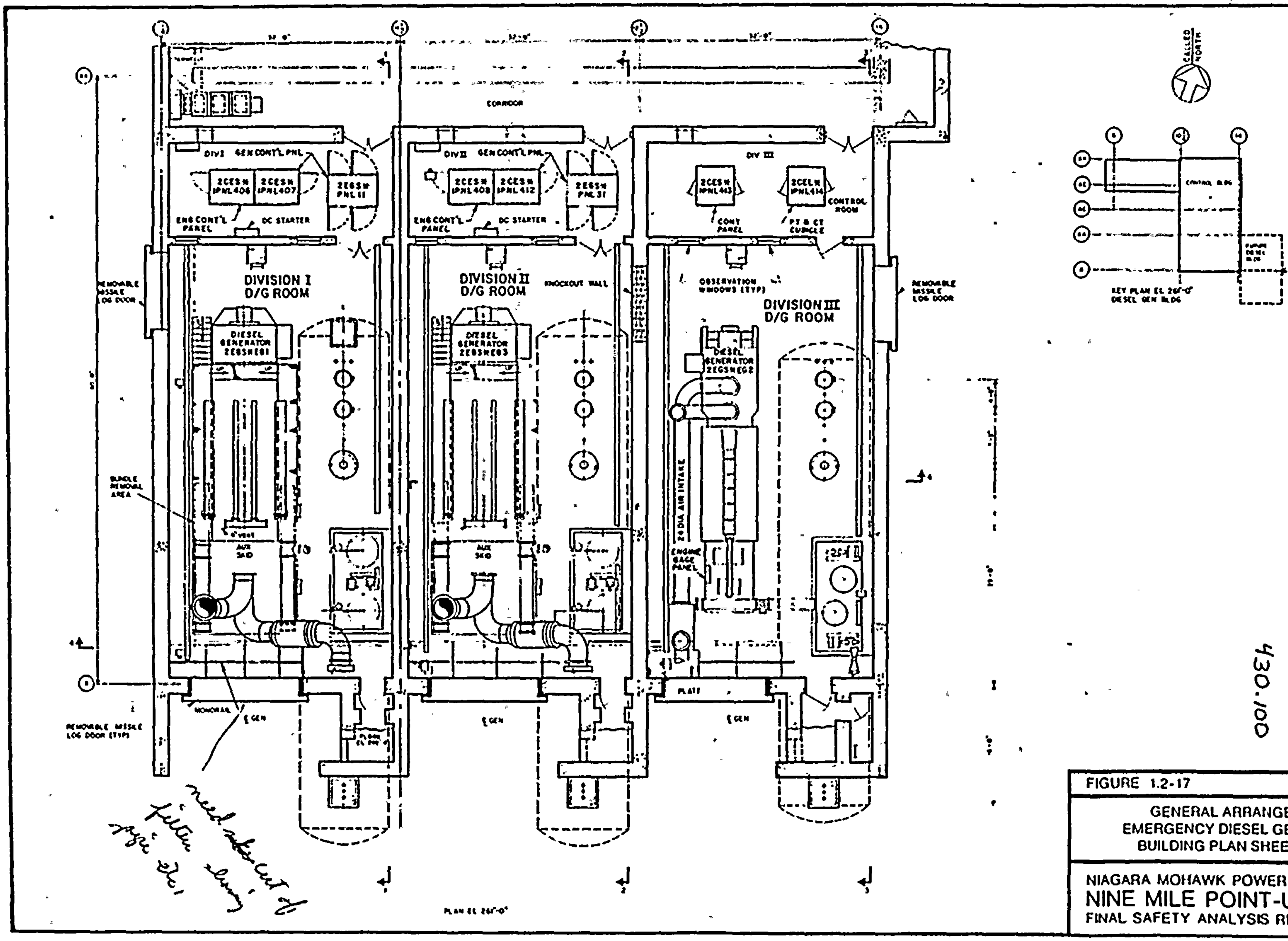
9.5.8.2 System Description

Each standby diesel generator associated with Divisions I, II, and III of the emergency onsite ac power system is shown on Figures 9.5-49 through 9.5-51. Each Division I and II system consists of a separate intake filter and silencer, a turbocharger, an intercooler heater, a diesel exhaust relief valve, an exhaust silencer, and associated piping. Division III consists of a separate intake filter and silencer, a turbocharger, a diesel exhaust relief valve, an
7 exhaust silencer, and associated piping. All intake and exhaust piping and their associated components are fabricated and installed in accordance with ASME Section III, Class 3 requirements, and are Seismic Category 1. Missile enclosures protect the intake piping, the intake components, and the exhaust piping associated with the diesel exhaust relief valves. Division III is the same, except that a filter-silencer is provided in lieu of a separate filter and silencer.

The combustion air is drawn in by the turbocharger through the protective overhang area at el 283 ft 6 in on the southern wall of the diesel generator building. The intake opening has a missile hood and a labyrinth wall to protect against missiles generated by tornados or any other source. The intake air passes through the intake air filter and silencer. The Division I and II intake air filters are located on the south wall. The filters are washable dry type. Division I and II filters have a capacity of

Attachment 1

10. The missle enclosures appear in Figure 1.2-17 for diesel generator divisions I, II, and III. Section 6-6 on this figure illustrates the diesel exhaust relief valve missle protection.



need cut out of filter showing pipe ...

LDCN No.
I.D. No. 12177 NMP
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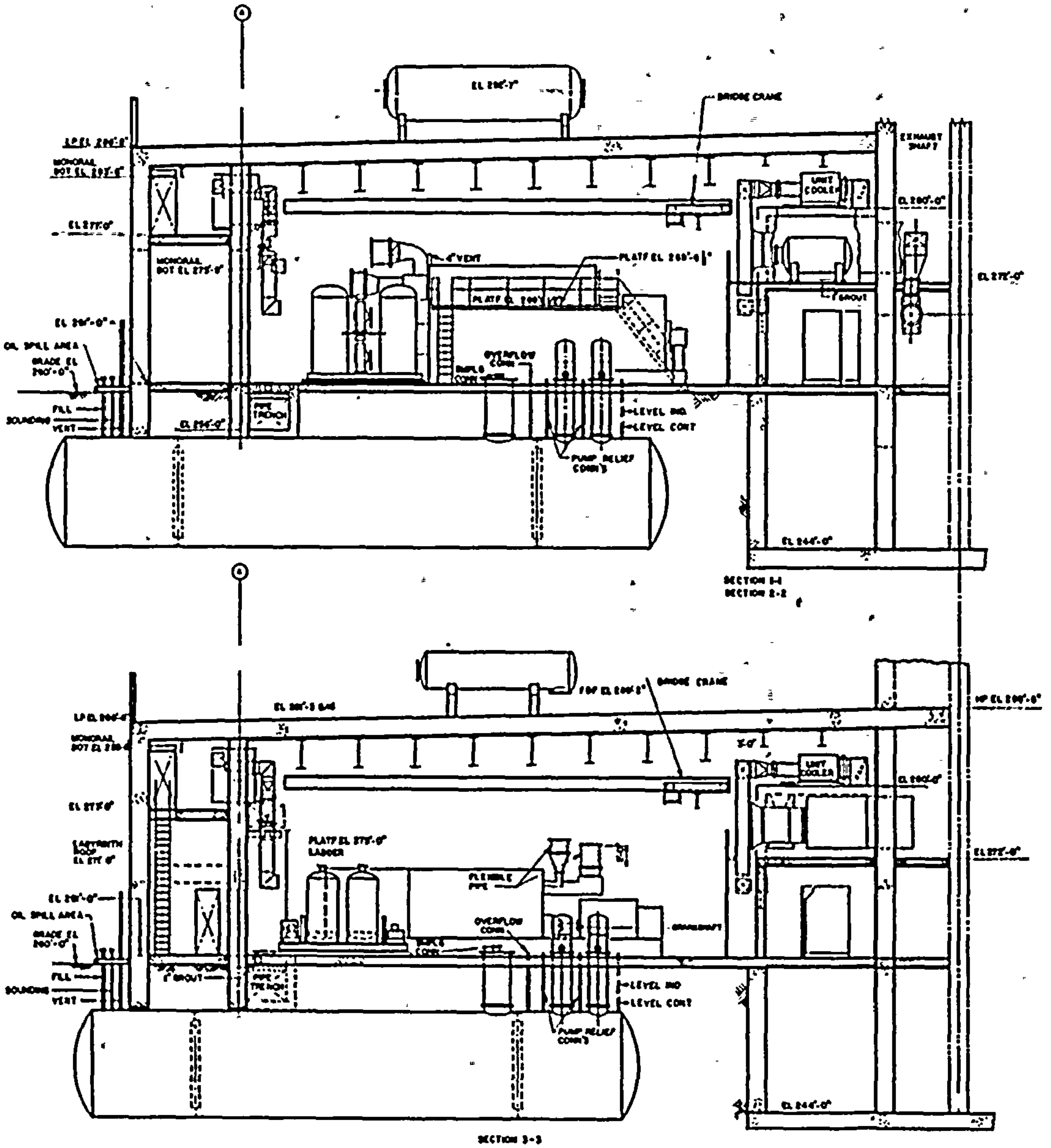
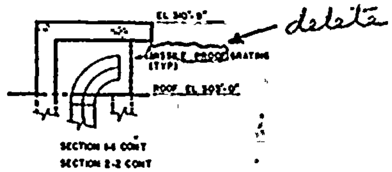
NRC Q. 430.97 &
430.100

FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 1 OF 3

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT





LDCN No.
J.O. No. 12177 NMP2
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NRC Q 430.97 & 430.100

FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 2 OF 3

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

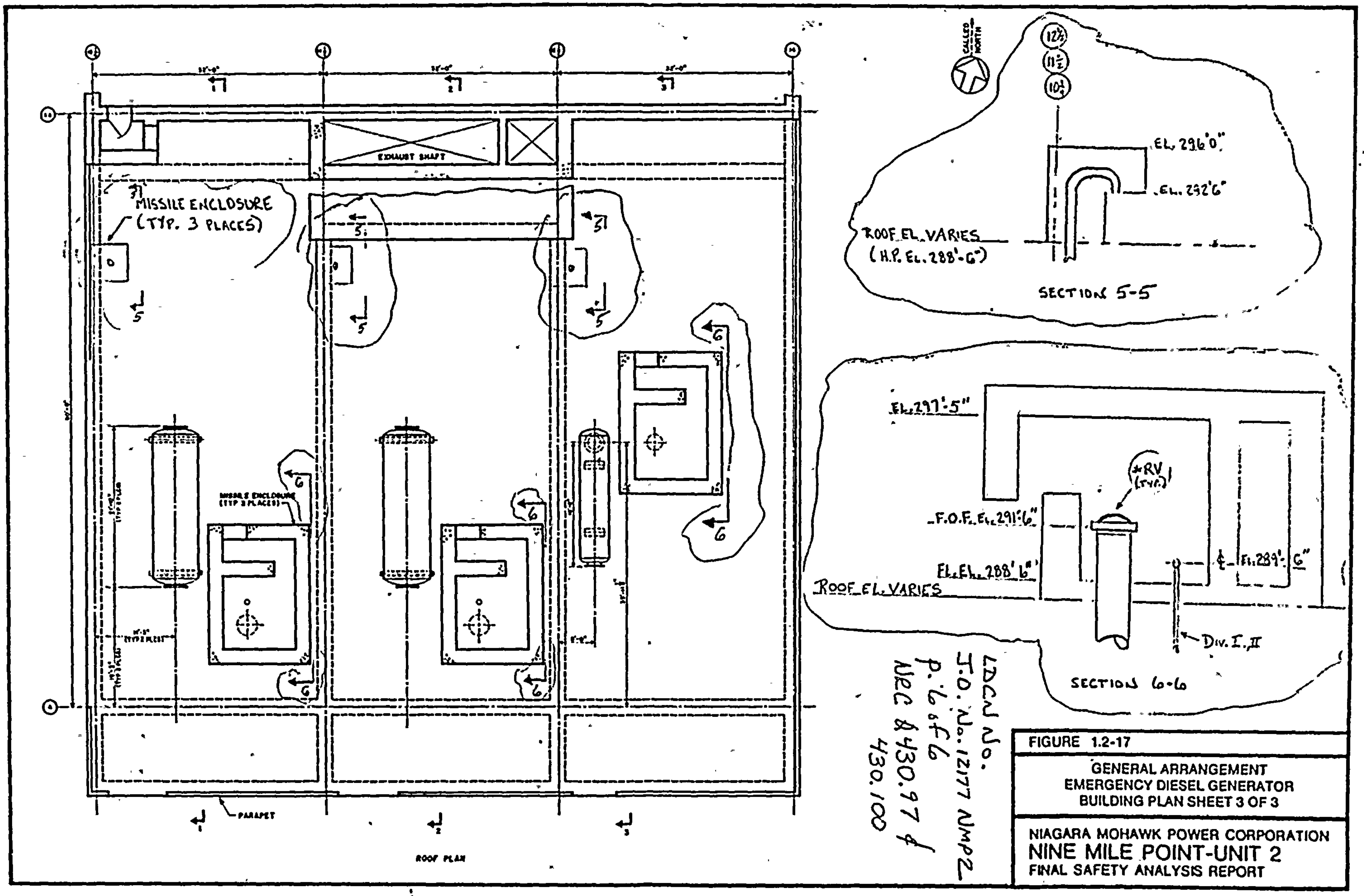


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 3 OF 3

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

POWER SYSTEM BRANCH ITEMS

Q 430.99 RESPONSE NOT ACCEPTABLE

RESPONSE INFORMATION HAS NOT BEEN SUBMITTED TO NIAGARA MOHAWK THIS QUESTION IS STILL AN OPEN ITEM

POWER SYSTEM BRANCH ITEMS

Q430.101 THE STAFF'S CONCERN IS THAT A FIRE IN A DIESEL GENERATION ROOM, COINCIDENT WITH A FAILURE OF THE FIRE PROTECTION SYSTEM FOR THAT ROOM, COULD RESULT IN COMBUSTION PRODUCTS ESCAPING AND SUBSEQUENTLY ENTERING THE COMBUSTION AIR INTAKES OF THE REMAINING DIESEL GENERATORS, THEREBY IMPAIRING THEIR OPERATION. THE APPLICANT SHOULD DEMONSTRATE HOW THIS WILL BE PREVENTED.

RESPONSE: THIS INFORMATION WILL BE PROVIDED ~~UNDER SEPARATE COVER~~. regarding smoke damper control of combustion products.

QUESTION F430.102 (9.5.8)

Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deleterious material on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches, etc.). Describe the provisions that have been made in your diesel generator building design, electrical starting system, and combustion air and ventilation air intake design(s) to preclude this condition to assure availability of the diesel generator on demand.

Also describe under normal plant operation what procedure(s) will be used to minimize accumulation of dust in the diesel generator room; specifically address concrete dust control. (SRP 9.5.8, Part II)

Diesel generators for nuclear power plants should be capable of operating at maximum rated output under various service conditions. For no load and light load operations, the diesel generator may not be capable of operating for extended periods of time under extreme service conditions or weather disturbances without serious degradation of the engine performance. This could result in the inability of the diesel engine to accept full load or fail to perform on demand. Provide the following:

(a) The environmental service conditions for which your diesel generator is designed to deliver rated load including the following:

Service Conditions

(a) Ambient air intake temperature range - °F

(b) Humidity, max - %

(b) Assurance that the diesel generator can provide full rated load under the following weather disturbances:

(1) A tornado pressure transient causing an atmospheric pressure reduction of 3 psi in 1.5 seconds followed by a rise to normal pressure in 1.5 seconds.

(2) A low pressure storm such as a hurricane resulting in ambient pressure of not less than 26 inches Hg for a minimum duration of two (2) hours followed by a pressure of no less than 26 to 27 inches Hg for

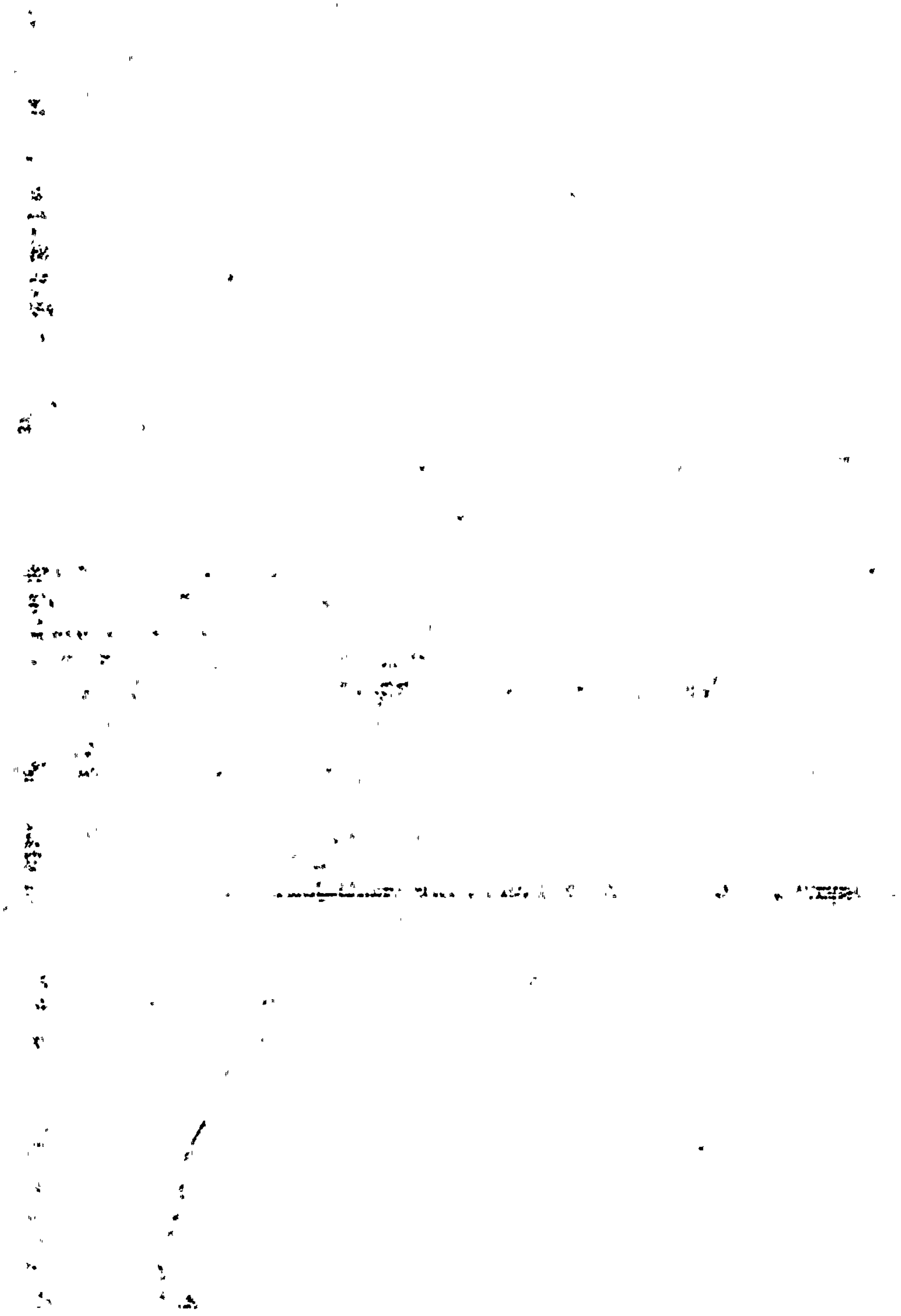
an extended period of time (approximately 12 hours).

(c) Discuss the effects low ambient temperature (subzero temperatures), will have on engine standby and operation and effect on its output particularly at no load and light load operation. Will air preheating be required to maintain engine performance versus ambient temperature for your diesel generator at normal rated load, light load, and no load conditions. (SRP 9.5.8, Parts I, II, and III)

RESPONSE

Provisions have been made in the design of the diesel generator rooms to minimize entrance of dust. The diesel generator control panels are located in separate, temperature-controlled and ventilated rooms. The control panels, except for the generator high voltage panels, have dust-tight enclosures.

See revised Section 9.5.8.5.



Division III Monitoring

There is no specific air intake exhaust gas monitoring instrumentation.

9.5.8.4 Inspection and Testing Requirement

The diesel generator combustion air intake and exhaust system is designed to be readily accessible for visual inspection. System operability is tested during preoperational testing of the diesel generator. Continued integrity of the system is ensured through routine inspection, periodic cleaning of the inlet air filter, and flushing of the intercooler and heater as recommended by the engine manufacturer. The system is tested with periodic testing of the diesel generator as a whole. Periodic testing of the diesel generator is discussed in Section 8.3.1.

9.5.8.5 Safety Evaluation

Each standby diesel generator has a combustion air intake and exhaust system independent of and separate from the combustion air intake and exhaust system of the other diesel generators. Each component of the combustion air intake and exhaust system is contained in the same section of the diesel generator building as its associated diesel generator. Therefore any failure in one diesel generator combustion air intake or exhaust system cannot jeopardize the safety function of any other diesel generator.

The combustion air intake system is sized to supply sufficient air for continuous operation of the diesel generator at maximum rated capacity with system pressure loss below the maximum pressure drop recommended by the engine manufacturer. The exhaust system is sized to discharge the exhaust gases from the diesel engine when the diesel generator is operating continuously at the rated capacity with exhaust backpressure maintained below that recommended by the engine manufacturer.

The combustion air intake and exhaust outlets are located to minimize the possibility of recirculating the exhaust gases. The intake openings are located at el 283 ft 6 in on the southern wall of the diesel generator building. The exhaust outlets are located above the roof at el 303 ft 3 in. The exhaust gas discharges are horizontal and directed away from the intake openings. The horizontal and vertical separation, high discharge velocity of the exhaust gases away from the intake openings, and the labyrinth wall in

front of the intake openings minimize the possibility of recirculating the exhaust gases. Emergency diesel generators are not protected by Unit 2 gaseous (CO_2) fire extinguishing systems. Preaction water spray systems are 7
used.

There is no storage of gas or any other substance in the vicinity of the intake openings whose intentional or accidental release can dilute and reduce the oxygen content of the intake air below acceptable levels. The emergency diesel generators are separated from each other and from all other areas by 3-hour rated fire barriers. Separate air intakes, located at the south end of the diesel generator 7
building, are provided for each generator. No credible fire in any generator room should affect the air intakes for the remaining two diesels.

The combustion air intake system has an air filter that is designed to reduce airborne particulate material over the entire time period that the diesel generator can operate continuously assuming maximum concentration of airborne particulate at the intake.

All engine-mounted electrical/electronic components are enclosed in dusttight enclosures. The diesel generator room and control panel room ventilation air is filtered through medium efficiency filters. The combustion intake air filters are high efficiency filters designed to reduce airborne particulate material over the entire time period that the diesel generator can operate continuously assuming maximum concentration of airborne particulate at the intake. 7
Division I and II intake air filters will arrest 100 percent of particles 7 microns in size and 90 percent of particles 3 microns in size. Division III intake air filter will arrest 96 percent of particles 7 microns in size and 75 percent of particles 3 microns in size.

There are no flow control devices (louvers, dampers, etc) in the intake air system.

The air intake system has a combustion air intercooler-heater to cool the compressed air so that it has adequate density to provide enough oxygen for combustion. The heater portion warms the intake air at starting to increase first-try starting reliability.

The Division I and II diesel generators are designed for the following service conditions:

Ambient air intake temperature range:	-20°F to 100°F
7 Maximum humidity:	100%

They are designed for tornado pressure transient causing an atmospheric pressure reduction of 3 psi in 3 sec. Being of turbocharged design, they will be able to provide full-rated load when subjected to a low-pressure storm such as a hurricane, resulting in ambient pressure of not less than 26 in. Hg for a minimum duration of 2 hrs followed by a pressure of no less than 26 to 27 in. Hg for an extended period of time (approximately 12 hrs).

The effects of high and moderate energy piping in the diesel generator building are discussed in Section 9.5.5.5.

The failure modes and effects analysis (FMEA) of the balance-of-plant instrumentation and controls components of the diesel generator combustion air intake and exhaust system is provided in the Nine Mile Point Unit 2 FSAR FMEA report.

9.5.9 Auxiliary Electric Boiler

9.5.9.1 Design Bases

9.5.9.1.1 Safety Design Basis

The auxiliary electric boiler is not required to effect or support safe shutdown of the reactor or to perform in the operation of reactor safety features.

9.5.9.1.2 Design Basis

The auxiliary boiler system is designed for use during plant shutdown conditions and is not normally required to supply steam during normal plant operation.

The auxiliary electric boilers (2ABM-B1A, B1B) are capable of supplying 40,500 lb/hr of steam each for a total of

QUESTION F430.107 (10.2)

In the turbine generator section discuss: 1) the valve closure times and the arrangement for the main steam stop and control and the reheat stop and intercept valve in relation to the effect of a failure of a single valve on the overspeed control functions; 2) the valve closure times and extraction steam valve arrangements in relation to stable turbine operation after a turbine generator system trip; 3) effects of missiles from a possible turbine generator failure on safety related systems or components. (SRP 10.2, Parts II, III and IV)

RESPONSE

See revised Section 10.2.2 for the response to 1) and 2). A reference to Section 3.5.1.3 exists in Section 10.2.2 for 3) of the question.

The turbine control diagram and logic diagram are being provided under separate cover for the NRC's use and information.

ISB Comments

The response is acceptable.*

* Closure time for CIV's should be provided.

Response to ISB comment
See revised section 10.2.2

supplied from the turbine extraction steam system (Figure 10.1-7 and Section 10.4.10).

To show that a single steam valve failure cannot disable the turbine overspeed trip from functioning, the following discussion is offered.

Main Stop and Control Valves - The main stop and control valves are arranged in series, four sets in parallel. On a turbine-generator trip all stop and control valves close. If, for example, a stop valve was not to close, the corresponding control valve would interrupt steam flow. Likewise, if a control valve fails to close, the corresponding stop valve would interrupt steam flow. The valves close in 0.2 sec on a turbine-generator trip. Thus, a single valve failure cannot contribute to an overspeed trip.

Combined Intermediate Valves - The combined intermediate valves are arranged six in parallel, however each CIV has a stop valve function and a control valve function powered by separate actuators and control loops effectively making each CIV a stop valve and a control valve in series. As such, the overspeed protection system is not disabled based on the discussion above. THE CLOSING TIME FOR THE CIV'S IS .15 SEC. 7 430.107

Bypass Valves - There are five bypass valves arranged in parallel capable of passing 25 percent VWO flow. The opening time for a bypass valve is 0.25 sec. If one bypass valve fails to open on a turbine-generator trip, 20 percent of VWO flow can still be bypassed to the condenser, and so not adversely affect overspeed protection.

The above discussion is necessary for generator-related trips only. On all other trips the main generator breaker remains closed after the trip initiation keeping a load on the turbine thus acting to "brake" it. The main breaker remains closed until the generator begins to motor.

The turbine overspeed protection system is designed to fail safe upon damage to electrical wiring or hydraulic lines such as would result from a moderate or high energy line break. The fail safe action is a turbine trip.

Turbine generator overspeed protection is provided in the extraction steam lines in accordance with the turbine manufacturer's requirements. These take the form of testable, power-assisted nonreturn valves in the extraction lines to the sixth, fourth, and third point feedwater

QUESTION F430.109 (10.2)

Your FSAR discussion of the turbine generator, Section 10.2.2, does not include any reference to inservice inspection and exercising of the turbine main steam stop and control and reheater stop and intercept valves. Expand your FSAR to include a detailed description of (1) the turbine main steam stop and control and reheat stop and intercept valves, and (2) the inservice inspection and testing program for these valves. (SRP 10.2, Part II)

RESPONSE

See revised Section 10.2.2.

The turbine control diagram and logic diagram are being provided under separate cover for the NRC's use and information.

ISB Comments

Not acceptable. We require disassembly and inspection of one of each type of main steam valve at approximately 3 1/3 year intervals (see SRP 10.2, Part II.5.a) Revise the FSAR accordingly.

Refer to FSAR Section 10.2.2. The applicant states that "The main stop and combined intermediate valves are tested weekly." The applicant should confirm that this test includes the main control valves as well as the main stop valves and CIV's.

Response To ISB Comments

See revised section 10.2.2.

[illegible]

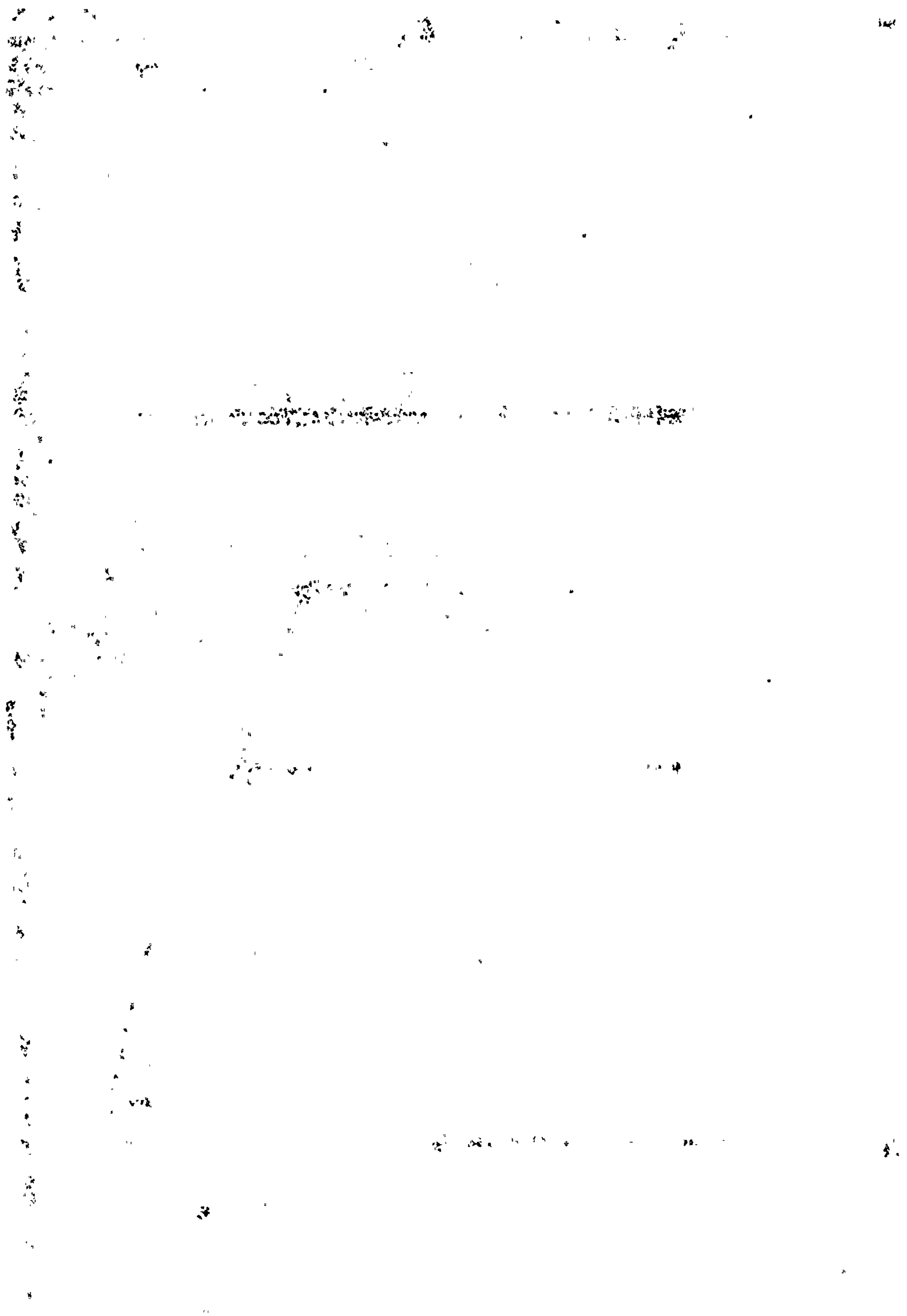
heaters and in the feeds to the auxiliary steam system. These valves are swing check valves with external counterweighted lever arms and air cylinders and have a closing time of 0.1 sec. The air cylinders use air pressure to maintain a spring in compression. Upon release of the air pressure the spring provides enough force at the start of the stroke to overcome sticking and to place the swing disc in the flow stream. The spring will not close the valve against flow, but will provide sufficient motion to confirm operability. The air cylinder/spring does not prevent the disc from closing on reverse flow. Additionally, the extraction steam system is designed so that the total unrestrained energy in the piping and equipment volume is less than the turbine manufacturer's maximum value limit. Nonreturn valves are not supplied in the extraction lines to the fifth point feedwater heaters since the steam is prevented from expanding through any turbine stages by the combined intermediate valves. Nonreturn valves are not needed on the extraction lines to the second and first point heaters, since they contain insufficient stored energy to produce an unacceptable overspeed event.

The main stop valves, control valves and combined intermediate valves are tested weekly. The need for inspection will be dictated by deviation from a baseline curve of travel versus time as shown on an X-Y plotter. The extraction valves are tested for movement weekly. Internal inspection and maintenance will be performed in accordance with the five refueling cycle turbine and valve maintenance and inspection program. 430.109

The generator is a direct coupled, three-phase, 60-Hz, 25-kV, 1,800-rpm synchronous generator with a hydrogen-cooled rotor and a water-cooled stator. The generator is rated at 1,348,400 kVa, 0.90 power factor (p.f.), with a short circuit ratio of 0.58 and a maximum hydrogen pressure of 75 psig.

The exciter system is the Alterrex type. The alternator-exciter is a three-phase, 1,800-rpm, 60-Hz, air-cooled machine rated at 3,385 kW, 555 V with a response ratio of 0.5.

The turbine utilizes an EHC system consisting of conventional governing devices (two initial pressure regulators, speed governor, startup control devices), emergency devices for turbine and plant protection (overspeed governor, backup overspeed, master trip, low vacuum trips, motoring protection, thrust bearing wear



QUESTION F430.115 (10.4.4)

Provide the results of an analysis indicating that failure of the turbine bypass system high energy line will not have an adverse effect or preclude operation of the turbine speed control system or any safety related components or systems located close to the turbine bypass system. (SRP 10.4.4, Parts I and II)

RESPONSE

See Section 10.4.4.3.

PSB Comments

Not acceptable. The referenced FSAR Section, in turn, references FSAR Chapter 15. Neither section contains information which provides an answer to the specific question.

Response To PSB Comments

See revised section 10.4.4.3

The bypass valve disk is of the globe type, and the stem is arranged to reach the outside through the discharge chamber of the valve. This arrangement minimizes the steam leakage when the valve is closed. It is necessary only to seal the stem against condenser vacuum.

Each bypass valve has its actuator arranged underneath the valve chest and fastened to the valve chest by a yoke-type structure. The actuator for each bypass valve is a double-acting hydraulic cylinder moved by 1,600 psig EHC fluid from the power unit controlled by a servo valve. Attached to the cylinder is a spring that opposes the opening motion so that the valves fail closed upon loss of hydraulic fluid pressure.

To supply hydraulic fluid during fast opening of the bypass valves, or for a limited time in case of failure of the hydraulic pumping system, gas charged hydraulic accumulators are connected to the hydraulic supply lines on the bypass valve assembly (Figure 10.4-5).

10.4.4.3 Safety Evaluation

The turbine bypass system is not safety related. The turbine bypass valves are designed to fail closed on loss of main condenser vacuum (a pressure greater than 23 in Hg abs) or loss of the turbine EHC system. THE EFFECTS OF A HIGH ENERGY LINE BREAK IN THE BYPASS SYSTEM IS DISCUSSED IN SECTION 15.6.4. 430.115
The effects of a turbine bypass system valve malfunction, as well as the effects of such failures on other systems and components, are evaluated in Chapter 15. The effects of postulated piping failures in the turbine bypass system are evaluated in Section 3.6.

10.4.4.4 Tests and Inspections

The opening and closing of the turbine bypass system valves are checked during refueling outages for performance and timing.

10.4.4.5 Instrumentation Requirements

<u>Description</u>

Instruments and controls are provided to automatically adjust bypass steam flow and thereby control reactor pressure. The controls and monitors described below are located in the main control room.

NINE MILE POINT UNIT 2

REQUEST FOR ADDITIONAL INFORMATION

430.118
(SRP 8.3.1)

FSAR Figures 8.3-3 and 8.3-11 shows a 120 VAC automatic and several 125 VDC manual load transfers between non Class 1E power supplies which are in turn fed from redundant 4160 VAC Class 1E buses during operation on the diesel generators. The configuration of the circuits is such that a single failure of the transfer device, open fuse holder, or fault between adjacent power panel buses could potentially affect the redundant Class 1E buses. In light of the fact SRP Section 8.3.1.III.2.b and R.G. 1.6 does not allow these configurations for connection of Class 1E loads to redundant Class 1E supplies, justify the acceptability of this configuration for non Class 1E loads which are not vital to plant safety. The interconnections in question is shown in Figure 8.3-3 between the UPS "B" supply and "A" supply, and those shown in Figure 8.3-11 between switchgear 2 BYS-SWG001A and 001B to the three control bus power panels. Also identify all other non Class 1E transfers or interconnections which are connected to redundant Class 1E power supplies.

PSB comments

Open. Question and response missing from FSAR.

RESPONSE

Response to PSB Comments
See revised section 8.3.1.4.1

REVISED WORDING

8.3.1.4.1 Electrical Isolation

The three divisions of the plant onsite power system are electrically independent of each other. This independence is maintained through the loads the divisions feed; each division feeds a separate load group and there is no chance of interconnecting independent divisions through the loads. Each division has its dedicated standby power source that is independent of the standby power source of any other division. There is no provision for paralleling the standby power sources of different divisions or for using the standby power source of one division to feed the loads of any other division. Each division uses its own control power sources for instrumentation and control, and the control power source of each division is independent of the control power of any other division. There is no provision for interconnecting these control power sources or for feeding the control circuits of one division from the control power sources of any other division.

Each division is also isolated from the associated nonsafety-related systems. Whenever a safety-related power or control circuit is connected with any nonsafety-related circuit, appropriate isolation devices as defined in Regulatory Guide 1.75 and IEEE 384 are used. Nonsafety power loads are not fed from safety buses except the stub bus loads (see Tables 8.3-1 and 8.3-2). The stub buses are tripped on LOCA signal. 7

Add Attachment - A

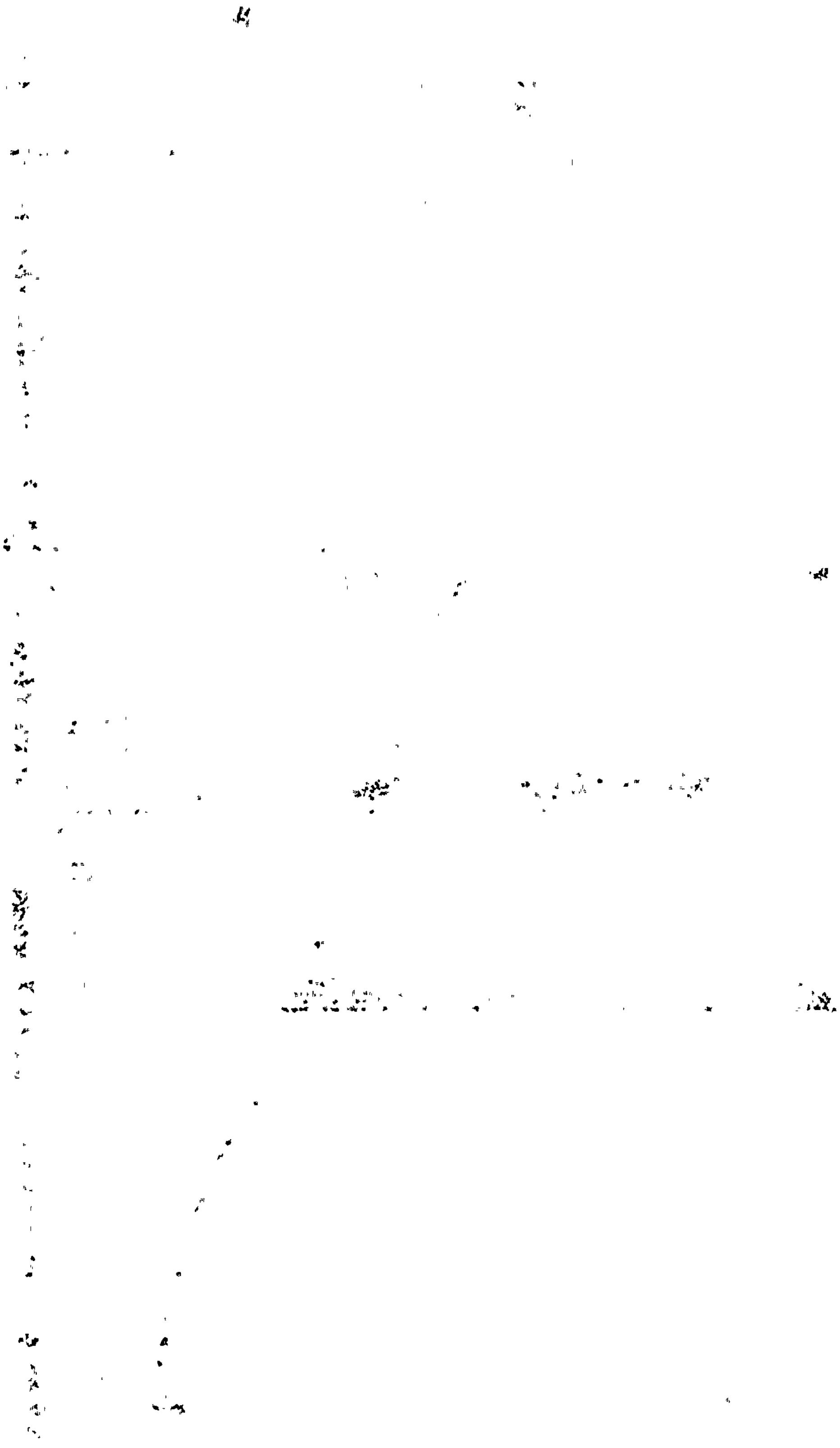
The associated circuits are treated as Class 1E circuits. The associated circuit cables meet all the requirements of Class 1E cables.

X

8.3.1.4.2 Physical Separation

<u>Physical Separation of the Class 1E Equipment</u>

The items of equipment associated with each of the three independent divisions of the Class 1E onsite power systems are located in separate Seismic Category I structures to physically isolate them from each other. The Class 1E 4.16-kV switchgear buses of the three divisions are located in the Division I, II, and III emergency switchgear rooms in the control building at el 261 ft. The Class 1E 600-V load centers associated with Divisions I and II are located in the emergency switchgear room of the respective division. The Class 1E MCCs associated with Divisions I and II are located in the emergency switchgear rooms of the respective division, in separate rooms in the screenwell building (el 261 ft), and in the reactor auxiliary building auxiliary



Attachment - A

For UPS 2VBB-UPS1A, the normal ac supply (N) is taken from 2NJS-US3 or -US4; the backup dc supply (B) is taken from 125 V dc switchgear 2BYS-SWG001A. The battery charger connected to this dc switchgear is fed from the stub bus 2NJS-US5. The alternate ac source (A) is also taken from 2NJS-US5. For UPS 2VBB-UPS1B, the normal ac supply (N) is taken from 2NJS-US3 or -US4; the backup dc supply (B) is taken from 125V dc switchgear 2BYS-SWG001B. The battery charger connected to this dc switchgear is fed from stub bus 2NJS-US6. The alternate ac source (A) is also taken from stub bus 2NJS-US6.

The UPSs are transferred to their backup dc sources (B) only in the

of loss of the normal source (1). The UPSs are transferred to their alternate source (A) in case of loss of both normal and backup source or in case of a fault in the inverter. As such, there is no interconnection of 2NJS-US5 and 2NJS-US6 through UPSs 2VBB-UPS1A and 2VBB-UPS1B.

DC power supply to 4.16 KV normal switchgear 2NNS-SWG016 -SWG017 and -SWG018, 600V load centers 2NJS-US1 through 2NJS-US10, and 13.8 KV switchgear 2NPS-SWG004 and 2NPS-SWG005 is provided from both dc buses 2BYS-SWG001A and 2BYS-SWG001B. One source serves as the normal source and the other as the standby source. Only one set of fuses is provided to connect either of the dc sources so that no interconnection of the two sources may occur.

For 4.16 kV switchgear 2NNS-SWG011 through 2NNS-SWG015, and 13.8 kV switchgear 2NPS-SWG001 through 2NPS-SWG003, normally one dc bus supplies control power to the main and the tie breakers; the other dc bus supplies control power to the feeder breakers. In case of loss of one of the dc sources, the associated bus may be manually energized from the other source. There are only two sets of fuses to be used with four fuse holders which are physically different to avoid any interconnection of the two sources (see revised Fig. 8.3-11).

Power supply to the fire protection panels are provided from both stub buses 2NJS-US5 and 2NJS-US6.

One serves as the normal source and the other serves as the standby, and they are electrically interlocked to avoid interconnection of the two sources.

There are at least two overcurrent protection devices for each source to prevent failure of any of the load centers fed from the stub buses for any fault in the panel which may short or ground both the sources.