NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

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(203) 666-6911

May 17, 1984

Docket No. 50-423
B11180

Director of Nuclear Reactor Regulation
Attn. Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) B. J. Youngblood to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit No. 3, dated January 16, 1984.

(2) B. J. Youngblood to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit No. 3, dated May 31, 1983.

(3) W. G. Counsil to B. J. Youngblood, Submittal of Revised Responses to PSB Mechanical Series Questions, dated April 6, 1984.

(4) W. G. Counsil to B. J. Youngblood, Summary/Submittal of Revised Responses to PSB Mechanical Series Questions, dated May 8, 1984.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Summary/Submittal of Revised Responses to PSB Mechanical Series Questions

Enclosure 3 of Reference (1) requested additional information on many of the responses to questions asked in Reference (2). Reference (3) and (4) provided a portion of the requested additional information. Attached is a status of all requested information within Enclosure 3 of Reference (1) as discussed during our April 25, 1984 meeting with the PSB Mechanical reviewer. Additionally, all remaining revised responses, as indicated within the status listing, are attached along with any corresponding FSAR back-up pages.

If you have any questions, please contact our licensing representative directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL
By Northeast Nuclear Energy Company Their Agent

W. G. Counsil

W. G. Counsil
Senior Vice President

B001
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STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

Attachment

Status of PSB Mechanical Requests for Additional Information

Question	Status	Remarks
430.57	Closed	Submitted in Reference 1
430.58	Closed	Submitted in Reference 2
430.59	Closed	Submitted in Reference 2
430.60	Open	Attached
430.61	Closed	Submitted in Reference 2
430.62	Open	Attached
FP-11	Open	Attached
430.63	Closed	Submitted in Reference 2
430.64	Closed	Submitted in Reference 2
430.66	Open	Attached
430.67	Closed	Submitted in Reference 1
430.68	Closed	Submitted in Reference 1
430.70	Closed	Submitted in Reference 1
430.71	Closed	Submitted in Reference 1
430.73	Open	Attached
430.74	Closed	Submitted in Reference 2
430.76	Open	Attached. Submitted in Reference 1
430.77	Closed	Submitted in Reference 2
430.79	Reviewer Undecided	Submitted in Reference 1
430.83	Open	Attached
430.84	Open	Attached
430.85	Open	Attached
430.87	Closed	Submitted in Reference 1
430.88	Reviewer Undecided	Attached
430.94	Closed	Submitted in Reference 1
430.99	Closed	Submitted in Reference 2
430.100	Closed	Submitted in Amendment 6
430.102	Reviewer Undecided	Submitted in Reference 2
430.103	Closed	Submitted in Reference 1
430.105	Reviewer Undecided	Submitted in Reference 2
430.107	Open	Attached. Submitted in Reference 1.
430.108	Closed	Submitted in Reference 1
430.109	Open	Submitted in Reference 1.
430.111	Closed	Submitted in Reference 1
430.114	Open	Attached
430.118	Closed	Submitted in Reference 1
430.121	Closed	Submitted in Reference 1
430.122	Closed	Submitted in Reference 1
430.124	Closed	Submitted in Amendment 6
430.127	Closed	Submitted in Reference 1
430.128	Closed	Submitted in Reference 2
430.129	Closed	Submitted in Reference 2
430.131	Open	Attached
ASB 15	Open	Attached

Question	Status	Remarks
430.133	Open	Attached
430.134	Open	Attached
430.139	Closed	Submitted in Reference 1
430.148	Closed	Submitted in Amendment 5
430.149	Closed	Submitted in Reference 1

Reference (1) W. G. Counsil to B. J. Youngblood, Submittal of Revised Responses to PSB Mechanical Series Questions, dated April 6, 1984.

(2) W. G. Counsil to B. J. Youngblood, Summary/Submittal of Revised Responses to PSB Mechanical Series Q··estions, dated May 8, 1984.

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430.64	Closed	Submitted in Reference 2
430.66	Open	Attached
430.67	Closed	Submitted in Reference 1
430.68	Closed	Submitted in Reference 1
430.70	Closed	Submitted in Reference 1
430.71	Closed	Submitted in Reference 1
430.73	Open	Attached
430.74	Closed	Submitted in Reference 2
430.76	Open	Attached. Submitted in Reference 1
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430.88	Reviewer Undecided	Attached
430.94	Closed	Submitted in Reference 1
430.99	Closed	Submitted in Reference 2
430.100	Closed	Submitted in Amendment 6
430.102	Reviewer Undecided	Submitted in Reference 2
430.103	Closed	Submitted in Reference 1
430.105	Reviewer Undecided	Submitted in Reference 2
430.107	Open	Attached. Submitted in Reference 1.
430.108	Closed	Submitted in Reference 1
430.109	Open	Submitted in Reference 1.
430.111	Closed	Submitted in Reference 1
430.114	Open	Attached
430.118	Closed	Submitted in Reference 1
430.121	Closed	Submitted in Reference 1
430.122	Closed	Submitted in Reference 1
430.124	Closed	Submitted in Amendment 6
430.127	Closed	Submitted in Reference 1
430.128	Closed	Submitted in Reference 2
430.129	Closed	Submitted in Reference 2
430.131	Open	Attached
ASB 15	Open	Attached

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NRC Letter: May 31, 1983

Question Q430.60 (Section 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 type 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 page party communications systems

2. Any other additional communication system provided that working station

(e) Describe the performance requirements and tests that the above onsite working stations communications 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.

(f) Discusss the protective measures taken to assure a functionally operable onsite communication system. The discussion should include the considerations given to component failures, loss of power, and the severing of one or more communication lines or trunks as a result of an accident or fire, and the areas where the radio commumnication systems cannot be used due to interference with control and instrumentation.

Response:

a. Table Q430.60-1 presents the plant site work stations where it may be necessary for plant personnel to be stationed following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to achieve cold shutdown.

Table Q430.60-2 presents other plant areas where it may be necessary for plant personnel to perform specific event-related tasks.

The sound-powered telephone system is provided for fire fighting communication as discussed in Section 7.7 of the Fire Protection Evaluation Report.

b. Table Q430.60-3 presents the estimated maximum sound level that could exist at the work stations which are identified in Table Q430.60-1.

Table Q430.60-4 presents the estimated maximum sound level that could exist at task areas (specific event-related tasks) which are identified in Table Q430.60-2.

c. Table Q430.60-1 also identifies the communication systems available at the work stations.

Table Q430.60-2 also identifies the communication systems available at the task areas (specific event-related tasks).

d. Table Q430.60-5 presents the estimated maximum background noise level that could exist at the work stations identified in Table Q430.60-1 and yet reliably expect effective communication.

Table Q430.60-6 presents the estimated maximum background noise level that could exist at the task areas (specific event-related tasks) identified in Table Q430.60-2 and yet reliably expect effective communication.

e. Precore hot functional testing will verify the operation of the sound-powered telephone system, voice paging system, and evacuation alarms at ambient noise levels throughout the plant.

Preoperational testing of the sound-powered telephone system, maintenance jack system, plant switching network, and voice paging system will verify that effective communications can be established from all work stations and task areas.

Where effective communication is not established during the above testing, appropriate corrective action will be taken. Corrective action may include but is not limited to, addition of acoustical barriers (i.e., booths) or relocation of communication equipment to achieve effective communication.

f. The plant switching network is powered from a normal ac source. Standby power is available from the plant switching network's dedicated battery charger system.

The voice paging system and the maintenance jack system are powered from a nonvital bus which ultimately is fed from a Class 1E motor control center via battery charger-5 (refer to FSAR Figure 8.3-?). The battery charger is seismically qualified

and mounted, and is located in the Class 1E control building,
elevation 4 ft-6 in. (refer to FSAR Figure 8.3-1, Sheet 1 of 4). 2.20

The sound-powered telephone system is self-powered. 2.21

The main control room is also equipped with a radio control 2.22
console. The radio control console is powered from the above 2.23
referenced nonvital bus. This console is hard wired to an onsite 2.24
repeater station (including antenna). This feature allows 2.25
communication between the control room and onsite hand-held
radios. Preoperational testing will identify those locations 2.26
onsite where hand-held radio communication will be prohibited due
to radio frequency interference with control and instrumentation. 2.27

The integrated design of the communication system provides 2.28
adequate communication, from onsite power sources, for
firefighting and control and maintenance of safety-related 2.29
equipment. The integrated design is comprised of separate and 2.30
independent systems. Component failures in one of these systems 2.31
will have limited effect on that system and no effect on the
other systems. Loss of offsite power would have limited effect 2.32
on communication capabilities due to the interconnection with the
Class 1E motor control center. Severing of one communication 2.34
line or trunk in a localized plant area will have limited effect
on that system and no effect on the other systems. 2.35

A fire or accident in the purple switchgear room or the purple 2.36
cable tunnel may impact the capability of utilizing the voice 2.37
paging system, the maintenance jack system, the sound-powered
telephone system, and portions of the plant switching network. 2.38
For a fire or accident in either of these two areas, cold 2.39
shutdown can be achieved by operator action from the main control 2.40
room only. If communication is required, hand-held portable 2.41
radios will be utilized.

A fire or accident in any other localized plant area, such that 2.42
more than one line or trunk is severed in that localized plant 2.43
area, will not impact the capability of the integrated
communication system to provide effective communication between 2.44
plant personnel.

TABLE Q430.60-1

WORK STATIONS/COMMUNICATION SYSTEMS

Work Station	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	RADIO SYSTEM
Main Control Room[1]	Yes	Yes	Yes	Yes	YES[1]
Auxiliary Shutdown Panel[2]	Yes	Yes	Yes	Yes	NO
Emergency Generator Control Panel[3]	Yes	Yes	Yes	Yes	YES

NOTES:

1. The radio control console is also located in the main control room.
2. The auxiliary shutdown panel is located in the purple switchgear room.
3. The emergency generator control panels are located in the respective emergency generator rooms.

TABLE Q430.60-2

TASK AREAS/COMMUNICATION SYSTEMS

Area	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	Radio System
Switchgear Room (O)[1]	No (3)	Yes	Yes	Yes	No
Switchgear Room (P)[1]	Yes	Yes	Yes	Yes	No
Emergency Generator (O)	Yes	Yes	Yes	Yes	Yes
Emergency Generator (P)	Yes	Yes	Yes	Yes	Yes
Auxiliary Building (4 ft-6 in.)	Yes	Yes	Yes	Yes / No (6b)	Yes
Auxiliary Building (24 ft-6 in.)	Yes	Yes	Yes	Yes	Yes
MCC and Rod Control Room (24 ft-6 in.) (O)	No (4)	Yes	Yes	No (6a)	Yes
MCC and Rod Control Room (24 ft-6 in.) (P)	Yes	Yes	Yes	No (6a)	Yes
Auxiliary Building (43 ft-6 in.)	Yes	Yes	Yes	No (6c)	Yes
Containment[2]	Yes	Yes	Yes	No	Yes
Engineered Safety Features Building					
• South Containment Recirculation Pump Cubicle (P)	No (5b)	Yes	No	No (5b)	Yes
• North Containment Recirculation Pump Cubicle (O)	No (5b)	Yes	No	No (5b)	Yes
• North Residual Heat Removal Heat Exchanger Cubicle (P)	No (5a)	Yes	Yes	No (5a)	Yes
• Turbine-Driven Auxiliary Feedwater Pump Cubicle	No (5c)	Yes	Yes	No (5a)	Yes

TABLE Q430.60-2 (Cont)

Area	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	RADIO SYSTEM
• South Residual Heat Removal Heat Exchanger Cubicle (O)	No (5a)	Yes	No (8)	No (5a)	YES
• Refueling Water Pump Cubicle	No (5a)	Yes	Yes	No (5a)	YES
• North Motor-Driven Auxiliary Feedwater Pump Cubicle (O)	Yes	Yes	No (9)	Yes	YES
• South Motor-Driven Auxiliary Feedwater Pump Cubicle (P)	No (5a)	Yes	No (9)	No (5a)	YES
• Air Conditioning Unit Cubicles (P)	No (5c)	Yes	No	No (5c)	YES
• Air Conditioning Unit Cubicles (O)	No (5c)	Yes	No	No (5c)	YES
Main Steam Valve Building	Yes	Yes	Yes	No	YES
Service Water Pump Cubicles					
• East Service Water Cubicle (P)	Yes	Yes	Yes	Yes	YES
• West Service Water Cubicle (O)	Yes	Yes	Yes	No (7)	YES

NOTES:

1. (O) = Orange Train
   (P) = Purple Train

2. Containment also contains the fuel handling carrier phone system.

INSERT BB

3. Available in adjacent (P) Switchgear Room.

4. Available in adjacent (P) MCC and Rod Control Room.

5. Available in (O) Motor-Driven Auxiliary Feedwater Pump Cubicle located:

   a) at the same building elevation
   b) at the next higher building elevation
   c) at the next lower building elevation

6. Available in Auxiliary Building

   a) at the same building elevation
   b) at the next higher building elevation
   c) at the next lower building elevation

7. Available in adjacent (P) Service Water Cubicle.

8. Available in adjacent (P) Residual Heat Removal Heat Exchanger Cubicle.

9. Available in adjacent Turbine-Driven Auxiliary Feedwater Pump Cubicle.

TABLE Q430.60-3

WORK STATIONS/SOUND LEVELS

Work Station	Estimated Maximum Sound Level (dBA)
Main Control Room	65
Auxiliary Shutdown Panel	75
Emergency Generator Control Panel	100

TABLE Q430.60-4

TASK AREAS/SOUND LEVELS

Area	Estimated Maximum Sound Level (dBA)
Switchgear Room (O)[1]	75
Switchgear Room (P)[1]	75
Emergency Generator (O)	100
Emergency Generator (P)	100
Auxiliary Building (4 ft-6 in.)	89-94 (97 near air compressor and pipe penetrations)
Auxiliary Building (24 ft-6 in.)	92-94 (97 near pumps)
MCC and Rod Control Room (24 ft-6 in.) (O)	65
MCC and Rod Control Room (24 ft-6 in.) (P)	65
Auxiliary Building (43 ft-6 in.)	Note A
Containment	Note B
Engineered Safety Features Building	
• South Containment Recirculation Pump Cubicle (P)	93 (96 near pumps)
• North Containment Recirculation Pump Cubicle (O)	93 (96 near pumps)
• North Residual Heat Removal Heat Exchanger Cubicle (P)	93
• Turbine-Driven Auxiliary Feedwater Pump Cubicle	97-100
• South Residual Heat Removal Heat Exchanger Cubicle (O)	93

TABLE Q430.60-4 (Cont)

Area	Estimated Maximum Sound Level (dBA)
• Refueling Water Pump Cubicle	97-100
• North Motor-Driven Auxiliary Feedwater Pump Cubicle (O)	97-100
• South Motor-Driven Auxiliary Feedwater Pump Cubicle (P)	97-100
• Air Conditioning Unit Cubicles (P)	89-90
• Air Conditioning Unit Cubicles (O)	89-90
Main Steam Valve Building	95-100
Service Water Pump Cubicles	
• East Service Water Cubicle (P)	91
• West Service Water Cubicle (O)	91

NOTES:

1. (O) = Orange Train
   (P) = Purple Train

TABLE Q430.60-4 (Cont)

NOTE A:

Sound levels for various areas in auxiliary building, elevation 43 ft-6 in., are:

Elevation	Area	Estimated Maximum Sound Level (dBA)
43 ft-6 in.	East	83 (91 near vacuum pump)
	Sample Room	63
	MCC Area and Boric Acid Tanks	80
	Heat Exchanger Cubicle	94
	North	83-85 (90 by stairway)
	Panel Room	63
	M-G Room	75 (86 near M-G)

NOTE B:

Sound levels for various areas in the containment are:

(-)24 ft-6 in.	Inner Area, During Outage	<85
	Outer Area	94 (97 near fans and compressors)
	Fan Rooms	101
[illegible] ft-8 in.	Reactor Coolant Pumps/ Steam Generators	98-102
	Hoist Space	90
	Pressurizer	91
	Letdown Heat Exchanger	88
	Platforms Outer Wall	90
24 ft-0 in.	North Area	87
	Platforms Outer Wall	90
	Opening Reactor Coolant Pump/Steam Generator	98
51 ft-4 in.	Main Floor	95
	Platforms Outer Wall	90-95

TABLE Q430.60-5

WORK STATIONS/EFFECTIVE COMMUNICATION SOUND LEVELS
(dBA)

Work Station	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	RADIO SYSTEM
Main Control Room	81	90	110[1]	81	81
Auxiliary Shutdown Panel	81	90	110[1]	81	NA
Emergency Generator Control Panel	81	90	110[1]	81(2)	81(2)

NOTE:

1. Double ear-cup headset
2. 110 dBA WITH DOUBLE EAR-CUP HEADSET

TABLE Q430.60-6

TASK AREAS/EFFECTIVE COMMUNICATION SOUND LEVELS
(dBA)

Area	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	Radio System
Switchgear Room (O)(1)	NA(4)	90	110(2)	81	NA
Switchgear Room (P)(1)	81	90	110(2)	81	NA
Emergency Generator (O)	81	90	110(2)	81(3)	81(3)
Emergency Generator (P)	81	90	110(2)	81(3)	81(3)
Auxiliary Building (4 ft-6 in.)	81	90	110(2)	NA(7b)	81(3)
Auxiliary Building (24 ft-6 in.)	81	90	110(2)	81(3)	81(3)
MCC and Rod Control Room (24 ft-6 in.) (O)	NA(5)	90	110(2)	NA(7a)	81
MCC and Rod Control Room (24 ft-6 in.) (P)	81	90	110(2)	NA(7a)	81
Auxiliary Building (41 ft-6 in.)	81	90	110(2)	NA(7c)	81(3)
Containment(2)	81	90	110(2)	NA	81(3)
Engineered Safety Features Building					
• South Containment Recirculation Pump Cubicle (P)	NA(6b)	90	NA	NA(6b)	81(3)
• North Containment Recirculation Pump Cubicle (O)	NA(6b)	90	NA	NA(6b)	81(3)
• North Residual Heat Removal Heat Exchanger Cubicle (P)	NA(6a)	90	110(2)	NA(6a)	81(3)
• Turbine-Driven Auxiliary Feedwater Pump Cubicle	NA(6a)	90	110(2)	NA(6a)	81(3)

TABLE Q430.60-6 (Cont)

Area	Plant Switching Network	Voice Paging System	Maintenance Jack System	Sound Powered Telephone System	RADIO SYSTEM
• South Residual Heat Removal Heat Exchanger Cubicle (O)	NA (6a)	90	NA (9)	NA (6a)	81 (3)
• Refueling Water Pump Cubicle	NA (6a)	90	110[2]	NA (6a)	81 (3)
• North Motor-Driven Auxiliary Feedwater Pump Cubicle (O)	81	90	NA (10)	81 (3)	81 (3)
• South Motor-Driven Auxiliary Feedwater Pump Cubicle (P)	NA (6a)	90	NA (10)	NA (6a)	81 (3)
• Air Conditioning Unit Cubicles (P)	NA (6c)	90	NA	NA (6c)	81 (3)
• Air Conditioning Unit Cubicles (O)	NA (6c)	90	NA	NA (6c)	81 (3)
Main Steam Valve Building	81	90	110[2]	NA	81 (3)
Service Water Pump Cubicles					
• East Service Water Cubicle (P)	81	90	110[2]	81 (3)	81 (3)
• West Service Water Cubicle (O)	81	90	110[2]	NA (8)	81 (3)

NOTES:

1. (O) = Orange Train
   (P) = Purple Train

2. Double ear-cup headset

INSERT AA

3. 110 dBA with double ear-cup headset.

4. Available in adjacent (P) Switchgear Room.

5. Available in adjacent (P) MCC and Rod Control Room.

6. Available in (O) Motor-Driven Auxiliary Feedwater Pump Cubicle located

   a) at the same building elevation.
   b) at the next higher building elevation.
   c) at the next lower building elevation

7. Available in Auxiliary Building

   a) at the same building elevation
   b) at the next higher building elevation
   c) at the next lower building elevation

8. Available in adjacent (P) Service Water Cubicle

9. Available in adjacent (P) Residual Heat Removal Heat Exchanger Cubicle.

10. Available in adjacent Turbine-Driven Auxiliary Feedwater Pump Cubicle.

NRC Letter: May 31, 1983

Question Q430.62 (Section 9.5.3)

Identify the safety related areas, vital areas, and hazardous areas where emergency lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of a transient or accident. Tabulate the lighting system provided in your design to accommodate those areas so identified. Include the degree of compliance to Standard Review Plan 9.5.1 regarding emergency lighting requirements in the event of a fire.

Response:

a. Table Q430.62-1 presents the plant site work stations where it may be necessary for plant personnel to be stationed following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to achieve cold shutdown.

   Table Q430.62-2 presents other plant areas where it may be necessary for plant personnel to perform specific event-related tasks or where access or egress may be required.

   The fixed, self-contained, sealed beam battery packs provided (including individual 8-hour battery power supplies) comply with Standard Review Plan 9.5.1, as discussed in Section 7.6 of the Fire Protection Evaluation Report.

b. Table Q430.62-1 also identifies the lighting systems available at work stations.

   Table Q430.62-2 also identifies the lighting systems available at task areas (specific event-related tasks) or where access and egress may be required.

c. Table Q430.62-3 presents the lighting levels available at work stations.

   Table Q430.62-4 presents the lighting levels available at task areas (specific event-related tasks) or where access and egress may be required.

d. Preoperational testing of the normal ac, essential ac, and 8-hour battery pack dc systems will verify the lighting levels provided for all work stations, task areas, and access and egress paths.

   Where lighting levels are not established during the above testing, appropriate corrective action will be taken. Corrective action may include, but is not limited to, addition or relocation of fixtures to provide the minimum footcandle levels.

e. The lighting levels presented in Table Q430.62-3 are sufficient to adequately control, monitor, and/or maintain safety-related equipment during accident and transient conditions.

The lighting levels presented in Table Q430.62-A are sufficient for access and egress. These lighting levels are in accordance with the IES Lighting Handbook-1981 Application Volume requirement for access/egress route emergency illumination.

The normal lighting levels presented in Table Q430.62-4 are sufficient for safety. These lighting levels are in accordance with the IES Lighting Handbook-1981 Application Volume Requirements for Lighting for Safety.

Portable battery powered lanterns are available to supplement the fixed lighting when and where required either to perform specific event-related tasks or to perform maintenance on safety-related equipment.

TABLE Q430.62-1

WORK STATIONS/LIGHTING SYSTEMS

Work Station	Normal Ac	Essential Ac (O)[1]	Essential Ac (P)[1]	Dc 8-Hr Battery Packs
Main Control Room (Operating Area)	No	Yes	Yes	Yes
Auxiliary Shutdown Panel[2]	Yes	No	Yes	Yes
Emergency Generator Control Panel[3]				
(O)	No	Yes	No	Yes
(P)	No	No	Yes	Yes

NOTES:

1. (O) = Orange Train
   (P) = Purple Train

2. The auxiliary shutdown panel is located in the purple switchgear room.

3. The emergency generator control panels located in the respective emergency generator rooms.

TABLE Q430.62-2

LIGHTING SYSTEMS

TASKS AREAS AND ACCESS AND EGRESS

Area	Normal Ac	Emergency Ac (O)[1]	Emergency Ac (P)[1]	Dc 8-hr Battery Packs
Main Control Room (Remaining Area)	Yes	Yes	Yes	Yes
Switchgear Room (O)	Yes	Yes	No	Yes
Switchgear Room (P)	Yes	No	Yes	Yes
Emergency Generator (O)	No	Yes	No	Yes
Emergency Generator (P)	No	No	Yes	Yes
Auxiliary Building (4'-6")	Yes	Yes	Yes	Yes
Auxiliary Building (24'-6")	Yes	Yes	Yes	Yes
MCC and Rod Control Room (24'-6") (O)	Yes	Yes	No	Yes
MCC and Rod Control Room (24'-6") (P)	Yes	No	Yes	Yes
Auxiliary Building (43'-6")	Yes	Yes	Yes	Yes
Containment	Yes	Yes	Yes	Yes
Engineered Safety Features Building				
• South Containment Recirculation Pump Cubicle (P)	Yes	No	Yes	Yes
• North Containment Recirculation Pump Cubicle (O)	Yes	Yes	No	Yes
HALLWAYS, STAIRWAYS, AND CORRIDORS	YES	YES	YES	YES

TABLE Q430.62-2 (Cont)

Area	Normal Ac	Emergency Ac (O)[1]	Emergency Ac (P)[1]	Dc 8-hr Battery Packs	
• North Residual Heat Removal Heat Exchanger Cubicle (P)	Yes	Yes	Yes	Yes	2.16 2.17 2.18 2.19
• Turbine-Driven Auxiliary Feed-water Pump Cubicle	Yes	Yes	Yes	Yes	2.23 2.24 2.25 2.26
• South Residual Heat Removal Heat Exchanger Cubicle (O)	Yes	Yes	Yes	Yes	2.30 2.31 2.32 2.33
• Refueling Water Pump Cubicle	Yes	Yes	Yes	Yes	2.37 2.38
• North Motor Driven Auxiliary Feedwater Pump Cubicle (O)	Yes	Yes	Yes	Yes	2.42 2.43 2.44
• South Motor Driven Auxiliary Feedwater Pump Cubicle (P)	Yes	Yes	Yes	Yes	2.48 2.49 2.50
• Air Conditioning Unit Cubicles (P)	Yes	No	Yes	Yes	2.54 2.55 2.56
• Air Conditioning Unit Cubicles (O)	Yes	Yes	No	Yes	2.60 3.1 3.2
Main Steam Valve Building	Yes	Yes	Yes	Yes	3.6 3.7

TABLE Q430.62-2 (Cont)

Area	Normal Ac	Emergency Ac (O)[1]	Emergency Ac (P)[1]	Dc 8-hr Battery Packs
Service Water Pump Cubicles				
• East Service Water Cubicle (P)	Yes	No	Yes	Yes
• West Service Water Cubicle (O)	Yes	Yes	No	Yes

NOTE:

1. (O) = Orange Train
(P) = Purple Train

TABLE Q430.62-3

WORK STATIONS/LIGHTING LEVELS(1)

	Estimated Footcandle Levels			
Work Stations	Normal Lighting	Essential Ac (O)(2)	Essential Ac (P)(2)	Dc 8-Hr Battery Packs
Main Control Room (Operating Area)	Note A	Note A	Note A	3(3) (4)
Auxiliary Shutdown Panel	20(3)	N/A	10(3)	4(3) (4)
Emergency Generator Control Panel				
(O)	20(3)	Note B(3)	N/A	4(3) (4)
(P)	20(3)	N/A	Note C(3)	4(3) (4)

NOTES:

1. Average maintained; floor level unless otherwise specified.

2. (O) = Orange Train
(P) = Purple Train

3. Average maintained; on vertical panel or board surface, within seeing task area.

A. 100 footcandles - half (O), half (P); dimmer controlled.

B. 20 footcandles, all (O).

C. 20 footcandles, all (P).

4. PORTABLE BATTERY POWERED LANTERNS ARE AVAILABLE TO SUPPLEMENT THE 8-HR BATTERY PACKS AS REQUIRED.

TABLE Q430.62-4

LIGHTING LEVELS (1)

(3) TASKS, AREAS AND ACCESS AND EGRESS

Area	Normal Lighting	Emergency Ac (O)(2) (Note E)	Emergency Ac (P)(2)	Dc 8-hr Battery Packs (Note F)
Main Control Room (Remaining Area)	20	.75	.75	.5
Switchgear Room (O)	20	Note A	NA	.5
Switchgear Room (P)	20	NA	Note A	.5
Emergency Generator (O)	Note C	Note C	NA	.5
Emergency Generator (P)	Note D	NA	Note D	.5
Auxiliary Building (4'-6")	20	.75	.75	.5
Auxiliary Building (24'-6")	20	.75	.75	.5
MCC and Rod Control Room (24'-6") (O)	20	Note B	NA	.5
MCC and Rod Control Room (24'-6") (P)	20	NA	Note B	.5
Auxiliary Building (43'-6")	20	.75	.75	.5
Containment	20	.75	.75	.5
Engineered Safety Features Building				
• South Containment Recirculation Pump Cubicle (P)	20	NA	.75	.5
• North Containment Recirculation Pump Cubicle (O)	20	.75	NA	.5
Hallways, Stairways, and Corridors	20	.75	.75	.5

TABLE Q430.62-4 (Cont)

		Estimated Footcandle Levels			
		Emergency Ac		Dc 8-hr	
Area	Normal Lighting	(O)(2) (Note E)	(P)(2)	Battery Packs (Note F)	
• North Residual Heat Removal Heat Exchanger Cubicle (P)	20	.75	.75	.5	2.20 2.21 2.22 2.23
• Turbine-Driven Auxiliary Feed-water Pump Cubicle	20	.75	.75	.5	2.27 2.28 2.29 2.30
• South Residual Heat Removal Heat Exchanger Cubicle (O)	20	.75	.75	.5	2.34 2.35 2.36 2.37
• Refueling Water Pump Cubicle	20	.75	.75	.5	2.41 2.42
• North Motor Driven Auxiliary Feedwater Pump Cubicle (O)	20	.75	.75	.5	2.46 2.47 2.48 2.49
• South Motor Driven Auxiliary Feedwater Pump Cubicle (P)	20	.75	.75	.5	2.53 2.54 2.55 2.56
• Air Conditioning Unit Cubicles (P)	20	.75	.75	.5	2.60 3.1
• Air Conditioning Unit Cubicles (O)	20	.75	.75	.5	3.5 3.6
Main Steam Valve Building	20	.75	.75	.5	3.10 3.11

TABLE Q430.62-4 (Cont)

Area	Estimated Footcandle Levels: Normal Lighting	Emergency Ac (O)(2) (Note E)	(P)(2)	Dc 8-hr Battery Packs (Note F)	
Service Water Pump Cubicles	20	.75	.75	.5	3.15 3.16
• East Service Water Cubicle (P)	20	NA	.75	.5	3.18 3.19 3.20
• West Service Water Cubicle (O)	20	.75	NA	.5	3.22 3.23 3.24

NOTES: 3.27

1. Average maintained; floor level unless otherwise specified. 3.29

2. (O) = Orange Train 3.31
(P) = Purple Train 3.32

A. 13.5 footcandles. 20 footcandles between switchgear bays (front). 3.36

B. 8.75 footcandles. 15 footcandles in front of load centers. 3.38

C. 24 footcandles, all (O). 3.40

D. 24 footcandles, all (P). 3.42

E. Along access/egress paths, up to and through the space except Notes A, B, C, and D which are averages over entire room. 3.45

F. .75 footcandles along center line of access and egress paths. 3.47

3. PORTABLE BATTERY FIXED POWERED LANTERNS ARE AVAILABLE TO SUPPLEMENT ~~[illegible]~~ LIGHTING WHEN AND WHERE REQUIRED EITHER TO PERFORM SPECIFIC EVENT-RELATED TASKS OR TO PERFORM MAINTENANCE ON SAFETY-RELATED EQUIPMENT.

Open Items

Chemical Engineering Branch - Fire Protection

FP-11 Emergency Lighting (Draft SER Section 9.5.1.4)

We find that 3.0 ft candles of light for egress routes is not adequate. We will require the applicant to provide 5.0 ft candles of light in all access and egress routes to and from all areas required to be manned for safe shutdown. This is an open item.

Response (4/84)

Refer to a response to NRC QUESTION 430.62.

Question Q430.66 (Section 9.5.3)

You state in Section 9.5.3.2 of the FSAR that the normal dc and essential dc lighting systems provide silhouette level lighting and light at approximately 3 foot candles, which is more than adequate for emergency operation. The staff disagrees with these statements. The staff has determined that a minimum of 10 foot candles at the work station is required to adequately control, monitor, and/or maintain safety related equipment during accident and transient conditions. For those safety related areas listed in requests 430.60 and 430.61 and illuminated by the dc lighting systems only verify that the minimum of 10 foot candles at the work station is being met. Also verify that the 10 foot candles minimum at the work station is being met by those safety related areas illuminated by the ac emergency system. Modify your design as necessary.

Response:

Refer to the revised response to NRC Question 430.62.

Question 430.73 (Section 3.2, 9.5.4, 9.5.5, 9.5.6, 9.5.7, and 9.5.8)

The FSAR text and Table 3.2-1 indicates that the components and piping systems for the diesel generator auxiliaries (fuel oil system, cooling water, lubrication, air starting, and intake and combustion system) that are mounted on the auxiliary skids are designed seismic Category I and are ASME Section III, Class 3 quality to the extent possible. The engine mounted components and piping and certain other components listed in the various sections of 9.5 are designed and manufactured to DEMA standards and/or manufacturer's standards and are seismic Category 3. This is not in accordance with Regulatory Guide 1.26 which requires the entire diesel generator auxiliary systems to be designed to ASME Section III, Class 3 of Quality Group C. You also state that the figures in Section 9.5 show where quality group classification changes are. The figures do not provide this information. Provide the following: (a) the industry standards that were used in the design, manufacture, and inspection of the engine mounted piping and components, (b) show on the appropriate P&ID's where the Quality Group Classification changes from Quality Group C, and where the Seismic Category I portions of the system are located. Sections 9.5.4 through 9.5.8 define certain pumps, filters, strainers, valves, and subsystems in the diesel generator auxiliary systems as Quality Group D or not applicable with regards to Quality Group Classification. It is our position that all components and piping in the diesel generator auxiliary systems be designed to Seismic Category I, ASME Section III, Class 3 requirements. Comply with this position or justify noncompliance.

Response

Regulatory guidance from Regulatory Guide 1.26, Revision 3, Positions C.1 and C.2 was used when determining the quality group classification of the diesel engine and its auxiliary support systems. As noted in the regulatory guide discussion section, "other systems not covered by this guide such as instrument and service air, diesel engine and its generators and auxiliary support systems...should be designed, fabricated, erected and tested to quality standards commensurate with the safety functions to be performed."

The diesel engine and its engine mounted portions of the auxiliary piping are designed to seismic and Category I requirements and follow the guidelines of DEMA standards, which are endorsed by Regulatory Guide 1.9 and IEEE Standard 387.

FSAR Figures Q430.73-1 through 430.73-4 show the on skid and off skid portions of piping systems and components. All piping and components are designed to seismic and Category I requirements. As can be seen from FSAR Figures Q430.73-1 through Q430.73-4, the piping up to the diesel skid interface is ASME 3, Class 3 for all auxiliary piping. The majority of on skid and engine piping is also ASME 3. Class piping that is not ASME 3, Class 3 is designed to manufacturers standards. The manufacturers standards are listed in Tables 9.5-12 and 9.5-13 430.73-1.

TABLE Q430.73-1

DIESEL ENGINE MANUFACTURERS
PIPING STANDARDS

AIR STARTING SYSTEM

Working Pressure 450 PSI

Pipe & Fittings Material

OD	Wall Thickness	Material Spec.
2.375	.218	A53
1.9	.145	A12OXS
1.875	.188	MT1020
1.75	.155	A513
.625	.049	A254C1
.375	.049	MT1010

JACKET WATER SYSTEM

Working Pressure 60 PSI

Pipe & Fittings Material

OD	Wall Thickness	Material Spec.
4	.188	MT1018
.375	.095	MT1010

FUEL OIL SYSTEM

Working Pressure 35 PSI

Pipe & Fittings Material

OD	Wall Thickness	Material Spec.
1.5	.120	MT1018
1	.065	MT304
.75	.095	MT1010
.5	.049	MT304
.25	.035	MT304

TABLE Q430.73-1

DIESEL ENGINE MANUFACTURERS PIPING STANDARDS

LUBE OIL SYSTEM

Working Pressure 120 PSI

Pipe & Fittings Material

OD	Wall Thickness	Material Spec.
3.5	.120	MT1018
1.625	.25	MT1018
1.5	.120	MT1010
1.25	.25	MT1018
1.1875	.156	MT1018
1	.095	MT1020
.75	.065	MT1010
.625	.065	MT1010
.375	.065	MT1010
.5	.065	MT1010
.25	.049	MT1010

TURBOCHARGER WATER PIPES

Working Pressure 60 PSI

Pipe & Fittings Material

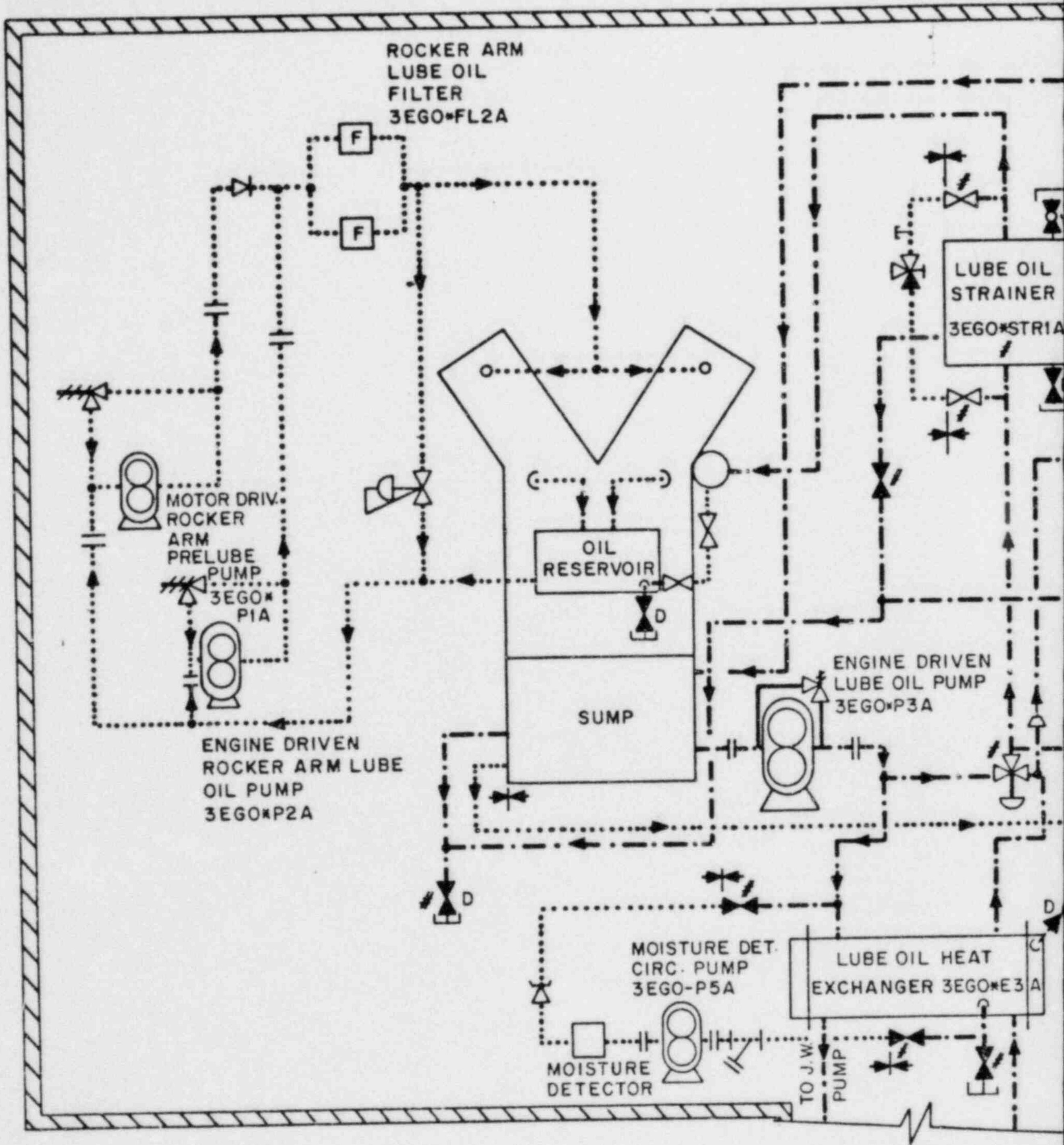
OD	Wall Thickness	Material Spec.
4	.188	MT1018
2.375	.154	A120-S
1.646	.140	A120-S
1.375	.133	A120-J
1	.188	MT1018

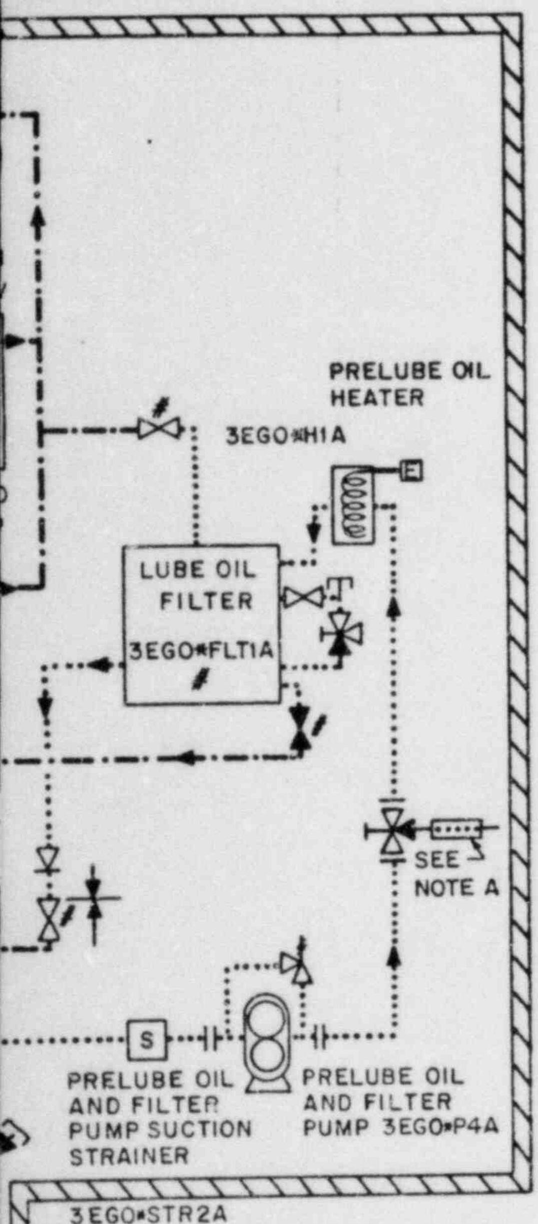
INJECTOR COOLING SYSTEM

Working Pressure 50 PSI

Pipe & Fittings Material

OD	Wall Thickness	Material Spec.
1.315	.179	A120-S
1.125	.065	MT1010
.376	.065	MT1010


ROCKER ARM
LUBE OIL
FILTER
3EGO*FL2A
F
F
MOTOR DRIV.
ROCKER
ARM
PRELUBE
PUMP
3EGO*
P1A
ENGINE DRIVEN
ROCKER ARM LUBE
OIL PUMP
3EGO*P2A
OIL
RESERVOIR
D
SUMP
D
LUBE OIL
STRAINER
3EGO*STR1A
ENGINE DRIVEN
LUBE OIL PUMP
3EGO*P3A
MOISTURE DET.
CIRC. PUMP
3EGO-P5A
MOISTURE
DETECTOR
LUBE OIL HEAT
EXCHANGER 3EGO*E3A
TO J.W. PUMP
D



LEGEND

1. OFF SKID (— — — —) ALL NON-MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

2. ON SKID (—·—·—) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

   (·········) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM A PRESSURE BOUNDARY SAFETY FUNCTION ARE DESIGNED TO ANSI B31.1 STANDARDS AND ARE SEISMIC CATEGORY I

3. ENGINE MOUNTED (———) INTEGRAL WITH THE ENGINE AND ARE DESIGNED TO THE MANUFACTURER'S STANDARD.

   CODE CHANGE

   ASME III VALVES AND EQUIPMENT

NOTES

A. FLEXIBLE HOSE BY MANUFACTURER IS NOT ASME III. HOSE ASSEMBLY WILL BE PRESSURE TESTED TO 200 PSIG.

B. PIPING FOR DIESEL A SHOWN. DIESEL B IS SIMILAR.

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FIGURE Q430.73-1
PIPING CLASSES OF THE LUBE OIL SYSTEM
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

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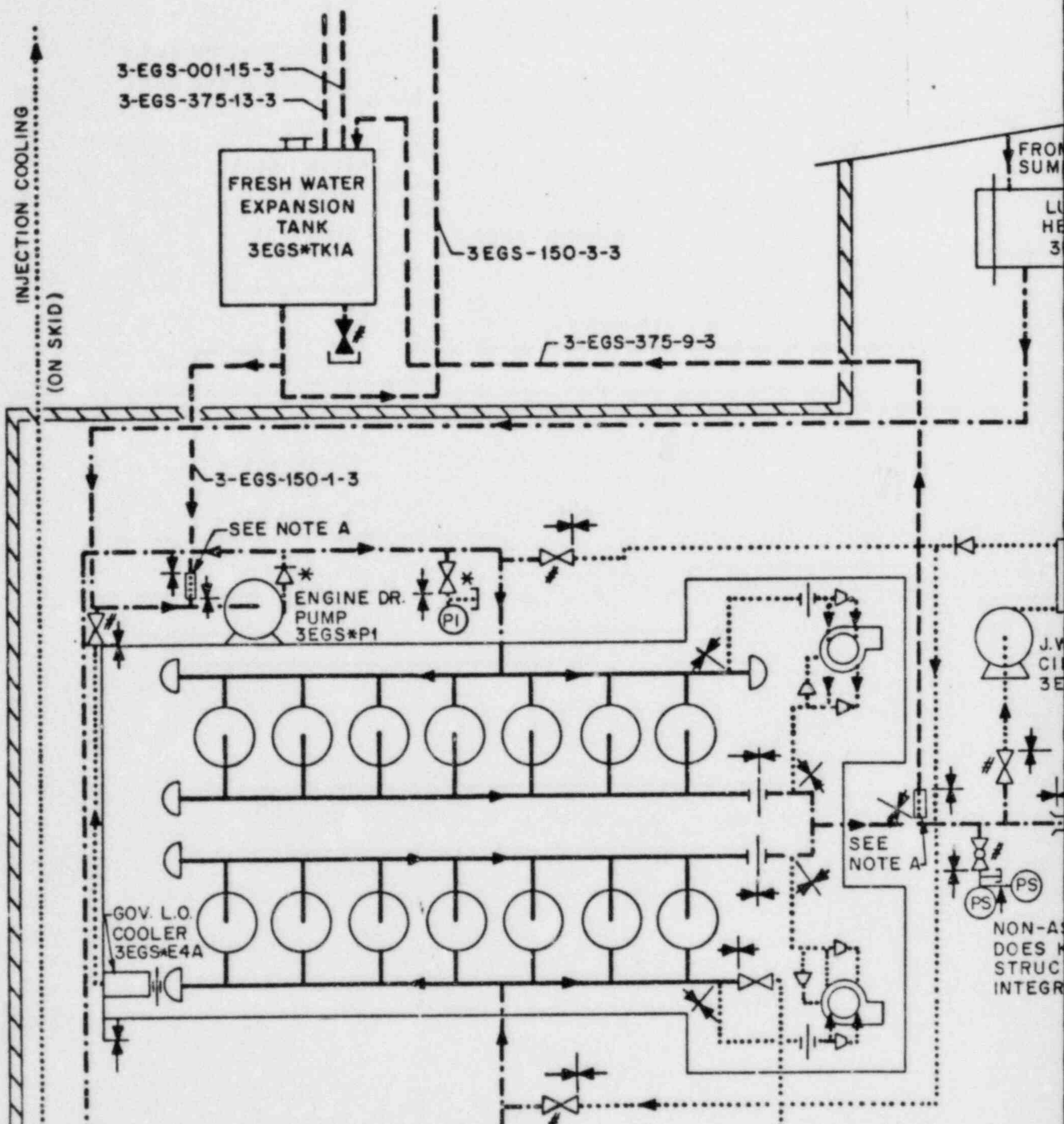
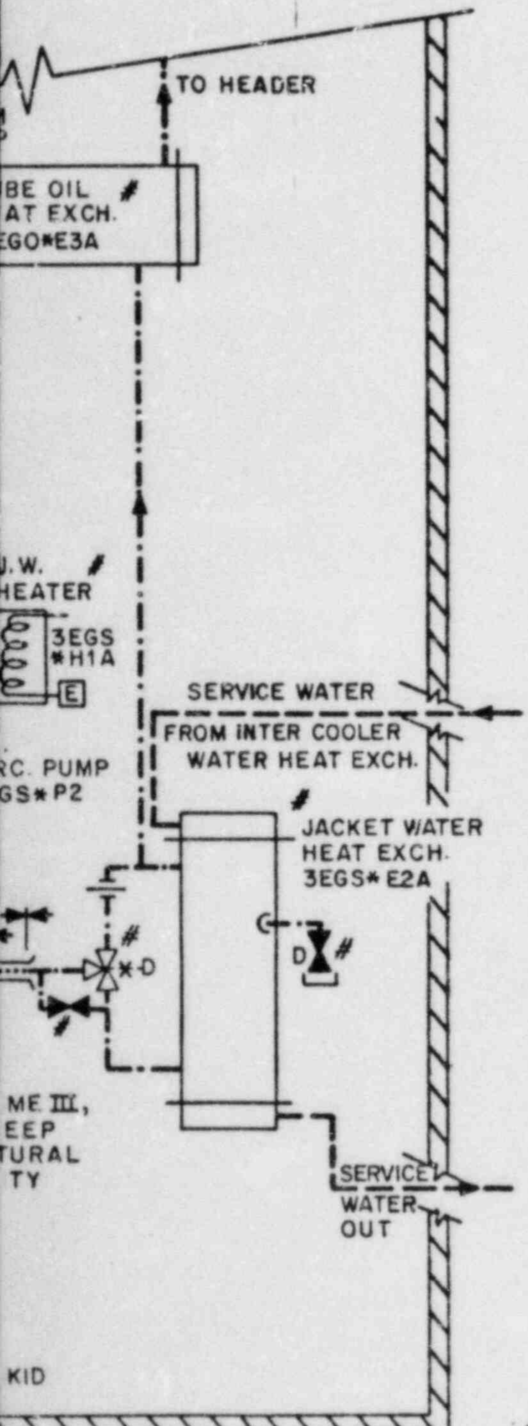


INJECTION COOLING
(ON SKID)
3-EGS-001-15-3
3-EGS-375-13-3
FRESH WATER
EXPANSION
TANK
3EGS*TK1A
3EGS-150-3-3
3-EGS-375-9-3
3-EGS-150-1-3
SEE NOTE A
ENGINE DR.
PUMP
3EGS*P1
PI
SEE
NOTE A
PS
PS
GOV. L.O.
COOLER
3EGS*E4A



LEGEND

1. OFF SKID (— — — —) — ALL NON-MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

2. ON SKID (—·—·—) — ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

   (·········) — ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM A PRESSURE BOUNDARY SAFETY FUNCTION ARE DESIGNED TO ANSI B31.1 STANDARDS AND ARE SEISMIC CATEGORY I

3. ENGINE MOUNTED (————) — INTEGRAL WITH THE ENGINE AND ARE DESIGNED TO THE MANUFACTURER'S STANDARD.

→|← CODE CHANGE

ASME III VALVES AND EQUIPMENT

NOTES

A. FLEXIBLE HOSE BY MANUFACTURER IS NOT ASME III. HOSE ASSEMBLY WILL BE PRESSURE TESTED TO 200 PSIG

B. PIPING FOR DIESEL A SHOWN. DIESEL B IS SIMILAR.

FIGURE Q430.73-2
PIPING CLASSES OF THE JACKET WATER SYSTEM
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

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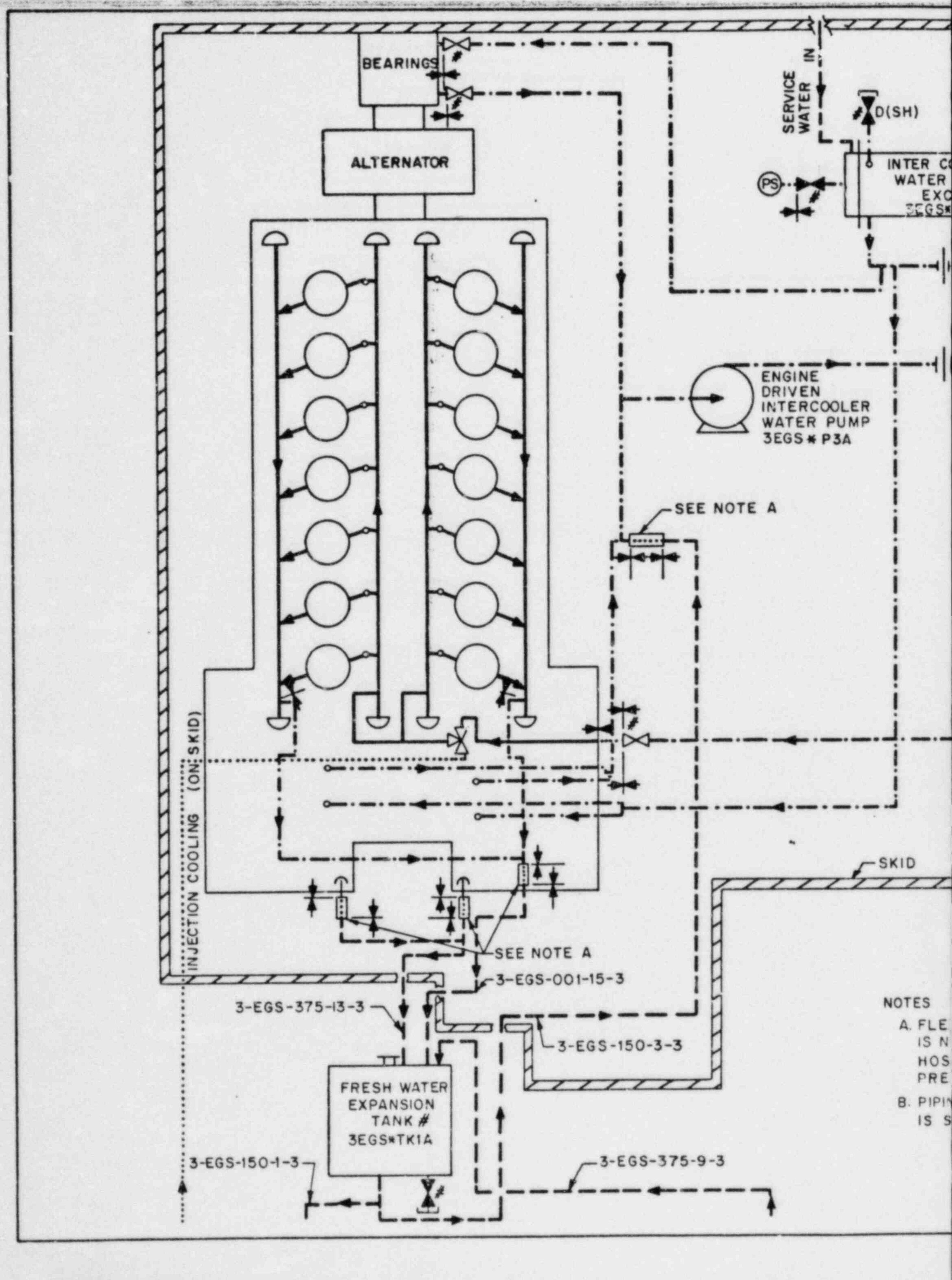
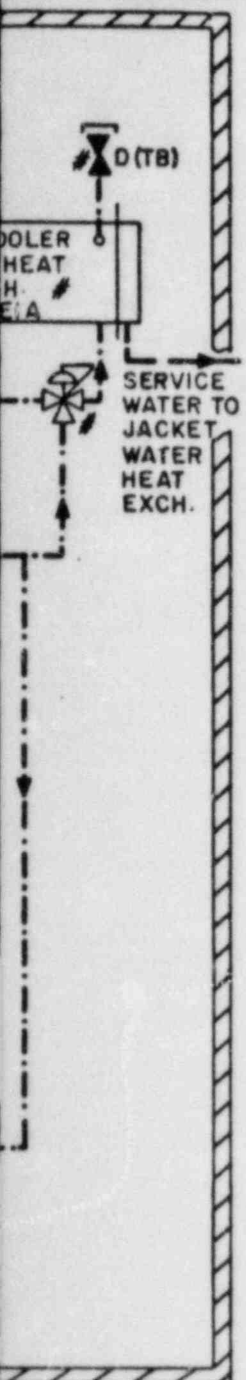


BEARINGS
ALTERNATOR
SERVICE WATER IN
D(SH)
PS
INTER C
WATER
EXC
3EGS
ENGINE DRIVEN INTERCOOLER WATER PUMP 3EGS*P3A
SEE NOTE A
INJECTION COOLING (ON SKID)
SKID
SEE NOTE A
3-EGS-001-15-3
3-EGS-375-13-3
3-EGS-150-3-3
FRESH WATER EXPANSION TANK # 3EGS*TK1A
3-EGS-150-1-3
3-EGS-375-9-3
NOTES
A. FLE
IS N
HOS
PRE
B. PIPIN
IS S



LEGEND

1. OFF SKID (— — — —) ALL NON-MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

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   (·········) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM A PRESSURE BOUNDARY SAFETY FUNCTION ARE DESIGNED TO ANSI B31.1 STANDARDS AND ARE SEISMIC CATEGORY I

3. ENGINE MOUNTED (———) INTEGRAL WITH THE ENGINE AND ARE DESIGNED TO THE MANUFACTURER'S STANDARD.

   CODE CHANGE

   ASME III VALVES AND EQUIPMENT

Also Available On Aperture Card

IBLE HOSE BY MANUFACTURER
OT ASME III.
E ASSEMBLY WILL BE
SSURE TESTED TO 200 PSIG.
G FOR DIESEL A SHOWN. DIESEL B
IMILAR

TI APERTURE CARD

FIGURE Q 430.73-3
PIPING CLASSES OF THE INTERCOOLER WATER SYSTEM
MILLSTONE NUCLEAR POWER STATION UNIT 3
FINAL SAFETY ANALYSIS REPORT

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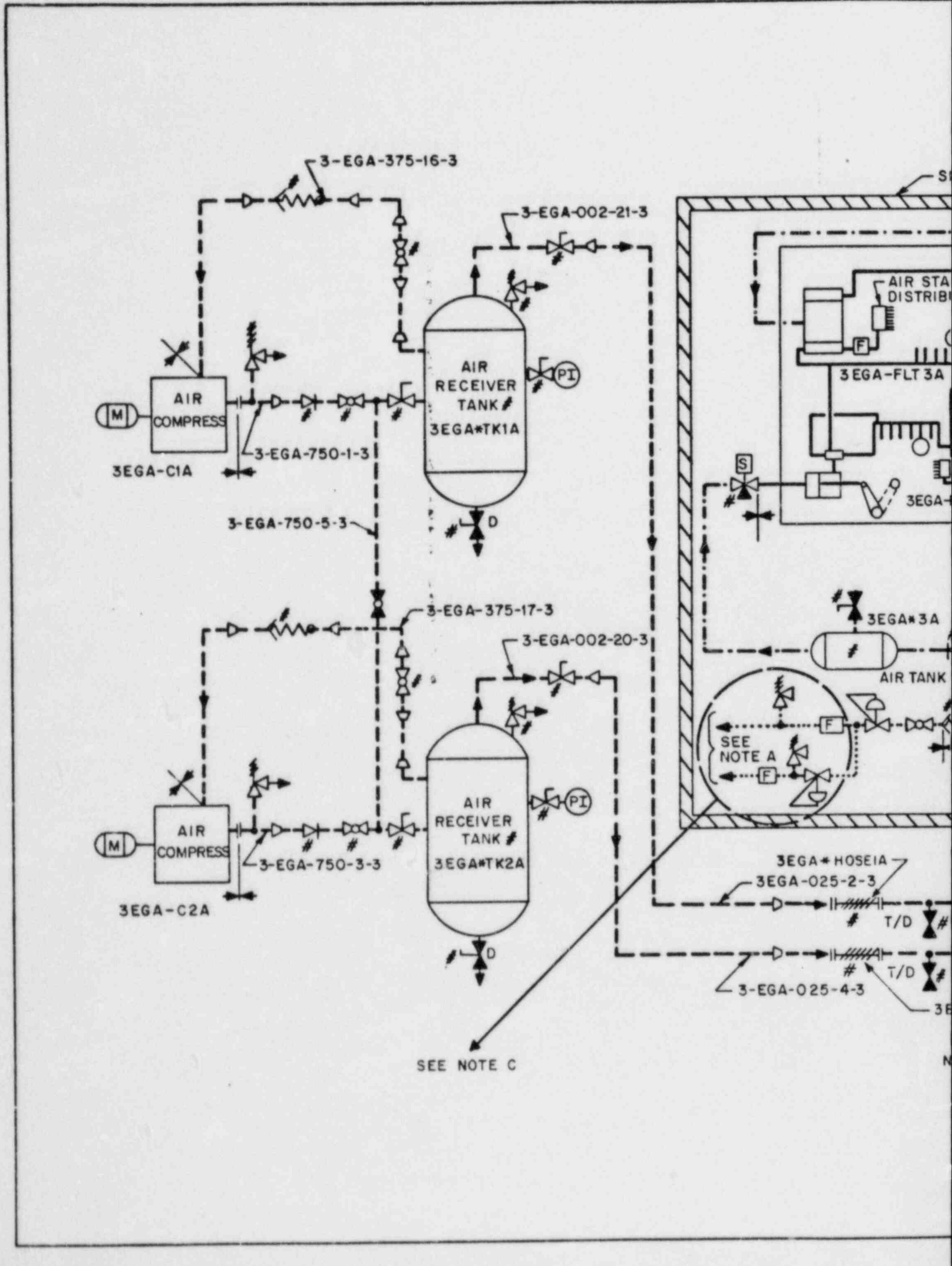
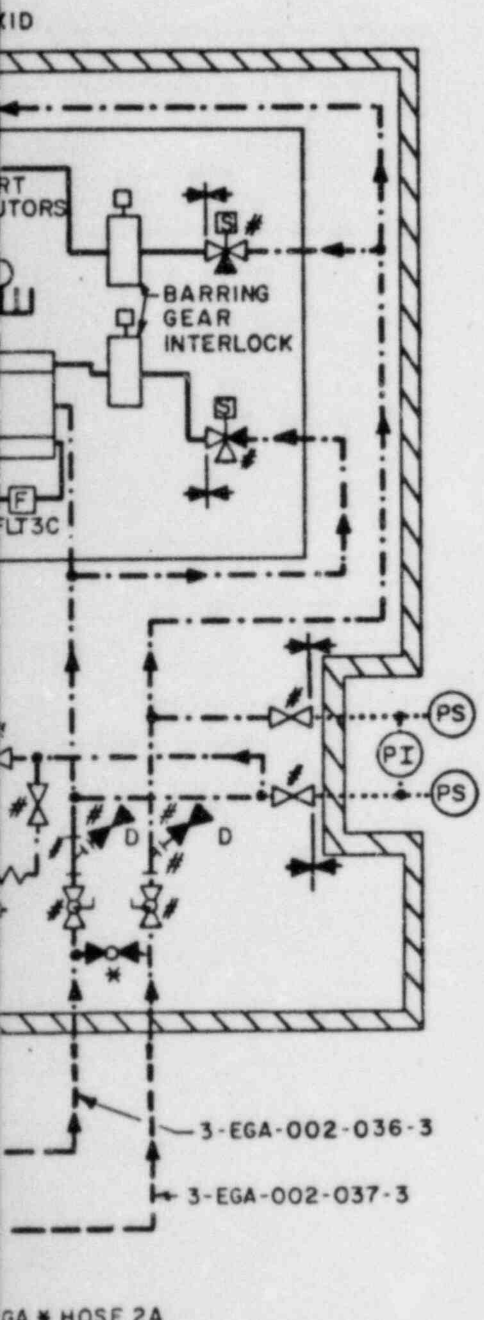

3-EGA-375-16-3
3-EGA-002-21-3
AIR STA
DISTRIBU
3EGA-FLT 3A
AIR COMPRESS
M
3EGA-C1A
3-EGA-750-1-3
AIR RECEIVER TANK #
3EGA*TK1A
PI
D
3-EGA-750-5-3
3-EGA-375-17-3
3-EGA-002-20-3
3EGA*3A
AIR TANK
SEE NOTE A
F
S
AIR COMPRESS
M
3EGA-C2A
3-EGA-750-3-3
AIR RECEIVER TANK #
3EGA*TK2A
PI
D
3EGA*HOSE1A
3EGA-025-2-3
T/D
3-EGA-025-4-3
SEE NOTE C



LEGEND

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2. ON SKID (— · — · —) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3.

   (· · · · · · · ·) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM A PRESSURE BOUNDARY SAFETY FUNCTION ARE DESIGNED TO ANSI B31.1 STANDARDS AND ARE SEISMIC CATEGORY I.

3. ENGINE MOUNTED (————) INTEGRAL WITH THE ENGINE AND ARE DESIGNED TO THE MANUFACTURER'S STANDARD.

4. —▸◂— CODE CHANGE

   # ASME III VALVES AND EQUIPMENT

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APERTURE
CARD

NOTES

A. PIPING RUNS TO TEMPERATURE CONTROL SYSTEM OF THE JACKET WATER SYSTEM AND IS OF SAME PIPE CLASSIFICATION.

B. PIPING FOR DIESEL A SHOWN. DIESEL B IS SIMILAR.

C. ALL PORTIONS OF THE AIR START SYSTEM ARE HIGH ENERGY EXCEPT THE CIRCLED AREA.

FIGURE Q430.73-4
PIPING CLASSES OF THE AIR START SYSTEM
MILLSTONE NUCLEAR POWER STATION
UNIT 3
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Single Failure Criterion

A single active component failure is assumed to occur in essential systems used to mitigate consequences of the postulated piping failure and to shut down the reactor. The single active component 430.76
failure is assumed to occur in addition to the postulated piping 430.109
failure and any direct consequences of the piping failure, such as unit trip and loss of offsite power. Section 3.1.1 defines this failure criterion and its applications.

Loss of Offsite Power

Offsite power is assumed unavailable if a trip of the turbine 430.76
generator system or reactor protection system is a direct consequence 430.109
of the postulated piping failure. However, a single failure of one emergency generator or one Class IE bus can be assumed as the single failure if this assumption is the most limiting.

Seismic Event 430.76 430.109

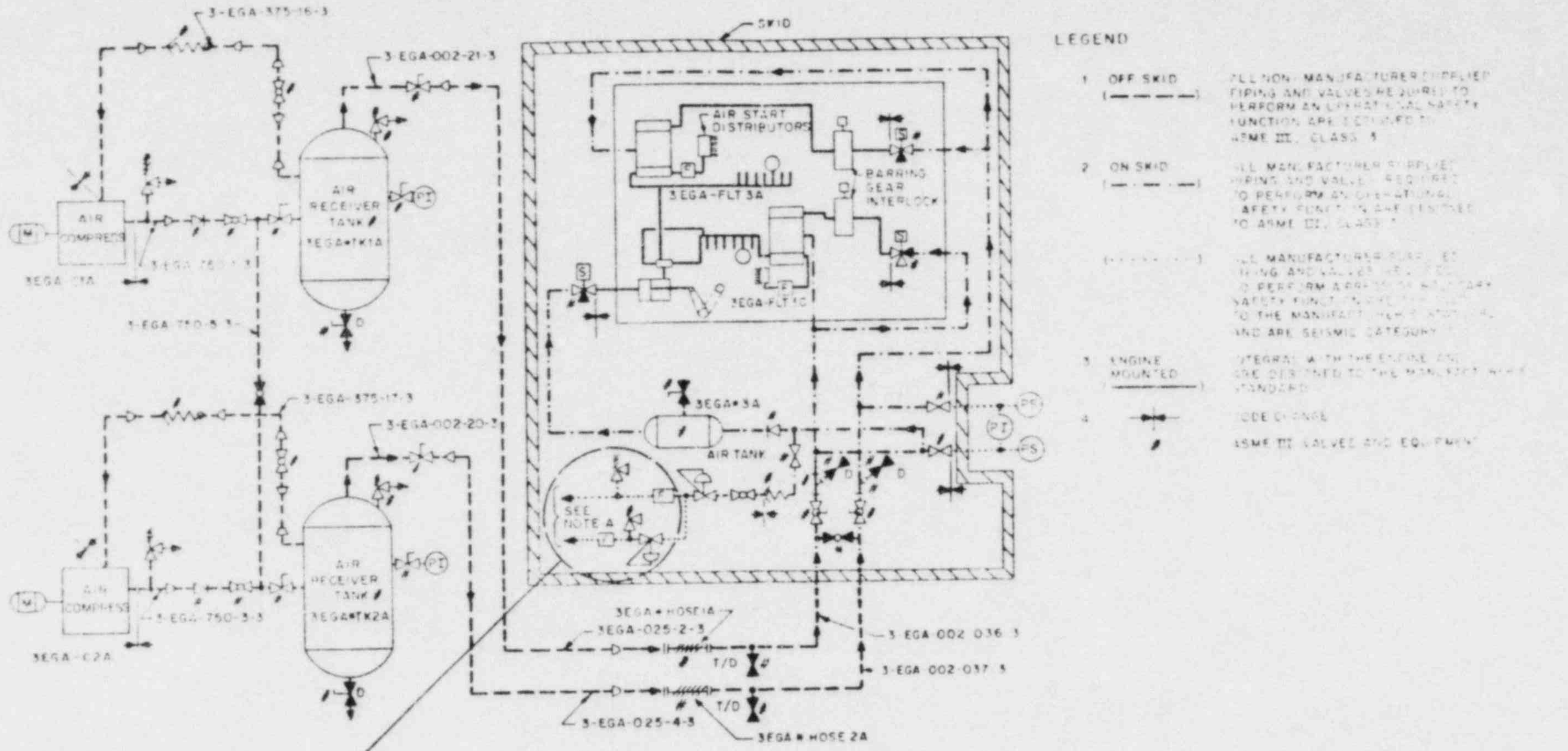
Credit for mitigating the consequences of a postulated event may be taken only for those systems and components designed to Seismic Category I requirements.

All available systems, including those actuated by operator actions, are used to mitigate the consequences of a postulated event. Judging the availability of systems includes consideration of the postulated failure and its direct consequences (e.g., unit trip and loss of offsite power) and the assumed single active component failure plus its direct consequences. The feasibility of the operator to take action is judged on the availability of ample time and adequate access to equipment for performing the proposed actions. Regulatory Guide 1.62 provides guidance in evaluating the feasibility of operator action.

3.6.1.3.2 Failure Mode and Effects

An analysis of breaks in high energy systems, cracks in moderate energy systems, and the consequent failure modes and effects (e.g., environmental, pipe whip, and jet impingement) must include consideration of their sources and targets. The source comprises the pipe which is postulated to fail and the resulting effects of the failure. The target comprises structures, systems, and components considered essential for shutting down the plant safely, maintaining the safe shutdown, and mitigating the effects of the postulated pipe failure.

Interactions between sources and targets are analyzed individually to determine how each affects essential equipment in the area of the source. The interactions analyzed are pipe whip, jet impingement, and environmental effects.



NOTES

A. PIPING RUNS TO TEMPERATURE CONTROL SYSTEM OF THE JACKET WATER SYSTEM AND IS OF SAME PIPE CLASSIFICATION

B. PIPING FOR DIESEL A SHOWN DIESEL B IS SIMILAR

C. ALL PORTIONS OF THE AIR START SYSTEM ARE HIGH ENERGY EXCEPT THE CIRCLED AREA

FIGURE Q430.73-4
PIPING CLASSES OF THE AIR START SYSTEM
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

Question 430.83 (Section 9.5.4)

In Section 9.5.4.1 of the FSAR you state that you comply with Regulatory Guide 1.137, "Fuel Oil Systems for Standby Diesel Generators" and ANSI N-195 "Fuel Oil Systems for Standby Diesel Generators." Section 9.5.4 emergency diesel engine fuel oil storage and transfer system (EDEFSS) does not provide adequate information to determine compliance. Provide sufficient information to show how you comply with this Regulatory Guide and ANSI Standard N-195 in your design of the EDEFSS. Provide any justification for noncompliance.

Response:

Refer to revised FSAR Section 9.5.4 for the response to this question.

Revised Response

See response to question 430.84.

Millstone Nuclear Power Station, Unit No. 3

Question 430.84 (SRP Section 9.5.4)

You state in Section 9.5.4 of the FSAR that two fuel oil storage tanks are provided and the they are interconnected through piping, valves, and pumps so that either diesel may be supplied from the tanks. This is an acceptable design. However, you further state that the total fuel oil storage capacity of both tanks is sufficient to operate only one diesel generator for seven days. The other diesel generator must be shut down. This is unacceptable and does not meet the requirements of General Design Criterion 17, Regulatory Guide 1.137 Position C.1, ANSI N-195 Section 5.2, and Standard Review Plan 9.5.4 Sections I.1.d, and III.6.b which require seven days fuel oil storage for each diesel generator. We require that each emergency diesel generator be supplied with a fuel oil storage tank of sufficient capacity to operate the diesel generator for sevel days. The tank capacity shall be in accordance with R. G. 1.137. Comply with this position.

Respose:

The Applicant notes that the design meets the intent of Regulatory Guide 1.137 and ANSI N195 with the exception of respective document sections C-1 and 5.2. By not meeting ANSI N195 Section5.2 he does not meet R. G. 1.137 C.1c. The Applicant notes he meets the remainder of the requirements of both R.G. 1.137 and ANSI N 195. The Applicant takes exception to SRP 9.5.4 - Section III.6.b and ANSI N 195 Section 5.2 for the following reasons: (1) The on-site storage facilities provide a 3 1/2 day fuel supply for each diesel generator assuming both units operate simultaneously at full load. Within 24 hours after notice for fuel has been given, the fuel oil storage tanks can be replenished from geographically diverse off-site fuel suppliers. Such notice will be given within 4 hours of an LOP coincident with a postulated accident per plant procedures.
Fuel supplies can be extended to and beyond seven days, as required. In this manner 7 days' of fuel can be provided to an operating diesel generator. (2) Historically the grid supplying the Millstone site has proved very reliable. Since the plants at the site have been operational, offsite power has been restored 95% of the time within 24 hours of first being lost. Consequently, the probability of requiring the DG for any time period exceeding 24 hours is small. Past experience indicates therefore that diesel generator operation in excess of 24 hours is highly unlikely.

A load shedding analysis has been performed which demonstrates that with reduction of loads, the emergency diesel generators will have the capability to be operated continuously for a minimum period of 5 1/2 days with margin that allows slightly over 6 days. In the analysis 8 hours into the worst case accident, which is a DBA coincident with a LOP, the loads may be reduced to appoximately 60% of rated capacity on Train A and to approximately 35% on Train B. The load on Train A remains constant where the load on Train B would increase to approximately 40% at 20 hours and fluctuate between 30% and 40% of rated load after 24 hours.

The above load shedding scheme may be implemented in the unlikely event that fuel oil would be unavailable after 24 hours into the accident. Fuel oil suppliers will be contacted within the first 4 hours of the accident.

9.5.3.3 Design Evaluation

Station lighting is provided to operate the unit safely under normal and accident conditions, including a single failure and loss of offsite power.

All fixtures within the control room are seismically supported. Clips are provided to prevent the fluorescent lamps from breaking electrical contact and/or dropping out of the electrical sockets during a seismic event. Also, high quality ballasts are used to minimize the interaction to the Class 1E system.

9.5.3.4 Inspection and Testing

Design of the station lighting systems permits routine surveillance and testing of all critical lighting systems without disrupting normal lighting service.

9.5.4 Emergency Generator Fuel Oil Storage and Transfer System

The emergency generator fuel oil storage and transfer system (EGF) is a safety related system designed to supply fuel oil to the emergency diesel generator engines.

9.5.4.1 Design Bases

The design bases for the EGF are as follows.

1. The outside air summer design dry bulb temperature for the Millstone Point site of 86°F and the outside air winter design dry bulb temperature of 0°F.

2. In accordance with the codes and classifications listed in Table 3.2-1.

3. In accordance with General Design Criterion 2 and Regulatory Guide 1.117, for the ability of structures housing the system and the system itself to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapters 2 and 3.

4. In accordance with General Design Criterion 4, for structures housing the system and the system itself being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks.

5. In accordance with General Design Criterion 5, for the capability of the system and its components to perform its required safety functions. A single active failure cannot result in loss of the system-functional performance capabilities.

6. In accordance with Regulatory Guide 1.26, for the quality group classification of system components. 18.46

7. In accordance with Regulatory Guide 1.29, for the seismic design classification of systems components. 18.48

8. In accordance with Regulatory Guide 1.102, for the protection of structures, systems, and components important to safety from the effects of flooding. 18.50

9. In accordance with Regulatory Guide 1.137, for fuel oil systems design, fuel oil quality, and tests. 18.52

10. In accordance with ANSI Standard N195, fuel oil systems for standby diesel generators, except as noted herein. 18.54 430.83 430.84 430.85

11. In accordance with Branch Technical Positions APCSB 3-1 and MEB 3-1, for breaks in high and moderate energy piping systems outside containment. 18.56

12. In accordance with Branch Technical Position ASB 9.5-1 Appendix A, guidelines for fire protection at nuclear power plants. 18.57 18.58

13. In accordance with General Design Criterion 17, for the capability of the fuel oil system to meet independence and redundancy criteria. 18.59 18.60

9.5.4.2 System Description 19.3

The EGF (Figure 9.5-2) is an ASME III, Class 3 system except for the 19.4
fill line, its associated strainer, and the flame arrestors which are 19.5
ANSI B.31.1, Class 4 (NNS). It provides fuel oil to the emergency 19.6
diesel generators for operation under all plant operating conditions 19.8
and during all design basis events. There is a separate fuel oil 19.9
storage and transfer flow path for each emergency generator. 19.10

Each flow path consists of a fuel oil storage tank, two 100 percent 19.11
capacity fuel oil transfer pumps and strainers, a day tank, and 19.12
piping to each respective diesel engine. The fuel oil transfer pumps 19.13
maintain the level in the day tanks automatically as discussed in
Section 9.5.4.5. Each day tank has two supply and one return 19.14
connections to the fuel oil injection system, mounted integrally, and 19.15
provided with its respective diesel engine

430.83

The emergency generator fuel oil system has the following features. 19.16

1. Two tanks installed in an underground concrete vault - one 19.18
for each diesel engine. Each emergency generator fuel oil 19.20
storage tank is sized to store approximately 35,000 gallons 19.21
of diesel fuel oil. All openings are located in the top of 19.22
the tanks. Openings are provided for filling and draining, 19.23
sampling and sounding, level instrument connections, 19.24
determining fuel level with a stick gauge, pump piping

connections, and a manway. Each tank is separately vented to the atmosphere through a vent line fitted with a flame arrester.

2. Four full-capacity, electric motor-driven, vertical, centrifugal, tank-mounted, emergency generator fuel oil transfer pumps (Table 9.5-9) are supplied - two pumps for each emergency generator fuel oil storage tank. Each pump is provided with an orificed recirculation line back to its associated emergency generator fuel oil storage tank to provide a minimum flow for pump protection. A dc motor-driven fuel pump powered from a Class 1E source is provided in addition to the gear-driven engine-mounted pump to ensure starting of the diesel generator.

   Each pump has sufficient capacity to fill both day tanks with both emergency generators running, since the fuel consumption at rated load and speed for one emergency generator is 6.16 gpm.

3. Two emergency generator fuel oil day tanks - one for each diesel engine. Each emergency generator fuel oil day tank is sized to store approximately 550 U.S. gallons of diesel fuel oil. Each day tank feeds its respective diesel fuel oil injection system through two supply lines. Each tank is located at an elevation to provide sufficient positive head for its respective diesel fuel oil injection system suction. Each tank is located at an elevation conforming to a tank bottom elevation of 3 feet above the diesel generator's "bottom of skid" elevation. This fulfills the diesel engine manufacturer's recommendation of a minimum elevation of 2 feet above the diesel generator's "bottom of skid" elevation. Two return lines from the diesel fuel oil injection pumps, one to the day tank and one to the storage tank, are provided for excess flow. Openings are provided in the day tanks for piping connections, level instrumentation, and a manway. Valved drain connections are provided in the bottom of the tanks for removing any accumulation of condensation. Each tank is separately vented to the atmosphere through a vent line fitted with a flame arrester.

4. Each of the redundant fuel oil transfer pumps is equipped with its own fuel oil strainer. The strainers are conventional simplex oil strainers with removable baskets for easy cleaning. Each strainer will ensure that the fuel oil delivered to the day tank meets the diesel generator manufacturer's standards of purity.

5. An interconnection with two normally locked-closed valves between the two emergency generator fuel oil supply headers to facilitate the use of either tank to supply either emergency generator. One pump on each tank is arranged to allow transfer from the A electrical bus to the B electrical

bus, or vice versa, by means of a 480 V, seismically 20.8
qualified Class 1E, manually-ope ated transfer switch, under
administrative control, thus ensu ing a 7 day supply of 20.11
fuel for one diesel generator. (See Sections 8.3.1.1.2 and 20.12
9.5.4.5).

6. A duplex fuel oil strainer is provided for each diesel 20.14
generator by the manufacturer.

7. All piping and fittings are ASME III, Class 3 carbon steel, 20.15
except for the fill line, its associated strainer, and the 20.16
flame arrestors which are ANSI B.31.1, Class 4. All piping 20.18
and fittings in the system are 150 pound rating. Piping 20.19
construction is welded throughout, except for the pumps
which have flanged connections.

The fuel oil storage tanks are located in an underground concrete 20.21
vault adjacent to the emergency generator enclosure. The tanks are 20.23
separated by a wall 18 inches thick to provide the minimum calculated 20.24
fire boundary between tanks. The vault's 2-foot thick concrete 20.25
outside walls and roof provide the required tornado protection per
Regulatory Guide 1.117. Access openings and pipe penetrations have 20.27
water tight seals to provide protection of the vaults against the 20.28
effects of flooding. The fuel oil transfer pumps are mounted 20.29
directly on top of a flanged connection to the storage tanks. 20.30
Removable concrete covers are provided on the vaults to facilitate 20.31
pump maintenance or removal. The concrete vault covers are designed 20.32
to provide tornado and missile protection. The pump strainers and 20.33
discharge valves also are located in the vault area. The storage 20.34
tank vents are located outside the vaults and terminated at 6 feet
above finished ground grade in tornado and missile proof 2-foot thick 20.35
reinforced concrete labyrinth enclosures. The labyrinth enclosures 20.36
preclude the entrance of water into the fuel oil tanks through the
vents. The common discharge line from each storage tank's transfer 20.37
pumps and the overflow line are routed underground to and from the 20.38
respective fuel oil day tank, which is located in the emergency
generator enclosure. These lines run under the concrete structure to 20.39
provide the required tornado missile protection. The fuel oil 20.40
transfer pumps may be started and stopped manually from the emergency
diesel generator panel located in the emergency generator enclosure. 20.41
The fuel oil storage tank fill lines are located outside the vaults, 20.42
terminated at an elevation of 3 feet-9 inches above finished ground 20.44
grade. The fill lines are capped and locked to preclude entrance of 20.45
water into the tanks. Should the fill lines become damaged, the fuel 20.46
oil storage tanks also can be filled from within their enclosure
through a manhole on the top of the tanks. In the event the fuel oil 20.48
storage tank enclosure area is flooded, the tanks may be filled
through their vent lines which are located well above the site flood 20.49
stage of 24 feet-6 inches (refer to Section 2.4.2.3).

The day tank vents are located and terminated 1 foot-6 inches above 20.50
the roof (elevation 51 feet-0 inches) of the emergency diesel 20.52
generator enclosure in their own tornado- and missile-proof 20.53
enclosure.

Fuel oil degradation due to the turbulence of sediment in the bottom of the fuel oil storage tank during the addition of new fuel oil is minimized by the following.

1. Normal fill line strainer (0.10 inch perforation size).

2. Fuel oil transfer pump discharge strainer (0.062 inch perforation size). The strainer is provided with a pressure differential indicating switch and alarm which activates a high differential pressure alarm on a local panel, and a local panel trouble alarm on the main board. If a high pressure differential exists that prevents sufficient fuel oil flow to the day tanks, the redundant fuel oil transfer pump will be automatically started on low-low day tank level.

3. Engine-mounted duplex fuel oil filter (.00012 to .00020 inch). The filter is provided with a pressure differential indicating switch which activates a high pressure alarm on a local panel, and a local panel trouble alarm on the main board. These filters will be frequently monitored, and filter cartridges replaced when necessary.

In addition, the fill line for each fuel oil storage tank is located a sufficient distance from the fuel oil transfer pump to enhance settling of sediment away from the pump suction.

To enable fuel oil pump testing, test piping is installed off the pump discharge downstream of the system flow elements. This piping allows fuel oil to be directed to the storage tank bypassing the diesel day tank. Normally closed valves located in the test lines prevent bypass during transfer of fuel oil to the day tanks.

The emergency generator fuel oil storage tanks and the emergency generator fuel oil day tanks are protected from corrosion by interior and exterior corrosion protective painted coatings applied in accordance with Steel Structures Painting Council Standards PA1, Paint Application Guide for Shop, Field, and Maintenance Painting; Paint 16-68T, Coal Tar Epoxy Polyamide Black (or Dark Red) Paints and Department of Defense Military Specification MIL-C-4556D, Coding Kit, Epoxy for Interior of Steel Fuel Tanks. To preclude the need for cathodic corrosion protection, underground fuel oil piping is encased in concrete, and the fuel oil storage tanks, fuel oil day tanks, and all other piping in the fuel oil transfer system are located in underground concrete vaults.

A number of design features are provided to prevent occurrence of a fire. Both the storage tank and the day tank vents are routed outside their respective areas and are equipped with flame arresters.

Temperature detectors in the storage tank, day tank, and emergency generator enclosures alarm in the control room to notify the operator of a potential fire. Operator action is required to interrupt the power supply to the transfer pumps.

Question 430.85 (Section 9.5.4)

In Section 9.5.4 provide a detailed description and operation of the fuel oil system. Specifically the filling of the day tanks from the fuel oil storage tanks, the operation of the high and low level control switches on the day tanks and the sequence of events for filling the day tanks, including selection of primary and secondary (standby) transfer pumps. You state that one of the transfer pumps on each storage tank can be powered from either Train A or Train B, and that selection of the power source is manual. From the information available and potential combination of transfer pump alignments it appears that an unnaceptable system operating arrangement could result. In order to adequately evaluate this system provide:

1. A detail description and operation of the fuel oil system including controls, their function and operation, and other instrumentation provided.

2. Discuss the sequence of events, operator action and procedures used in filling the fuel oil day tanks including selection of primary and secondary transfer pumps. In addition discuss the mode of operation of the transfer pumps.

3. A detail description of the electrical circuitry (including interlocks), special design features and potential combinations of pump cross connections achievable required operator actions, and procedures used to accomplish those potential combinations. These electrical features should be discussed in the appropriate section of Chapter 8.

4. Show for all accident and transient conditions, including those discussed in Section 9.5.4.3 of the FSAR that postulated combinations of pump selection and electrical circuits will not violate the independence criteria of GDC-17 as the result of operator action, operating procedures, and interlocks.

Response:

Refer to the responses to NRC Questions 430.32, 430.82, and 430.83, and FSAR Section 7.3.1.1.5 for the response to this question.

Revised Response:

Refer to the revised responses to 430.84 and 430.82.

Fire suppression for each of the fuel oil tank vaults is provided by a total flooding carbon dioxide system that is actuated by heat detectors. A discharge by either carbon dioxide system will be annunciated in the main control room.

There is a complete and separate fuel oil storage and transfer flow path for each emergency generator, each of which is located in a separate fire area. A fire in either flow path will not affect the operability of the other system from performing its designed task.

9.5.4.3 Safety Evaluation

As a result of the redundancy incorporated in the system design, the EDG system will provide its minimum required safety function under any one of the following conditions:

- loss of offsite power coincident with failure of one emergency generator;
- loss of offsite power coincident with maintenance outage or failure of one emergency generator fuel oil transfer pump associated with each emergency generator; and
- loss of offsite power coincident with maintenance outage or failure of either emergency generator fuel oil storage tank.

Each of the emergency generator fuel oil storage tanks is sized to store sufficient diesel fuel oil for a minimum of 3-1/2 days of continuous operation of an emergency generator at rated load. An interconnection with two normally locked-closed valves is provided between the two emergency generator fuel oil transfer pump discharge headers to facilitate the use of either tank to supply either emergency generator. A single failure will not compromise the independence of the two systems. There are no direct connections between the two systems. One pump on each tank is arranged to allow transfer from the A electrical bus to the B electrical bus, or visa versa, by means of a 480 V, seismically qualified Class 1E transfer switch manually-operated under administrative control. Diesel oil meeting ASTM 0975-1977 requirements is provided by regular and emergency fuel oil suppliers. Emergency fuel oil suppliers can deliver fuel to the site within 24 hours after being contacted. Plant procedures ensure that, within 4 hours after an LOP or postulated accident occurs, action will be taken to notify suppliers of a need for fuel oil. Four regular fuel suppliers in three different locations include: Mobil Oil (New Haven, Connecticut and Providence, Rhode Island); Amerada-Hess (New Haven); Guy's Oil Service (Niantic); and Lehigh Oil Company (Norwich). Four emergency fuel suppliers located in three different places include: Mobil Oil; Lehigh Oil; Wyatt, Inc (New Haven); and Gulf Oil (Norwich). All of these firms, both regular and emergency, can provide oil using 8000-gallon fuel trucks. The New Haven based firms (Mobil, Wyatt) can also supply fuel oil by railway tank car, if necessary.

430.83
430.84
430.85
430.74
D975

Rail routings exist which would not be subject to the detrimental effects of floods. The railroads also can clear snow from tracks as required. Land routes for trucks have proved dependable regarding the ability to keep them clean even after heavy snowstorms. Since fuel can be obtained overland through varied suppliers at different orientations (west, north, and east) from the site via Routes 1, 95, or 52, adequate fuel availability despite the potential of flooding is ensured. The site access road will not become unusable during floods, and is cleaned frequently during snowstorms. Consequently, adequate provisions exist to obtain fuel from offsite sources even in unfavorable conditions, and to extend fuel supplies for an operating single diesel generator to 7 days and beyond, as conditions require.

Additionally, should an LOP event occur, it has been estimated (see EPRI Report NP-2301) that offsite power can be restored to the site 95 percent of the time within a 24 hour period. This estimate is based on data reported for nuclear power plants within the region of the Northeast Power Coordinating Council. During the 14 years the switchyard has been in operation, the Millstone site has experienced only one LOP. This event occurred when salt spray contaminated insulators in the switchyard, causing them to flashover. These insulators have since been replaced with ones having a considerably greater creepage distance which reduces the likelihood of flashover. In addition, an automatic salt contamination monitoring system was installed at the Millstone site in 1982. This system alarms at approximately 50 percent of the contamination level from salt-induced flashovers, further reducing a repeat performance.

The transmission grid to which the Millstone switchyard is connected is a highly integrated and reliable network which has not suffered an outage since November 1965. The fact that power to the New York City and Long Island areas was lost in 1977 without affecting Connecticut further attests to the reliability of the grid.

Grid reliability combined with a high probability of restoring offsite power within 24 hours ensures that the present fuel oil storage scheme for the emergency diesel generators is adequate.

In addition, the availability and reliability of offsite fuel oil supplies to replenish fuel oil storage tanks has been demonstrated. Consequently, the Applicant believes that grid reliability and fuel availability justify the position that having a 7 day onsite fuel oil storage capability per diesel generator is not necessary. The Applicant, therefore, takes exception to this requirement in Regulatory Guide 1.137 and ANSI N195.

Each of the emergency generator fuel oil day tanks is sized to store 550 U. S. gallons of diesel fuel oil, in accordance with National Fire Protection Association (NFPA) Standards (Section 3.1). This storage capacity provides for approximately 1-1/2 hours of continuous operation of the emergency generator at rated load. When water is removed or when draining of a day tank becomes necessary, a 1 inch drain line with a normally locked closed valve located at the bottom of each tank is used. The oil is drained to a portable container and

removed from the emergency diesel generator enclosure. The portable 22.53
container is brought into the enclosure only when draining of the
tank becomes necessary.

The fuel oil day tanks and connecting piping to the fuel oil day 22.54
tanks are located a minimum distance of 18 inches 22.55
from the insulated diesel exhaust
piping to preclude contact with these hot surfaces. Fuel oil piping 22.57
to the diesel generator fuel pumps is directed to the opposite end of
the diesel, away from the insulated exhaust piping. 22.58

The fuel oil day tanks are located in an area monitored by a flame 22.59
detection system and protected with a sprinkler fire suppression 23.1
system to mitigate the consequences of an open flame in close
proximity to the fuel oil day tanks.

The day tank is designed for gravity feed to the emergency 23.2
generators. The supporting structure is equipped with a drip pan to 23.4
contain leakage of oil from the day tank. Oil level in the drip pan 23.5
is monitored by a level switch (normal power only) which provides a
signal to a high level alarm, located in the diesel enclosure, and a 23.6
common alarm in the control room, initiating operator action to drain
the drip pan. Oil in the drip pan is addressed by system design; 23.8
i.e., the oil flows by gravity from the drip pan through a 4-inch
drain line piped to the oil separator. Backflow prevention devices 23.10
preclude oil backing up out of the floor drains in the event of a day
tank rupture. Further details on this drain path are provided in the 23.11
Millstone 3 Fire Protection Evaluation Report, as referenced in 23.12
Section 9.5.1.

Each fuel oil storage tank is provided with a sump for water 23.13
collection and removal. The fuel oil storage tanks are periodically 23.14
sampled for water contamination and accumulated water, if detected,
is removed. Removal of water precludes the growth of algae which can 23.16
exist at the water-oil interface.

The sulphur content of the diesel fuel oil is 0.5 percent maximum (by 23.17
weight) to minimize corrosiveness of sulphur compounds in the diesel 23.18
engine exhaust gas. A winter blend of fuel oil is used to ensure a 23.19
cloud point in accordance with ASTM D975 and the ambient site
conditions. Fuel oil supplied to the site is first checked for water 23.21
content and sediment upon its arrival. If acceptable, it will be off 23.22
loaded from its supply source to the fuel oil storage tanks. Fuel 23.23
will be sampled for quality requirements as called out in ANSI N195
and Regulatory Guide 1.137 in accordance with Safety Technical 23.24
Specifications.

Each emergency generator fuel oil transfer pump receives power from 23.25
its associated emergency generator (Section 8.3). 23.26

9.5.4.4. Inspection and Testing Requirements

After the initial hydrostatic test on the emergency generator fuel oil supply piping at completion of construction, all active system components and controls are functionally tested periodically (Section 16.3/4.8). The diesel fuel oil is sampled periodically to determine possible contamination or deterioration of the oil in storage.

Fuel oil is sampled quarterly to determine water and sediment content. If a high level of sediment is detected, the reasons for increased levels of sediment will be determined and appropriate action taken. If algae is found to be the cause of the high level of tank sediment, a procedure will be written at that time to address its treatment. Any accumulated water detected during sampling is removed when found.

9.5.4.5 Instrument Requirements

The diesel generator fuel oil storage and transfer system operating parameters are monitored, indicated, and controlled, locally or remotely, as follows.

The following instruments and controls are located on the emergency generator panels:

- control switches and indicator lights for the emergency generator fuel oil transfer pumps,

- annunciators that alarm when the following conditions exist for the emergency generator fuel system:

    - storage tank fuel level low and high
    - transfer pump discharge strainer differential pressure high
    - day tank fuel level low
    - day tank fuel level low-low
    - day tank fuel level high
    - day tank drip pan fuel level high (connected to normal power system only)

- indicators that monitor the following parameters:

    - emergency generator fuel oil storage tank fuel level
    - emergency generator fuel oil day tank level

The following emergency generator fuel oil system parameters are monitored by the plant computer:

- fuel oil transfer pump running
- fuel oil transfer pump stopped
- fuel oil transfer pump discharge pressure
- fuel oil transfer pump discharge flow

- day tank fuel level 430.68
- storage tank fuel level

An emergency generator panel trouble annunciator is provided for panels A and B in the control room. The annunciators are energized when an alarm condition exists on the respective panel.

Emergency generator fuel oil day tank level indicators are provided on the main control board.

There are local pressure indicators on the discharge of each transfer pump and local level indicators for each fuel oil storage tank.

The fuel oil transfer pump can be manually or automatically operated. Level indicating switches located on the day tank sense high, low, and low-low levels of fuel oil. With the pump control switch in the "Auto" position, a low level condition will start the lead pump. At a low-low level, the follow (standby) pump will start. A tank high level condition will cause both pumps to stop. Level switch setpoints are determined in accordance with the guidelines of ANSI N195. 480.83

A manually-operated transfer switch is provided for one of the two transfer pumps on each storage tank. When electrical power is lost to one of the storage tank pump systems, the transfer switch disconnects that pump from its motor control center and reconnects it to the electrical supply of the other storage tank pump system. This pump is then controlled manually by a circuit breaker.

9.5.5 Emergency Diesel Engine Cooling Water System

Each of the two emergency diesel engines is cooled by the jacket water and the intercooler water systems (Figure 9.5-3).

9.5.5.1 Design Bases

The redundant engine jacket water and intercooler water subsystems are joined at the common expansion tank and tempering valve V3A. The system as a whole is completely self-contained within a closed-loop. These systems are cooled by the service water system (Section 9.2.1). Only the jacket and intercooler cooling water are used for cooling the various engine components. The service water supply does not interface with the cooling water systems, except at the cooling water heat exchangers. 430.92 430.101

The engine-driven water circulating pumps (3EGS*P3 and 3EGS*P1) are of adequate capacity to limit the temperature of the jacket cooling water leaving the engine to the engine manufacturer's specified limit of 165°F, and to maintain the temperature of the intercooler water leaving the air cooler water heat exchanger to 120°F under all conditions based on the extremes of the service water temperature (Section 9.2.1). 430.101

NRC Letter: May 31, 1983

Question Q430.88 (Section 9.5.4)

Section 9.5.4.3 states that "the supporting structure of the day tank is equipped with a drip pan of sufficient capacity to hold the entire contents of the day tank." Figure 9.5-2 of the FSAR shows a platform underneath the day tanks; it is assumed that this is the drip pan. This figure also shows a line coming off the platform labeled "to 55 gallon drum." Indicate whether the 55 gallon drum is located inside or outside of the diesel generator room, and show its location. Describe the operation of the day tank drainage system and the procedures that will be used when in operation to prevent an oil spill and resulting fire hazard in the diesel generator area.

Response:

Refer to revised FSAR Section 9.5.4.3 and revised Figure 9.5-2 for the response to this question.

The day tank drainage system was considered in the Fire Hazards Analysis provided in Section 5 of the Fire Protection Evaluation Report.

Refer also to the response to the Fire Protection Draft SER Item No. 88 (FP-21) submitted by NNECO to the NRC March 23, 1984 (Letter No. B11070).

Rail routings exist which would not be subject to the detrimental effects of floods. The railroads also can clear snow from tracks as required. Land routes for trucks have proved dependable regarding the ability to keep them clean even after heavy snowstorms. Since fuel can be obtained overland through varied suppliers at different orientations (west, north, and east) from the site via Routes 1, 95, or 52, adequate fuel availability despite the potential of flooding is ensured. The site access road will not become unusable during floods, and is cleaned frequently during snowstorms. Consequently, adequate provisions exist to obtain fuel from offsite sources even in unfavorable conditions, and to extend fuel supplies for an operating single diesel generator to 7 days and beyond, as conditions require.

Additionally, should an LOP event occur, it has been estimated (see EPRI Report NP-2301) that offsite power can be restored to the site 95 percent of the time within a 24 hour period. This estimate is based on data reported for nuclear power plants within the region of the Northeast Power Coordinating Council. During the 14 years the switchyard has been in operation, the Millstone site has experienced only one LOP. This event occurred when salt spray contaminated insulators in the switchyard, causing them to flashover. These insulators have since been replaced with ones having a considerably greater creepage distance which reduces the likelihood of flashover. In addition, an automatic salt contamination monitoring system was installed at the Millstone site in 1982. This system alarms at approximately 50 percent of the contamination level from salt-induced flashovers, further reducing a repeat performance.

The transmission grid to which the Millstone switchyard is connected is a highly integrated and reliable network which has not suffered an outage since November 1965. The fact that power to the New York City and Long Island areas was lost in 1977 without affecting Connecticut further attests to the reliability of the grid.

Grid reliability combined with a high probability of restoring offsite power within 24 hours ensures that the present fuel oil storage scheme for the emergency diesel generators is adequate.

In addition, the availability and reliability of offsite fuel oil supplies to replenish fuel oil storage tanks has been demonstrated. Consequently, the Applicant believes that grid reliability and fuel availability justify the position that having a 7 day onsite fuel oil storage capability per diesel generator is not necessary. The Applicant, therefore, takes exception to this requirement in Regulatory Guide 1.137 and ANSI N195.

Each of the emergency generator fuel oil day tanks is sized to store 550 U. S. gallons of diesel fuel oil, in accordance with National Fire Protection Association (NFPA) Standards (Section 3.1). This storage capacity provides for approximately 1-1/2 hours of continuous operation of the emergency generator at rated load. When water is removed or when draining of a day tank becomes necessary, a 1 inch drain line with a normally locked closed valve located at the bottom of each tank is used. The oil is drained to a portable container and

removed from the emergency diesel generator enclosure The portable 22.53
container is brought into the enclosure only when draining of the
tank becomes necessary.

The fuel oil day tanks and connecting piping to the fuel oil day 22.54
tanks are located a minimum distance of 28 inches 22.55
from the insulated diesel exhaust
piping to preclude contact with these hot surfaces. Fuel oil piping 22.57
to the diesel generator fuel pumps is directed to the opposite end of
the diesel, away from the insulated exhaust piping. 22.58

The fuel oil day tanks are located in an area monitored by a flame 22.59
detection system and protected with a sprinkler fire suppression 23.1
system to mitigate the consequences of an open flame in close
proximity to the fuel oil day tanks.

The day tank is designed for gravity feed to the emergency 23.2
generators. The supporting structure is equipped with a drip pan to 23.4
contain leakage of oil from the day tank. Oil level in the drip pan 23.5
is monitored by a level switch (normal power only) which provides a
signal to a high level alarm, located in the diesel enclosure, and a 23.6
common alarm in the control room, initiating operator action to drain
the drip pan. Oil in the drip pan is addressed by system design; 23.8
i.e., the oil flows by gravity from the drip pan through a 4-inch
drain line piped to the oil separator. Backflow prevention devices 23.10
preclude oil backing up out of the floor drains in the event of a day
tank rupture. Further details on this drain path are provided in the 23.11
Millstone 3 Fire Protection Evaluation Report, as referenced in 23.12
Section 9.5.1.

Each fuel oil storage tank is provided with a sump for water 23.13
collection and removal. The fuel oil storage tanks are periodically 23.14
sampled for water contamination and accumulated water, if detected,
is removed. Removal of water precludes the growth of algae which can 23.16
exist at the water-oil interface.

The sulphur content of the diesel fuel oil is 0.5 percent maximum (by 23.17
weight) to minimize corrosiveness of sulphur compounds in the diesel 23.18
engine exhaust gas. A winter blend of fuel oil is used to ensure a 23.19
cloud point in accordance with ASTM D975 and the ambient site
conditions. Fuel oil supplied to the site is first checked for water 23.21
content and sediment upon its arrival. If acceptable, it will be off 23.22
loaded from its supply source to the fuel oil storage tanks. Fuel 23.23
will be sampled for quality requirements as called out in ANSI N195
and Regulatory Guide 1.137 in accordance with Safety Technical 23.24
Specifications.

Each emergency generator fuel oil transfer pump receives power from 23.25
its associated emergency generator (Section 8.3). 23.26

9.5.4.4. Inspection and Testing Requirements

After the initial hydrostatic test on the emergency generator fuel oil supply piping at completion of construction, all active system components and controls are functionally tested periodically (Section 16.3/4.8). The diesel fuel oil is sampled periodically to determine possible contamination or deterioration of the oil in storage.

Fuel oil is sampled quarterly to determine water and sediment content. If a high level of sediment is detected, the reasons for increased levels of sediment will be determined and appropriate action taken. If algae is found to be the cause of the high level of tank sediment, a procedure will be written at that time to address its treatment. Any accumulated water detected during sampling is removed when found.

9.5.4.5 Instrument Requirements

The diesel generator fuel oil storage and transfer system operating parameters are monitored, indicated, and controlled, locally or remotely, as follows.

The following instruments and controls are located on the emergency generator panels:

- control switches and indicator lights for the emergency generator fuel oil transfer pumps,
- annunciators that alarm when the following conditions exist for the emergency generator fuel system:
  - storage tank fuel level low and high
  - transfer pump discharge strainer differential pressure high
  - day tank fuel level low
  - day tank fuel level low-low
  - day tank fuel level high
  - day tank drip pan fuel level high (connected to normal power system only)
- indicators that monitor the following parameters:
  - emergency generator fuel oil storage tank fuel level
  - emergency generator fuel oil day tank level

The following emergency generator fuel oil system parameters are monitored by the plant computer:

- fuel oil transfer pump running
- fuel oil transfer pump stopped
- fuel oil transfer pump discharge pressure
- fuel oil transfer pump discharge flow

Question 430.107 (Section 9.5.6)

Diesel generators in many cases utilize air pressure or air flow devices to control diesel generator operation and/or emergency trip functions such as air operated overspeed trips. The air for these controls is normally 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 functions (air pressure and/or flow), a failure modes and effects analysis, and the necessary P&ID's 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 non-seismic 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 L.O.P., 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 rely on 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 provide assurance that it can perform for a period of seven days or longer.

Response:

Refer to revised FSAR Sections 9.5.6.3 and 9.5.6.5 for the response to this question.

The Staff's concern on depleting the air in the air start system while trying to start the engine is addressed in the response to NRC Question 430.104 and FSAR Section 9.5.6.2. (Amendment 4)

Resetting of diesel engine while an automatic start signal is inserted will be addressed in operating procedures and operator training.

There is no sharing of starting air system components between the two emergency generators. A complete failure in one emergency generator starting air system will not lead to a failure of the other emergency generator to start. A single active failure in either of the emergency generator's redundant starting air systems will not lead to the loss of the other redundant starting air system.

Protection from floods, tornadoes, and missiles is discussed in Sections 3.4.1, 3.3, and 3.5, respectively. Protection from high and moderate energy pipe breaks is discussed in Section 3.6.1.

The emergency generator starting air system is Seismic Category I, as defined in Regulatory Guide 1.29 (Section 3.2.1), Safety Class 3, and designed to Quality Group C Standards (Regulatory Guide 1.26, Section 3.2.2), to the extent possible. Engine-mounted components and the starting air compressors which are not covered in the rules of ASME III, Code Class 3 are designed in accordance with the diesel manufacturer's latest standards for reliability. These components include the following:

- Engine-mounted air start distributors;
- Engine-mounted air start valves;
- Engine-mounted starting booster air valve;
- Engine-mounted fuel rack shutdown and starting booster servo; and
- Engine-mounted piping and valves supplying air-to-jacket water system air-operated valves (Section 9.5.5) which are not required for performance of safety-related functions of the emergency generator.

The Seismic Category I starting air receiver tanks are of sufficient capacity to start the emergency diesel generator and operate the engine controls for at least 7 days. Starting air system leakage will be determined at a minimum by periodic evaluation of the compressor cycling period. If the cycling period goes beyond acceptable range, the system will be repaired.

Any failure that results in a loss of control air pressure to the positioner of the diaphragm-operated three-way valve would cause the valve to go into its safe position to fully open and will not cause failure or shutdown of the diesel generator.

In addition, a 0.19 ft^3 capacity, 450 psig design pressure, ASME III, Class 3 air tank is provided in the air supply line to each servo fuel rack shutdown and starting booster solenoid valve (3EGA*SOV25A&B). A check valve isolates the tank from the main starting air system. The air tanks are provided to ensure a source of air for positive fuel shut off in the event of loss of all starting air pressure in the main starting air system. However, a

loss of this air will not result in the failure or shutdown of the emergency diesel generator.

9.5.6.4 Inspection and Testing Requirements 29.55

Test connections have been provided on the interconnecting piping 29.57
between the emergency generator and starting air tanks. This enables 29.60
the operator to manually bleed the storage tanks, and periodically, 30.1
to test and check startup of the starting air compressors.

Moisture and other contaminants which might affect the air starting 30.2
system will be removed by periodic blowdown of the air storage tank. 30.3
Other plant operating procedures consistent with the recommendations 30.4
of the diesel manufacturer will be developed to ensure proper 30.5
functioning of the air starting system.

Section 8.3.1 discusses the emergency generator functional testing 30.6
requirements.

9.5.6.5 Instrumentation Requirements 30.8

Each air compressor is equipped with a manual control switch and 30.9
indicator lights, located on the motor control center. A pressure 30.11
switch on the air receiver tank automatically starts and stops each
compressor. This switch is set to start the compressor when the tank 30.12
pressure drops below the low setpoint pressure of 375 psig and to 30.13
stop the compressor when the pressure reaches the high setpoint
pressure of 425 psig. Relief valves on the receiver tanks and at 30.14
each compressor discharge are set at 450 psig to protect the system
from overpressurization. The compressor motor is also protected 30.16
against thermal overload.

If the receiver tank pressure drops to the low-low setpoint pressure 30.17
of 350 psig, the condition actuates an alarm an the respective 30.18
emergency generator panel and the emergency generator trouble alarm
on the main control board. Each receiver tank is also provided with 30.19
a local pressure indicator. In the event receiver tank pressure 30.20
drops to its low-low setpoint (350 psig) and the compressor is not
available to recharge the receivers, the receivers still will be able 30.21
to supply a sufficient quantity of air for a minimum of 5 starts in 30.22
10 seconds or less per start. This is based on interpollation of 30.23
test data provided in Table 9.5-11.

A control air system is connected to the starting air system 30.24
(Figure 9.5-3) to provide a source of air for operation of different 30.25
components in the jacket coolant temperature control system and the
shutdown control system.

The jacket coolant temperature control system consists of a 30.26
temperature transmitter, a temperature controller, and a diaphragm 30.27
operated three-way valve with a positioner. Both the temperature 30.28
transmitter and the temperature controller are supplied with air at
20 psi from the starting air system. 30.29

The temperature transmitter delivers an output signal between 3 and 30.30
15 psi as the temperature of the jacket coolant discharge from the 30.31
engine varies between 100°F and 200°F. A temperature of 100°F will 30.32
produce a temperature transmitter output signal of 3 psi while a
temperature of 200°F produces a 15 psi output signal. 30.33

The temperature controller receives the 3 to 15 psi output signal 30.34
from the temperature transmitter and develops its own 3 to 15 psi 30.35
output signal that controls the positioner of the diaphragm operated
three-way valve. The controller gives decreasing output pressure 30.36
with increasing input pressure (reverse acting) that will cause the
valve to go into full cooling with a loss of air pressure (fail 30.37
safe).

The diaphragm operated three-way valve is controlled by a positioner 30.38
that receives the controller output pressure and air at 45 psi from 30.39
the starting air system. This causes the valve to open and close its 30.40
ports to control the flow of jacket coolant through the heat
exchanger or divert the coolant around the heat exchanger so that the 30.41
temperature of the coolant discharged from the engine will remain at 30.42
the value set into the controller at all loads and ambient
temperatures. The port controlling the flow of jacket coolant into 30.43
the shell side of the heat exchanger is fully open when the
positioner receives a controller output pressure of 3 psi or less and 30.44
fully closed with a controller output pressure of 15 psi. Pressures 30.46
between 3 and 15 psi will result in both ports being partially open.

The shutdown control is also governed by the control air and starting 30.47
air systems.

The shutdown control consists of an air cylinder and an oil cylinder 30.48
in a two-compartment body. The air cylinder (linkage end) has 30.49
connection to the starting air control pressure. During starting, 30.50
the starting air pressure expands the cylinder by moving the piston
which moves the linkage to the injection pump to admit fuel to the 30.51
engine.

Control air pressure is connected to the cylinder opposite to the rod 30.52
end through a line containing a shutdown solenoid valve. The engine 30.54
is stopped when the shutdown solenoid valve admits enough control air
pressure against the piston to move the piston which will move the 30.55
injection pump linkage to the "no fuel" position.

9.5.7 Emergency Diesel Engine Lubrication System 30.57

Each emergency diesel engine lubrication system (Figure 9.5-3) 30.58
lubricates and cools various emergency diesel engine components. 30.60

9.5.7.1 Design Bases 31.3

The engine-driven lubricating oil and rocker-arm lubricating oil 31.4
pumps have sufficient capacity to ensure adequate lubrication of main 31.5
bearings, crank pins, camshaft bearings, valve gear, rocker arms, and 31.7

NRC Letter: May 31,1983

Question Q430.109 (Section 9.5.6)

The air starting system for your plant is defined as a high energy system. A high energy line pipe break in the air starting system of one diesel generator, plus any single active failure in any auxiliary system of the other diesel generator will result in loss of all onsite ac power. This is unacceptable. Provide the following information.

a. Assuming a pipe break at any location in the high energy portion of the air start system, demonstrate that no damage from the resulting pipe whip, jet impingement, or missiles (air receivers, or engine mounted air tanks) will occur on either of the two diesel generators or their auxiliary systems.

b. Section 9.5.6.3 states that the air receivers, valves, and piping to the engine are designed in accordance with ASME Section III Class 3 (Quality Group C) requirements to the extent possible. This is partially acceptable. We require the entire air starting system from the compressor discharge up to and including all engine mounted air start piping, valves and components be designed to Seismic Category I, ASME Section III Class 3 (Quality Group C) requirements. Show that you comply with this position.

Response:

See Response to Question 430.76

Single Failure Criterion

A single active component failure is assumed to occur in essential systems used to mitigate consequences of the postulated piping failure and to shut down the reactor. The single active component 430.76
failure is assumed to occur in addition to the postulated piping 430.109
failure and any direct consequences of the piping failure, such as unit trip and loss of offsite power. Section 3.1.1 defines this failure criterion and its applications.

Loss of Offsite Power

Offsite power is assumed unavailable if a trip of the turbine 430.76
generator system or reactor protection system is a direct consequence 430.109
of the postulated piping failure. However, a single failure of one emergency generator or one Class IE bus can be assumed as the single failure if this assumption is the most limiting.

Seismic Event 430.76 430.109

Credit for mitigating the consequences of a postulated event may be taken only for those systems and components designed to Seismic Category I requirements.

All available systems, including those actuated by operator actions, are used to mitigate the consequences of a postulated event. Judging the availability of systems includes consideration of the postulated failure and its direct consequences (e.g., unit trip and loss of offsite power) and the assumed single active component failure plus its direct consequences. The feasibility of the operator to take action is judged on the availability of ample time and adequate access to equipment for performing the proposed actions. Regulatory Guide 1.62 provides guidance in evaluating the feasibility of operator action.

3.6.1.3.2 Failure Mode and Effects

An analysis of breaks in high energy systems, cracks in moderate energy systems, and the consequent failure modes and effects (e.g., environmental, pipe whip, and jet impingement) must include consideration of their sources and targets. The source comprises the pipe which is postulated to fail and the resulting effects of the failure. The target comprises structures, systems, and components considered essential for shutting down the plant safely, maintaining the safe shutdown, and mitigating the effects of the postulated pipe failure.

Interactions between sources and targets are analyzed individually to determine how each affects essential equipment in the area of the source. The interactions analyzed are pipe whip, jet impingement, and environmental effects.

NRC Letter: May 31, 1983 1.8

Question Q430.114 (Section 9.5.7) 1.11

Describe the instrumentation, controls, sensors and alarms provided 1.12
for monitoring the diesel engine lubrication oil system and describe 1.13
their function. Describe the testing necessary to maintain a highly 1.14
reliable instrumentation, control, sensors, and alarm system and
where the alarms are annunciated. Identify the temperature, 1.16
pressure, and level sensors which alert the operator when these
parameters exceed the ranges recommended by the engine manufacturer 1.17
and describe any operator action required during alarm conditions to
prevent harmful effects to the diesel engine. Discuss systems 1.19
interlocks provided. Revise your FSAR accordingly. 1.20

Response: 1.21

1. Refer to revised FSAR Section 9.5.7.5 for a description of the 1.23
   instrumentation, controls, sensors, and their functions. 1.24

   Testing will comply with requirements stated in IEEE 1.26
   Standards 279-1971 and 338-1971 (refer to FSAR Sections 7.1.2.11 1.27
   and 7.3.1.1.5), and a minimum calibration frequency of once every
   18 months or more frequently as specified in Millstone Station 1.28
   Procedures.

2. Refer to FSAR Chapter 16 and Section 8.3.1.1.3 Items 2 and 3 for 1.31
   testing.

3. Refer to revised FSAR Section 9.5.7.5 for location of alarms. 1.32

4. Refer to revised FSAR Section 9.5.7.5 for identification of 1.33
   instrumentation.

5. Millstone 3 operating procedures address actions to be taken in 1.34
   response to alarm conditions. These actions are consistent with 1.35
   the engine manufacturer's guidelines and prevent harmful effects
   to the diesel engine. Copies of these operating procedures will 1.37
   be available for NRC review 60 days prior to system turnover.

6. Refer to revised FSAR Section 9.5.7.5 and FSAR Section 8.3.1.1.3 1.38
   for interlocks that trip engine on low lube oil pressure or on 1.39
   high lube oil temperature.

and valves. The subsystem will be normally isolated by locked closed ASME III isolation valves. The loop will only be used during the monthly diesel engine testing.

On detection of moisture, the detector will annunciate a "local panel trouble" alarm on the main control board and actuate an alarm on the local board located in the emergency generator enclosure.

Addition of lubricating oil will be done by trained maintenance personnel using procedures developed and proven satisfactory during the preoperational and startup test program to prevent entry of deleterious materials into the engine lubrication oil system.

The diesel engine prelubrication system is self-contained and integral to the diesel engine. Continuous operation is permitted in accordance with the manufacturer's recommendations. The "V" design of the diesel engine allows for lubricating oil to continuously drain down to the engine sump. This prevents the buildup of lubricating oil in the cylinders which could be blown into the exhaust system on engine start. The turbocharger lubricating system is self-contained and does not get its supply from the engine oil header thus preventing buildup of oil in the turbocharger housing during prelubrication of the engine.

Each diesel engine prelubrication system is periodically inspected during plant operation for possible leakage. This ensures against any dangerous accumulations of lubricating oil that could ignite during continuous prelubrication.

The prelubrication period for the rocker arm lubricating system is 2 minutes prior to any manual start which is in accordance with the recommendations of the diesel engine manufacturer.

9.5.7.4 Inspection and Testing Requirements

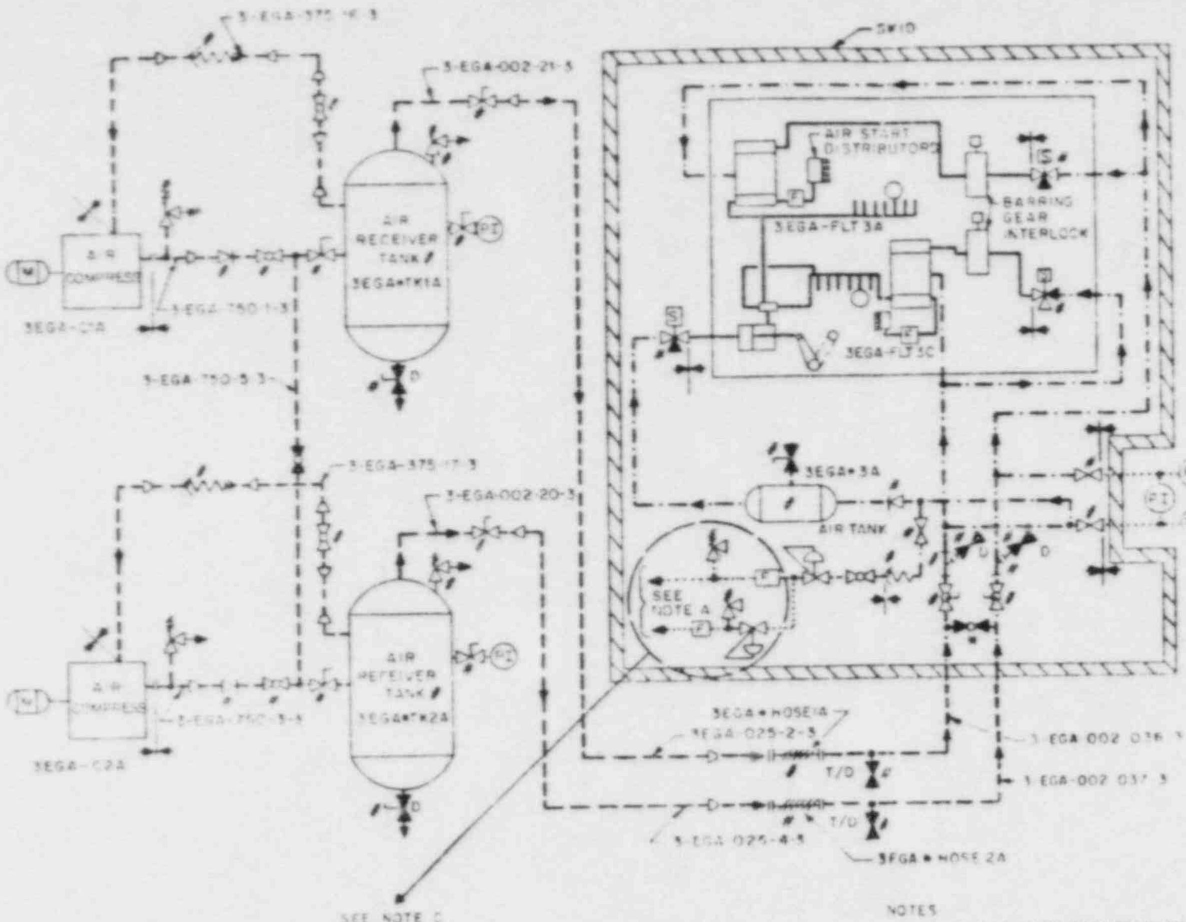
Section 8.3 discusses emergency generator inspection and testing requirements.

9.5.7.5 Instrumentation Requirements

Section 8.3 discusses emergency generator protective trips and trip circuit bypasses. Refer to Chapter 16, Technical Specifications, for periodic tests of active components.

A low lubricating oil level alarm is provided to alert personnel when the lubricating oil level in the sump falls below the manufacturer's recommended minimum level.

A high-pressure alarm is provided to alert personnel when the pressure in the crankcase exceeds the manufacturer's recommended high-pressure limit.



LEGEND

1 OFF SKID (— — — —) ALL NON-MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN [illegible] SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3

2 ON SKID (— · — · —) ALL MANUFACTURER SUPPLIED PIPING AND VALVES REQUIRED TO PERFORM AN OPERATIONAL SAFETY FUNCTION ARE DESIGNED TO ASME III, CLASS 3

(- - - - - - -) ALL MANUFACTURER [illegible] PIPING AND VALVES [illegible] TO PERFORM A PRESSURE BOUNDARY SAFETY FUNCTION ARE [illegible] TO THE MANUFACTURER'S STANDARD AND ARE SEISMIC CATEGORY I

3 ENGINE MOUNTED (———) INTEGRAL WITH THE ENGINE AND ARE DESIGNED TO THE MANUFACTURER'S STANDARD

4 CODE CHANGE

ASME III VALVES AND EQUIPMENT

NOTES

A. PIPING RUNS TO TEMPERATURE CONTROL SYSTEM OF THE JACKET WATER SYSTEM AND IS OF SAME PIPE CLASSIFICATION

B. PIPING FOR DIESEL A SHOWN, DIESEL B IS SIMILAR

C. ALL PORTIONS OF THE AIR START SYSTEM ARE HIGH ENERGY EXCEPT THE CIRCLED AREA

FIGURE Q430.73-4
PIPING CLASSES OF THE AIR START SYSTEM
[illegible] NUCLEAR POWER STATION UNIT [illegible]
FINAL SAFETY ANALYSIS REPORT

A high level alarm switch is provided to alert personnel when the oil level in the separate rocker arm lubricating oil tank exceeds the manufacturer's recommended maximum.

A low-pressure alarm on the local panel and a local panel trouble alarm on the main control board are provided to alert personnel when the rocker arm lubricating oil pressure falls below the manufacturer's recommended minimum. Upon actuation of this alarm, the rocker arm lube oil reservoir level and the rocker arm lube oil duplex filter pressure differential will be checked and corrective action taken to maintain operability of the rocker are lube oil system. In addition, the rocker arm lube oil reservoir level will be checked daily on operating engines, and prior to any manual start.

Actuation of the low lube oil pressure switch will energize an annunciator and give an alarm that the lubricating oil pressure has reached a dangerously low level. Actuation of any 2 of these low lube oil pressure switches will shutdown the engine.

High- and low-temperature alarms are provided to alert personnel when the oil temperature rises above, or falls below, the operating range recommended by the manufacturer.

The following annunciators are on each emergency generator local panel:

- moisture detector circulating pump motor thermal overload or loss of control power.
- lube oil moisture content high
- rocker arm lube oil pressure low
- crank case pressure high
- lube oil sump temperature low
- lube oil sump level low
- lube oil temperature high
- rocker arm reservoir level high
- lube oil pressure low

An emergency generator local panel trouble annunciator for each panel is located on the main control board and is alarmed whenever a respective local panel annunciator is alarmed.

9.5.8 Emergency Generator Combustion Air Intake and Exhaust System

The emergency generator combustion air intake and exhaust system supplies filtered air to the emergency diesel engine for combustion and releases exhaust gases to atmosphere (Figure 9.5-3).

NRC Letter: May 31, 1983

Question Q430.131 (Section 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 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.

Response:

All panels, except the control panel, that house electrical, controls, and instrumentation equipment associated with starting the diesel generators are attached to the diesel generator skid and are NEMA 3 or 12 type, dusttight. The free standing control panel is a NEMA 3 ventilated enclosure. However, louvers are provided with this panel.

All air filters will be inspected and cleaned as necessary on a weekly basis in accordance with the normal station housekeeping procedure. The interior of the control panel wil be cleaned using low pressure air on a weekly basis, as required. The diesel generator enclosure floor slab will be treated with an appropriate sealant to preclude concrete dust.

In addition, the immediate area near the diesel generator enclosure where combustion and ventilation air intakes are located will be concrete paved to minimize dust entrainment.

Open Items

Auxiliary Systems Branch

ASB-15 Dust Accumulation in Diesel Generator Building (Draft SER Section 9.4.6)

The applicant has not provided sufficient information regarding protection from dust accumulation; the staff, therefore, cannot conclude that it meets the requirements of GDC 17 regarding protection from unacceptable dust collection in accordance with the guidelines of NUREG/CR-0660. This is an open item.

Response (4/84)

Refer to a response to NRC Question No 430.131.

Question 430.133 (Section 9.5.8)

Diesel generators for nuclear power plants should be capable of operating at maximum rated output under various service conditions. For no load and light 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 designated to deliver rated load including the following:

   Service conditions

   1. Ambient air intake temperature range - °F

   2. 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. In light of recent weather conditions (subzero temperatures), discuss the effects low ambient temperature 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. Also provide assurance that the engine jacket water and lube oil preheat systems have the capacity to maintain the diesel engine at manufacturer's recommended standby temperatures with minimum expected ambient conditions. If the engine jacket water and lube oil preheat systems capacity is not sufficient to do the above, discuss how this equipment will be maintained to do the above, discuss how this equipment will be maintained at ready standby status with minimum ambient temperature.

d. Provide the manufacturer's design data for ambient pressure vs. engine derating.

e. Discuss the effects of any other service and weather conditions will have on engine operation and output, i.e., dust storm, air restriction, etc.

Response:

a.1. Ambient air intake range is -17°F to 102°F.

a.2. Maximum relative humidity is 100 percent.

b. According to the manufacturer, engines are rated on a basis of long-term effects on the life of the engine due to altitude and ambient temperatures. The manufacturer has provided assurance that hurricanes and tornados are considered short-term conditions and are of no consequence to the rate or capability of these units. In addition, from data provided by the manufacturer, there would be no long term derating of the units for ambient pressures of 26 inches Hg or above.

c. The diesel engines level of degradation vs. percentage of full load applied to a full speed no load condition with low ambient intake air temperatures has been confirmed. The diesel engine manufacturer states that there is no degradation of the diesel engines ability to accept and carry load after operation at full speed no load condition at low ambient intake air temperatures.

In addition, the manufacturer has assured that air preheating is not required.

The engine jacket water system is heated by an 18 kW electrical heater. The water is circulated by the standby jacket coolant motor-driven pump. The jacket water temperature is controlled between 105°F, and an alarm sounds if the jacket water temperature reaches 95°F.

The lube oil system is heated by a 15 kW heater with circulation provided by the motor-driven prelube and filter pump. The lube oil is controlled between 120°F and 125F at the heater, and an alarm is given if the lube oil temperature in the oil sump reaches 110°F.

These keep-warm systems have sufficient capacity to maintain the diesel engine at the manufacturer's recommended standby temperatures at minimum expected ambient conditions. Refer to the response to NRC Question 430.122 for measures that may be taken in the event of a failure of the emergency diesel generator enclosure heating system to maintain the minimum expected ambient conditions above 50°F.

d. Manufacturer derating data is applicable on a long-term basis for the altitude derating and is not applicable to short-term phenomena such as tornados, hurricanes, tropical storms, or other weather depressions.

e. There are no adverse effects from other service or weather conditions on engine operation.

Refer to FSAR Sections 9.5.4.2 and 9.5.8.3, and the responses to NRC questions 430.19, 430.70, 430.81, 430.91, 430.120, 430.126, 430.129, and 430.134 for additional discussions of service and weather conditions on diesel operation.

NRC Letter: May 31, 1983

Question Q430.134 (SRP Section 9.5.8)

You state in Section 9.5.8.3 that damage to the exposed portions of the diesel exhaust pipe by tornado missiles has been considered. An access hatch in the exhaust ductwork, which will be manually opened during ~~tornado~~ alerts, functions as an exhaust bypass (secondary exhaust path) in the event of tornado missile damage to the exhaust system. This is an acceptable design. However, Figure 9.5.4 of the FSAR shows the location of the exhaust access hatch in relation to the exhaust ductwork and the exhaust plenum openings.

a. From the drawings, a tornado missile, entering either the 66" x 100" or the 48" x 168" plenum openings, could cause sufficient damage to exhaust ductwork and the access hatch to degrade diesel generator operation or result in the unavailability of the diesel generators. We require that the exposed portions of the exhaust stacks be tornado missile protected. Comply with this position.

b. In the event of freezing rain, ice storm, and/or a snow storm because of the location of the openings, clogging or total blockage, or the freezing shut of the access hatch could results. Describe the design features, inservice inspection procedures, and technical specifications which will preclude this event, or alter your design to address the concern.

Response:

a. Damage to the access hatch from tornado missiles is not credible. No viable missile trajectory targets the access hatch. Once the access hatch is open, exposed portions of the exhaust ductwork are not required. Damage to these exposed parts will not degrade the exhaust.

The plenum openings are sufficiently small and restricted to preclude the entrance of missiles large enough to cause the damage described. The exhaust duct is a 40 inch diameter pipe with a 3/8 inch wall thickness. It is seismicly supported to withstand the high forces and accelerations experienced during a seismic event. This design gives the exhaust duct and access hatch adequate protection against expected tornado generated missiles. The required missile trajectories necessary to cause damage to the exhaust stack coincident with the elevations required for missile damage are not credible. The proximity of adjacent buildings shields the engine's stack and further decreases the existance of a credible missile path.

b. As described in the response to NRC Question 430.129, the diesel engine exhaust is equipped with a normally open, low point drain which promotes drainage of water. Frozen precipitation is melted during the monthly diesel generator availability tests and drained through the same exhaust low point drain. It is not credible that any precipitation which could collect and freeze before passing through the drain line, would be sufficient to cause exhaust restriction due to the large exhaust pipe diameter.

Plant personnel will be instructed on procedures for opening the access hatch in the event that there is an ice or snow buildup in the exhaust pipe plenum or on the access hatch.