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

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 666-6911

April 6, 1984

Docket No. 50-423
B11114

Director of Nuclear Reactor Regulation
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 letter to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit 3, dated May 31, 1983.

Gentlemen:

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

Enclosure 3, of Reference (1) requested additional information beyond responses provided to Reference (2). Attached is a portion of those revised responses. These revised responses appear as they will in our next amendment. Attachment 1 contains the following revised responses:

430.57	430.87	430.118
430.67	430.94	430.121
430.68	430.103	430.122
430.70	430.107	430.127
430.71	430.108	430.139
430.76	430.109	
430.79	430.111	

B001
1/40

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

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Senior Vice President

W. F. Fee

By: W. F. Fee
Executive Vice President
Engineering & Operations

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

Then personally appeared before me W. F. Fee who being duly sworn, did state that he is Executive 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.

Judith Alman

Notary Public

NRC Letter: May 31, 1983 1.9

Question Q430.57 (Section 8.3) 1.12

Provide a detail discussion (or plan) of the level of training 1.13
proposed for your operators, maintenance crew, quality assurance, and 1.14
supervisory personnel responsible for the operation and maintenance
of the emergency diesel generators. Identify the number and type of 1.15
personnel that will be dedicated to the operations and maintenance of
the emergency diesel generators and the number and type that will be 1.16
assigned from your general plant operations and maintenance groups to 1.17
assist when needed.

In your discussion identify the amount and kind of training that will 1.18
be received by each of the above categories and the type of ongoing 1.19
training program planned to assure optimum availability of the
emergency generators.

Also discuss the level of education and minimum experience 1.20
requirements for the various categories of operation and maintenance 1.21
personnel associated with the emergency diesel generators.

Response: 1.22

Refer to FSAR Section 13.2 for the education, experience, and 1.23
training requirements for personnel responsible for the operation and 1.24
maintenance of the emergency diesel generators.

In addition, maintenance personnel and engineering personnel with 1.25
maintenance responsibility on emergency diesel generators will be 1.26
trained by attending a diesel school presented by the diesel
manufacturer. These individuals will be involved with the initial 1.27
preoperational and startup phases of testing of the diesel
generators. This testing will verify the adequacy of procedures, 1.29
provide training for the plant staff, and ensure optimum availability 1.30
of the diesel generators. Equivalent diesel school training will be 1.31
conducted periodically to provide continuing system familiarity as
well as indoctrinate new personnel in diesel maintenance procedures. 1.32
Operating personnel training on diesel generator systems is covered 1.33
in site school. All personnel receive on-the-job training prior to 1.34
performing operations or maintenance on the diesel generator.

NRC Letter: May 31, 1983

Question Q430.67 (Section 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8)

Section 1.2 of the FSAR does not provide any plant plan or elevation drawings. These drawings are necessary to evaluate the adequacy of the diesel generator equipment and its facility with regards to conformance with General Design Criteria 2, 4, 5, and 17 and the Regulatory Guides, NUREGs, and other acceptance criteria in the Standard Review Plans. Provide a plot plan and plan, elevation and sectional elevation drawings of the Millstone emergency diesel generator facility. The drawings shall include: location of the diesel generator and its components (pumps, tanks, air receivers, etc), details and location of the air intake and exhaust structures, locations of any gas (hydrogen, nitrogen, CO_2 etc) tanks located on site, locations and heights of surrounding buildings, and routings of major piping systems within the diesel generator facility (fuel oil, air intake and exhaust systems).

Further Information Requested:

Provide cross reference between equipment names and equipment tag numbers shown on Figure 3.8-66.

Response:

Refer to revised FSAR Figures 1.2-2 and 3.8-66 for the response to this question.

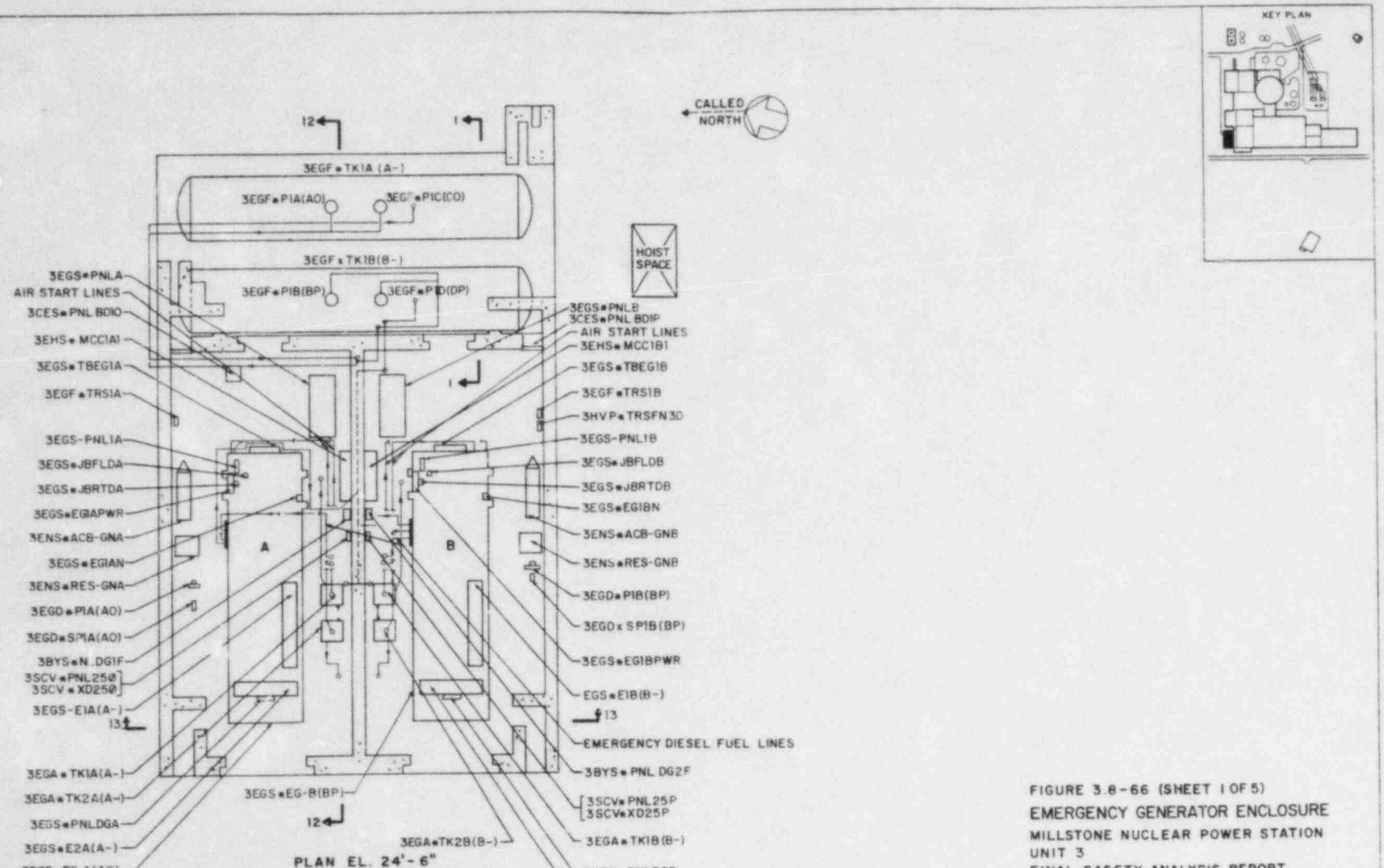
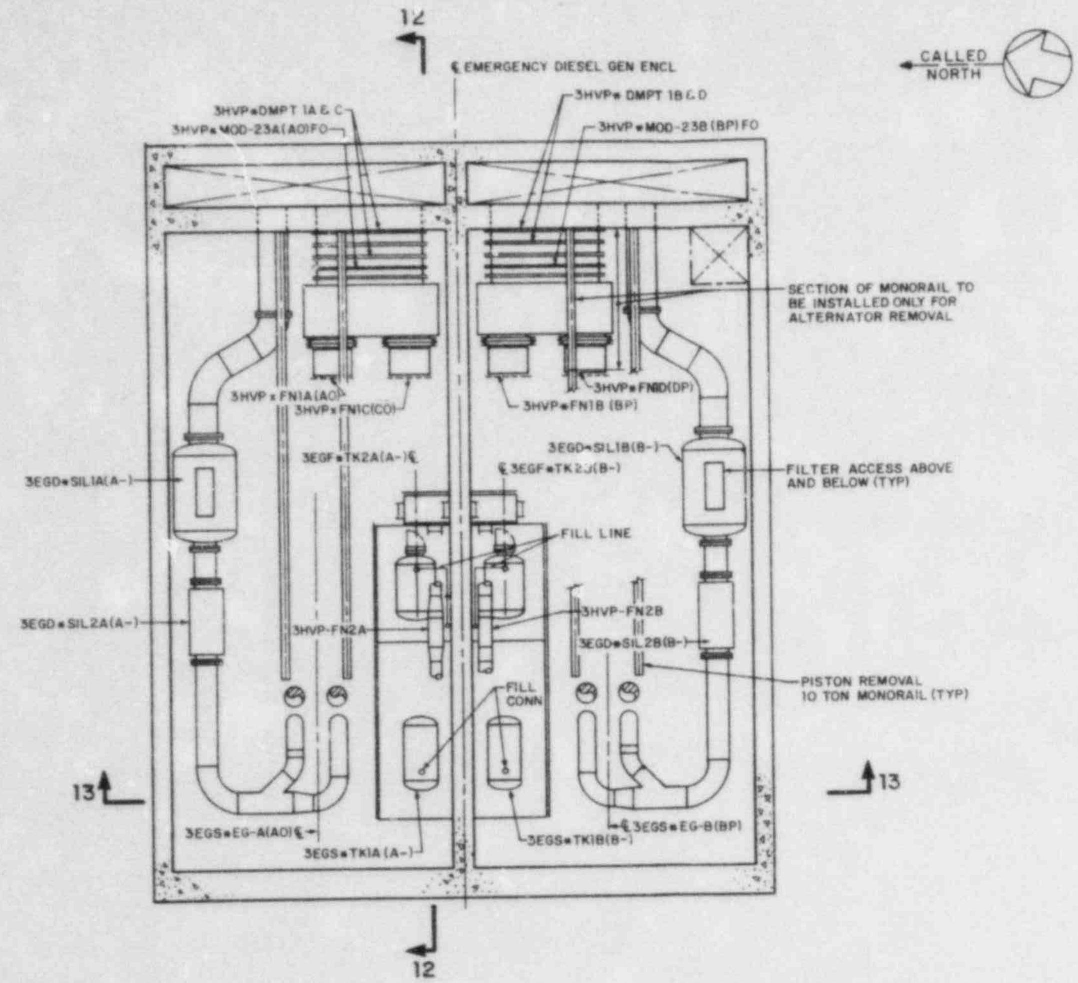


FIGURE 3.8-66 (SHEET 1 OF 5)
EMERGENCY GENERATOR ENCLOSURE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT



PLAN EL. 37'-0 1/4"

FIGURE 3.8-66 (SHEET 2 OF 5)
EMERGENCY GENERATOR ENCLOSURE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

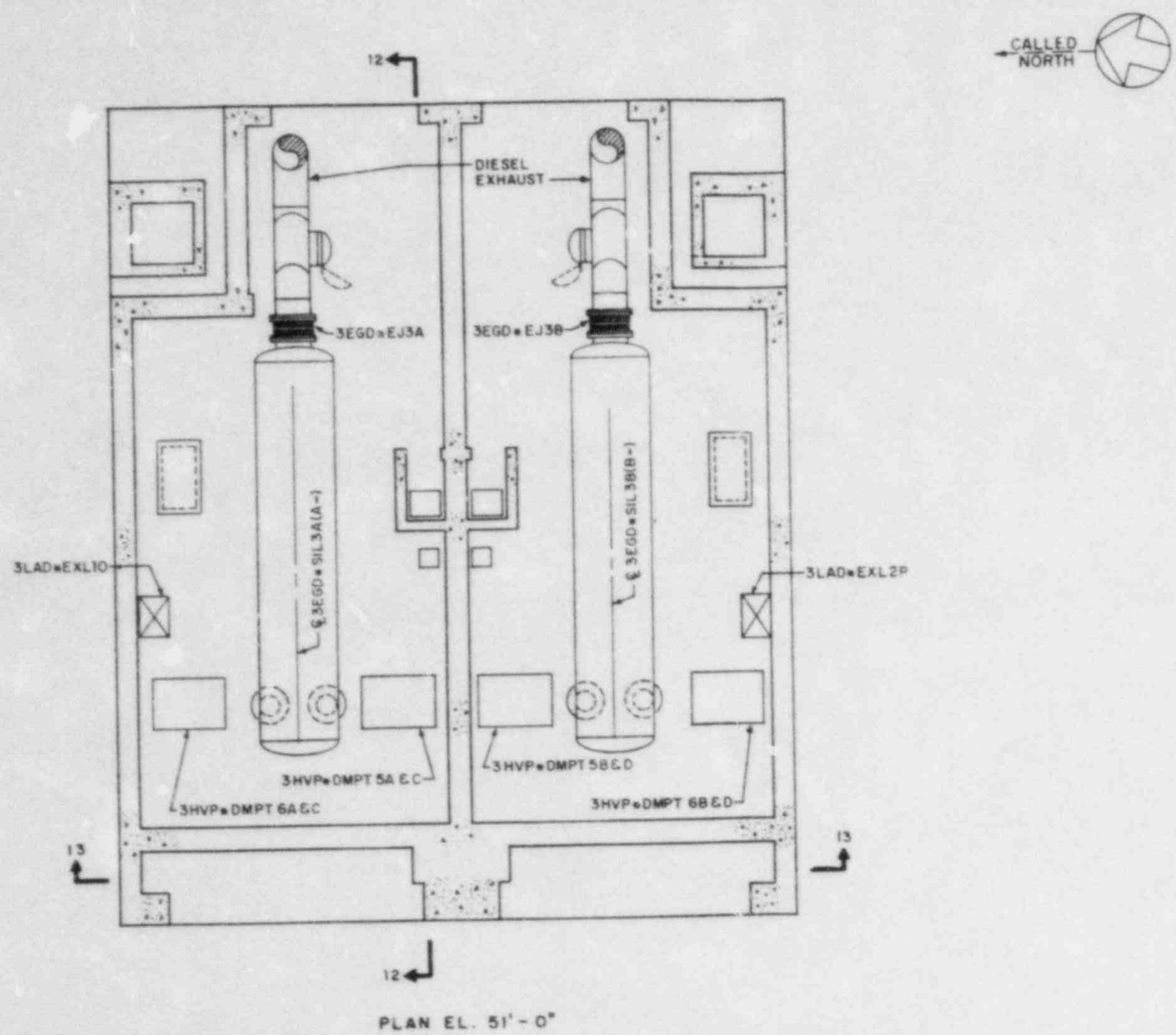


FIGURE 3.8-66 (SHEET 3 OF 5)
EMERGENCY GENERATOR ENCLOSURE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

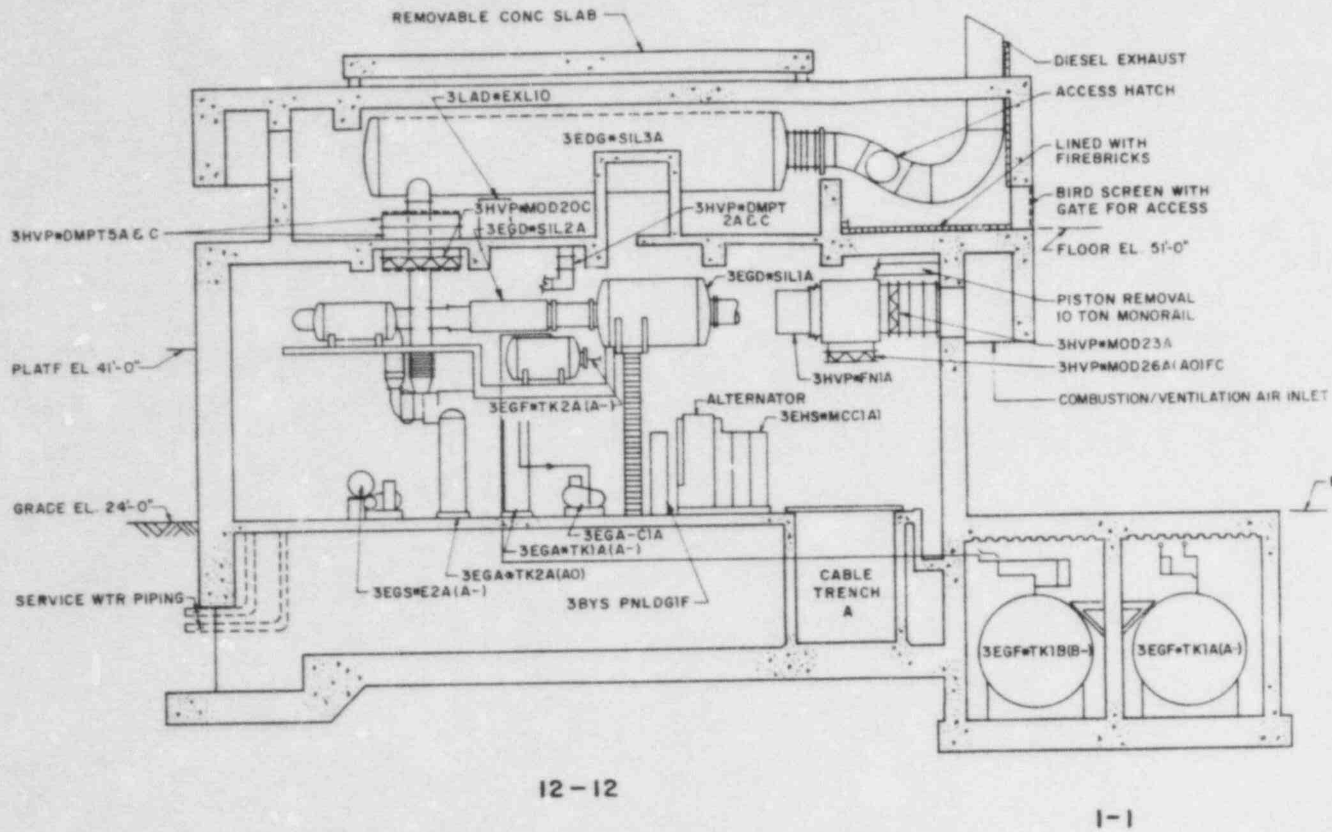
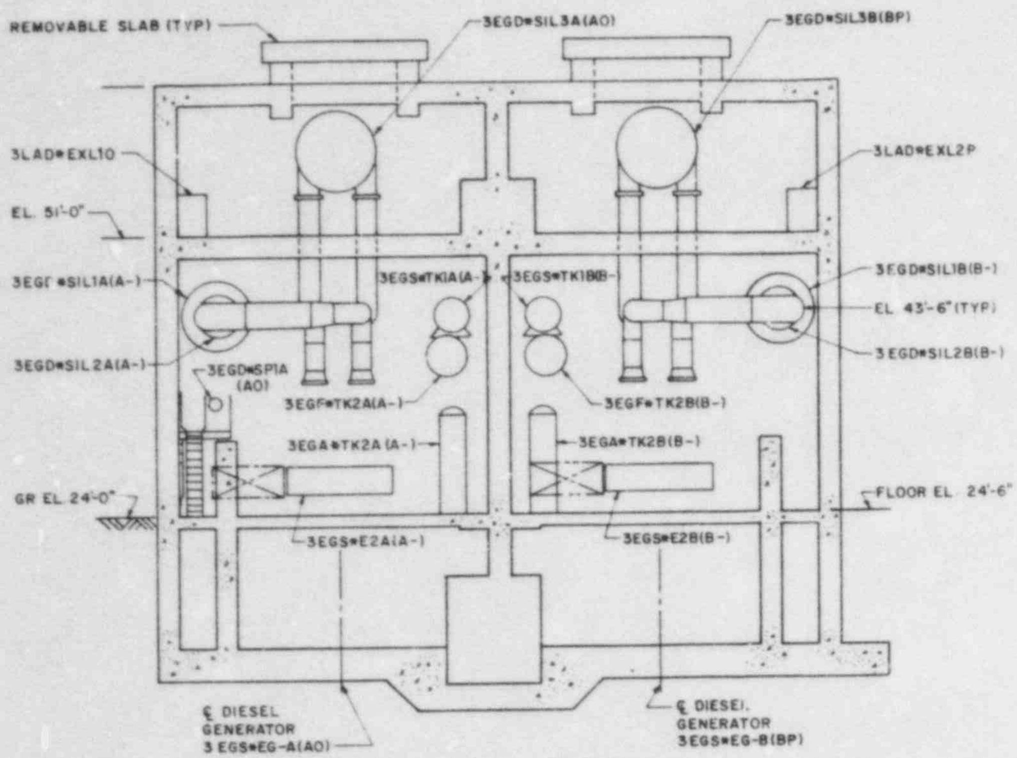


FIGURE 3.8-66 (SHEET 4 OF 5)
EMERGENCY GENERATOR ENCLOSURE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

AMENDMENT 8 MAY 1984



13 - 13

FIGURE 3.8-66 (SHEET 5 OF 5)
EMERGENCY GENERATOR ENCLOSURE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

NOTES TO FIGURE 3.8-66

EMERGENCY DIESEL GENERATOR - EQUIPMENT INDEX

Equipment Mark No.	Equipment Description
3BYS*PNLDG1F	Emergency Generator 125 V dc Distribution Panel
3CES*PNLBD10	Safety-Related to Nonsafety-Related Signal to Isolator Panel
3EGA*TK1A(A-)	Emergency Diesel Generator Air Start System Air Receiver Tanks
3EGA*TK2A(A-)	Emergency Diesel Generator Air Start System Air Receiver Tanks
3EGA*EJ3A	Emergency Diesel Generator Exhaust Expansion Joint
3EGD*P1A(AO)	Crankcase Vacuum Pump
3EGD*SIL1A(A-)	Emergency Diesel Generator Combustion Air Filter and Silencer
3EGD*SIL2A(A-)	Emergency Diesel Generator Combustion Air Silencer
3EGD*SIL3A(A-)	Emergency Diesel Generator Exhaust Muffler
3EGD*SP1A(AO)	Crankcase Vacuum Oil Separator
3EGF*P1A(AO)	Emergency Generator Fuel Oil Transfer Pumps
3EGF*P1B(BP)	Emergency Generator Fuel Oil Transfer Pumps
3EGF*P1C(CO)	Emergency Generator Fuel Oil Transfer Pumps
3EGF*P1D(DP)	Emergency Generator Fuel Oil Transfer Pumps
3EGF*TK1A(A-)	Emergency Generator Fuel Oil Storage Tank
3EGF*TK1B(B-)	Emergency Generator Fuel Oil Storage Tank
3EGF*TK2A(A-)	Emergency Generator Fuel Oil Day Tank
3EGF*TRS1A	Manual Transfer Switch for Emergency Generator Fuel Oil Transfer Pump
3EGS-E1A(A-)	Emergency Diesel Generator Intercooler Water Heat Exchanger

NOTES TO FIGURE 3.8-66 (Cont)

Equipment Mark No.	Equipment Description	
3EGS*E2A(A-)	Emergency Diesel Generator Engine Jacket Watercooler	2.21
3EGS*EG-A(AO)	Emergency Diesel Generator Skid A	2.24
3EGS*EG1AN	Emergency Generator 4 kV Neutral Current Transformer Lead Box	2.27
3EGS*EG1APWR	Emergency Generator Power Lead Termination Box	2.30
3EGS*JBFLDA	Emergency Generator Housing Mounted Junction Box	2.33
3EGS*JBRTDA	Emergency Generator Housing Mounted Junction Box	2.36
3EGS-PNL1A	Emergency Generator Distribution Panel (Skid Mounted)	2.39
3EGS*PNLA	Emergency Generator Control Panel	2.42
3EGS*PNLDGA	Emergency Generator Control Panel	2.45
3EGS*TBEG1A	Emergency Generator Control and Relay Box	2.48
3EHS*MCC1A1	Emergency Motor Control Center	2.51
3ENS*ACB-GNA	Emergency Generator 4 kV Neutral Ground Breaker	2.54
3ENS*RES-GNA	Emergency Generator 4160 V Neutral Ground Resistor	2.57
3HVP*DMPT1A&C	Diesel Generator Building Tornado Damper	2.60
3HVP*DMPT5A&C	Diesel Generator Building Tornado Damper	3.3
3HVP*DMPT6A&C	Diesel Generator Building Tornado Damper	3.6
3HVP*FN1A(AO)	Diesel Generator Building Ventilation Supply Fan	3.9
3HVP*FN1C(CO)	Diesel Generator Building Ventilation Exhaust Fan	3.12
3HVP-FN2A	Diesel Generator Building Ventilation Exhaust Fan	3.15

Q 30.17

NOTES TO FIGURE 3.8-66 (Cont)

Equipment Mark No.	Equipment Description	
3HVP*MOD-23A(AO)FO	Diesel Generator Building Ventilation Inlet Damper	3.18
3LAD*EXL10	Diesel Generator Building Emergency Lighting Transformer	3.21
3SCV*PNL250	240/120 V ac Single Phase Emergency Distribution Panel	3.24
3SCV*XD250	240/120 V ac Single Phase Emergency Distribution Panel	3.27

430.67

NOTE: 3.32

With the exception of 3EGF*TK1B, *P1B, and *P1D, the equipment index shows emergency diesel generator A equipment. Emergency diesel generator B equipment is similar. 3.33 3.35

NRC Letter: May 31, 1983 1.9

Question Q430.68 (Section 9.5.4) 1.12

Discuss the testing necessary to maintain and assure a highly 1.13
reliable instrumentation, controls, sensors and alarm system and 1.14
where the alarms are annunciated. Identify the temperature, pressure 1.15
and level sensors which alert the operator when these parameters
exceed the ranges recommended by the engine manufacturer and describe 1.16
what operator actions are required during alarm conditions to prevent 1.17
harmful effects to the diesel engine. Discuss the system interlocks 1.18
provided.

Response: 1.19

a. For a discussion of testing, refer to FSAR Section 9.5.4.4. 1.21
Testing will comply with requirements stated in IEEE 1.22
Standards 279-1971 and 338-1971 (reference FSAR Sections 7.1.2.11 1.23
and 7.3.1.1.5) and a minimum calibration frequency of once every
18 months or more frequently as specified in Millstone Station 1.24
Procedures.

b. For identification of instrumentation, refer to revised FSAR 1.25
Section 9.5.4.5.

c. For location of alarms, refer to FSAR Section 9.5.4.5. 1.26

d. Millstone 3 operating procedures address actions to be taken in 1.27
response to alarm conditions. These actions are consistent with 1.28
the engine manufacturer's guidelines and prevent damage to the
diesel engine. Copies of these operating procedures will be 1.29
available for NRC review 60 days prior to system turnover.

e. There are no interlocks generated from the emergency generator 1.30
fuel oil system instrumentation.

NRC Letter: May 31, 1983

Question Q430.70 (Section 9.5.4)

Describe your design provisions made to protect the fuel oil storage tank fill and vent lines from damage by tornado missiles.

Further Information Requested:

Address tornado missile protection of the day tank vent line.

Response:

Refer to revised FSAR Section 9.5.4.2 for the response to the question.

bus, or vice versa, by means of a 480 volt, seismically qualified Class IE manually operated transfer switch, under administrative control, thus ensuring a 7 day supply of fuel for one diesel generator. (See Sections 8.3.1.1.2 and 9.5.4.5). 420.83

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

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

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

430.70
430.79
430.81

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

NRC Letter: May 31, 1983

Question Q430.71 (Section 9.5.4)

Discuss the means for detecting or preventing growth of algae in the diesel fuel storage tank. If it were detected, describe the methods to be provided for cleaning the affected storage tank.

Response:

Refer to revised FSAR Sections 9.5.4.3 and 9.5.4.4 for the response to this question.

brought into the enclosure only when draining of the tank becomes necessary. 430.88

The fuel oil day tanks and connecting piping to the fuel oil day tanks are located a minimum distance of 4 3/4 feet from the emergency diesel generators and 9 1/2 feet from the insulated diesel exhaust piping to preclude contact with these hot surfaces. Fuel oil piping to the diesel generator fuel pumps is directed to the opposite end of the diesel, away from the insulated exhaust piping. 430.75

The fuel oil day tanks are located in an area monitored by a flame detection system and protected with a sprinkler fire suppression 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 generators. The supporting structure is equipped with a drip pan to contain leakage of oil from the day tank. Oil level in the drip pan 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 common alarm in the control room, initiating operator action to drain the drip pan. Oil in the drip pan is then drained to a portable container through a normally closed 1 inch drip pan drain line and removed from the emergency diesel generator enclosure. The portable container is brought into the enclosure only when the drip pan needs draining. 430.88

Each fuel oil storage tank is provided with a sump for water collection and removal. The fuel oil storage tanks are periodically sampled for water contamination and accumulated water, if detected, is removed. Removal of water precludes the growth of algae which can exist at the water-oil interface. 430.71

The sulphur content of the diesel fuel oil is 0.5 percent maximum (by weight) to minimize corrosiveness of sulphur compounds in the diesel engine exhaust gas. A winter blend of fuel oil is used to ensure a cloud point in accordance with ASTM D975 and the ambient site conditions. 430.83

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

9.5.4.4. Inspection and Testing Requirements

After the initial hydrostatic test on the emergency generator fuel oil supply piping on 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 430.71

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:

1. Storage tank fuel level Low and High
2. Transfer pump discharge strainer differential pressure High
3. Day tank fuel level Low
4. Day tank fuel level Low-Low
5. Day tank fuel level High
6. 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:

1. Fuel oil transfer pump running
2. Fuel oil transfer pump stopped
3. Fuel oil transfer pump discharge pressure
4. Fuel oil transfer pump discharge flow
5. Day tank fuel level
6. 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.

NRC Letter: May 31, 1983 1.8

Question Q430.76 (Section 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8) 1.11

You state in the FSAR that protection from high and moderate energy 1.12
pipe breaks is discussed in Section 3.6.1. Section 3.6.1 only 1.13
identifies the fuel oil system as a moderate energy system and does
not provide any analysis for that system. This is unacceptable. 1.14
Identify all high and moderate energy lines and systems that will be 1.15
installed in the diesel generator room. Discuss the measures that 1.16
will be taken in the design of the diesel generator facility to
protect the safety related system, piping, and components from the 1.17
effects of high and moderate energy line failure to assure
availability of the diesel generator when needed. (See request 1.20
430.110 for additional concerns on high energy line breaks with
regard to the air start system.)

Response: 1.21

A review of the high energy air start system on the emergency 1.22
generator will be performed in accordance with the acceptance 1.23
requirements of FSAR Section 3.6. The definition of loss of offsite 1.24
power coincident with postulated piping failure found in FSAR
Section 3.6 has been revised to reflect the assumptions of BTP ASB 1.25
3-1, Paragraph 3.b1 to clarify postulated events.

Corrective measures will be taken if the review determines that pipe 1.26
breaks in this system do not meet the acceptance criteria of FSAR 1.27
Section 3.6.

The piping and component classification of the high energy air start 1.28
system is shown on revised Figure Q430.73-4. All other diesel 1.29
generator auxiliary systems, lube oil, jacket water, intercooler
water, and control air are considered moderate energy systems. Their 1.31
piping and component classifications are shown on Figures Q430.73-1
through Q430.73-4. The effects of moderate energy pipe breaks are 1.32
considered negligible.

Single Failure Criterion

A single active component failure is assumed to occur in systems used to mitigate consequences of the postulated piping failure and to shut down the reactor. The single active component failure is assumed to occur in addition to the postulated piping 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.

430.76
430.109

Loss of Offsite Power

Offsite power is assumed unavailable if a trip of the turbine generator system or reactor protection system is a direct consequence 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.

430.76
430.109

Seismic Event

430.76
430.109

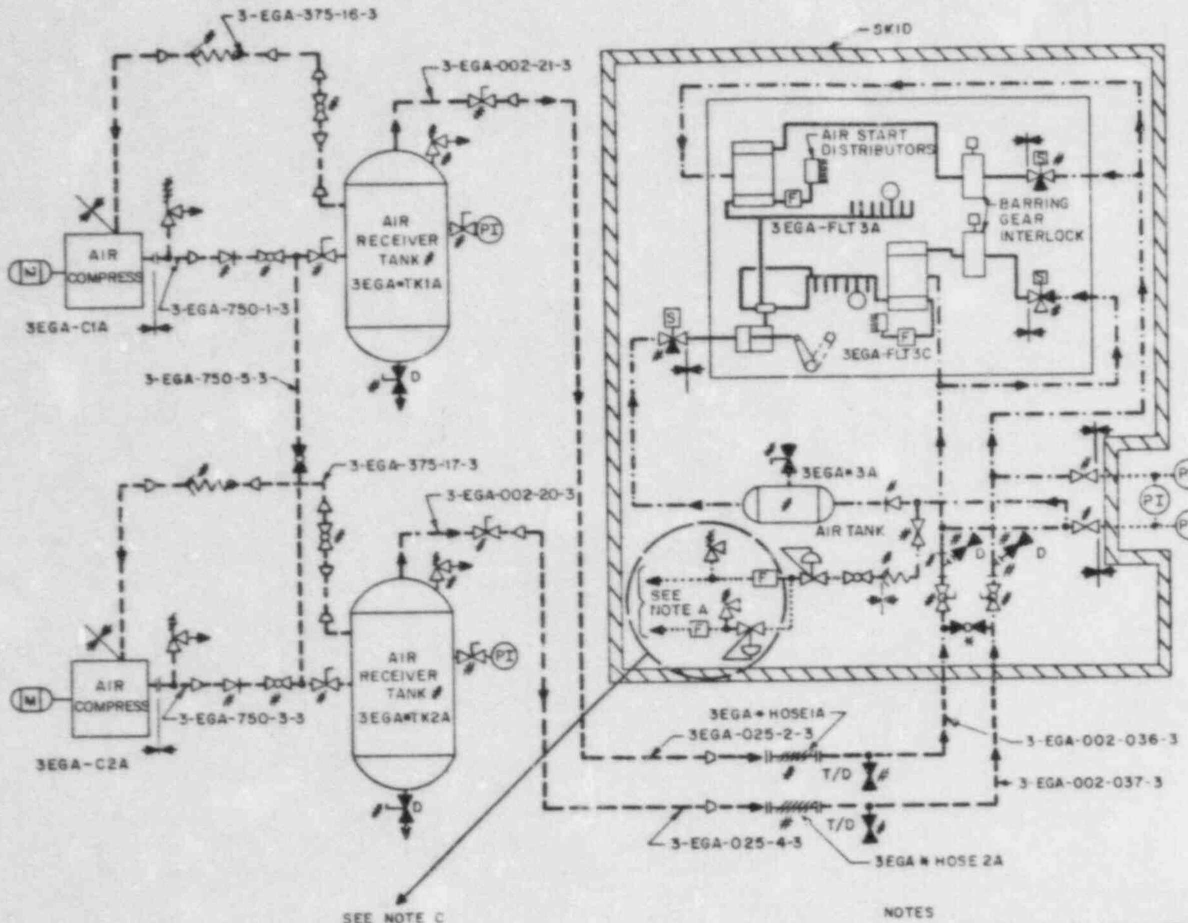
Credit for mitigating the consequences of a postulated event may be taken only for those systems and components designed to Seismic Category I requirements.

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.



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 THE MANUFACTURER'S STANDARD AND ARE SEISMIC CATEGORY 1.
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
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

REVISION 2 MAY 1984

NRC Letter: May 31, 1983

Question Q430.79 (Section 9.5.4)

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

Response:

Refer to revised FSAR Section 9.5.4.2 for the response to this question.

bus, or vice versa, by means of a 480 volt, seismically qualified Class IE manually operated transfer switch, under administrative control, thus ensuring a 7 day supply of fuel for one diesel generator. (See Sections 8.3.1.1.2 and 9.5.4.5).

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

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

The fuel oil storage tanks are located in an underground concrete vault adjacent to the emergency generator enclosure. The tanks are separated by a wall 18 inches thick to provide the minimum calculated fire boundary between tanks. The vault's 2 foot thick concrete outside walls and roof provide the required tornado protection per Regulatory Guide 1.117. Access openings and pipe penetrations have water tight seals to provide protection of the vaults against the effects of flooding. The fuel oil transfer pumps are mounted directly on top of a flanged connection to the storage tanks. Removable concrete covers are provided on the vaults to facilitate pump maintenance or removal. The concrete vault covers are designed to provide tornado and missile protection. The pump strainers and discharge valves also are located in the vault area. The storage tank vents are located outside the vaults and terminated at 6 feet above finished ground grade in tornado and missile proof 2 foot thick reinforced concrete labyrinth enclosures. The labyrinth enclosures preclude the entrance of water into the fuel oil tanks through the vents. The common discharge line from each storage tank's transfer pumps and the overflow line are routed underground to and from the respective fuel oil day tank, which is located in the emergency generator enclosure. These lines run under the concrete structure to provide the required tornado missile protection. The fuel oil transfer pumps may be started and stopped manually from the emergency diesel generator panel located in the emergency generator enclosure. The fuel oil storage tank fill lines are located outside the vaults terminated at an elevation of 3 feet 9 inches above finished ground grade. The fill lines are capped and locked to preclude entrance of water into the tanks. Should the fill lines become damaged, the fuel 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 storage tank enclosure area is flooded, the tanks may be filled through their vent lines which are located well above the site flood 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 the roof (el 51 feet-0 inches) of the emergency diesel generator enclosure in their own tornado- and missile-proof 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) Paint, 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

NRC Letter: May 31, 1983 1.8

Question Q430.87 (Section 9.5.4) 1.11

Figure 9.5-2 of the FSAR shows a fuel oil accumulator tank on the 1.12
diesel engine fuel oil system. The accumulator tank is located on 1.14
the engine skid and is connected in parallel with the fuel oil
headers. Provide a description of the tank, its capacity and its 1.15
purpose.

Response: 1.17

The accumulator tank, which is integral to the emergency diesel 1.18
generator, is located on the discharge header of the engine mounted 1.19
fuel oil pumps above the fuel oil headers and below the fuel oil day
tank. This ensures a positive fuel oil supply on engine startup 1.20
until the engine driven fuel oil pumps can supply fuel pressure. The 1.22
tank is of carbon steel construction, cylindrically shaped, with flat
ends. It is pressure tested to 70 psig, and has a capacity of 0.86 1.23
gallons of fuel oil.

NRC Letter: May 31, 1983 1.9

Question Q430.94 (Section 9.5.5) 1.12

Discuss the testing necessary to maintain and assure a highly 1.13
reliable instrumentation, controls, sensors, and alarm system, and
where the alarms are annunciated. Identify the temperature, 1.14
pressure, level, and flow (where applicable) sensors which alert the
operator when these parameters exceed the ranges recommended by the
engine manufacturer and describe what operator actions are required 1.15
during alarm conditions to prevent harmful effects to the diesel
engine. Discuss the systems interlocks provided. 1.16

Response: 1.17

a. For a discussion on emergency generator testing requirements, 1.19
refer to FSAR Section 8.3.1. Refer to FSAR Chapter 16 for 1.20
surveillance testing. Testing will comply with requirements 1.21
stated in IEEE Standards 279-1971 and 338-1971 (reference FSAR
Sections 7.1.2.11 and 7.3.1.1.5) and a minimum calibration 1.22
frequency of once every 18 months or more frequently as specified 1.23
in Millstone Station Procedures.

b. For location of alarms, refer to revised FSAR Section 9.5.5.5. 1.24

c. For identification of instrumentation sensors, refer to revised 1.25
FSAR Section 9.5.5.5.

d. Millstone 3 operating procedures address actions to be taken in 1.26
response to alarm conditions. These actions are consistent with 1.27
the engine manufacturer's guidelines and prevent damage to the
diesel engine. Copies of these operating procedures will be 1.28
available for NRC review 60 days prior to system turnover.

e. For a discussion on interlocks, refer to FSAR Section 8.3.1.1.3, 1.29
Item 2, Tripping and Surveillance.

NRC Letter: May 31, 1983

Question Q430.103 (SRP Section 9.5.6)

Describe the instrumentations, controls, sensors and alarms provided for monitoring the diesel engine air starting system, and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when the parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided. Revise your FSAR accordingly.

Response:

a. For a description of the instrumentation, controls, sensors, and alarms, refer to FSAR Section 9.5.6.5. Testing will comply with requirements stated in IEEE Standards 279-1971 and 338-1971 (reference FSAR Sections 7.1.2.11 and 7.3.1.1.5) and a minimum calibration frequency of once every 18 months or more frequently as specified in Millstone Station Procedures.

b. For a discussion of inspection and testing, refer to FSAR Section 9.5.6.4.

c. For identity of instrumentation, refer to FSAR Section 9.5.6.5.

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

e. There are no interlocks generated from the emergency generator starting air system instrumentation.

NRC Letter: May 31,1983

Question Q430.107 (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.

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. 430.110 430.104

9.5.6.3 Safety Evaluation

Two independent redundant starting air systems are supplied for each emergency generator. The starting air systems are housed in the Seismic Category I emergency generator building (Section 3.8.4). 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:

1. Engine-mounted air start distributors

2. Engine-mounted air start valves

3. Engine-mounted starting booster air valve

4. Engine-mounted fuel rack shutdown and starting booster servo

5. 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 function 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 seven 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. 430.107

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.

430.107 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 assure 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. Insert A

9.5.6.4 Inspection and Testing Requirements

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

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

430.103 Section 8.3.1 discusses the emergency generator functional testing requirements.

9.5.6.5 Instrumentation Requirements

Each air compressor is equipped with a manual control switch and indicator lights, located on the motor control center. A pressure switch on the air receiver tank automatically starts and stops each compressor. This switch is set to start the compressor when the tank pressure drops below the low setpoint pressure of 375 psig and to stop the compressor when the pressure reaches the high setpoint

430.111 pressure of 425 psig. Relief valves on the receiver tanks and at each compressor discharge are set at 450 psig to protect the system from overpressurization. The compressor motor is also protected against thermal overload.

430.111 If the receiver tank pressure drops to the low-low setpoint pressure of 350 psig, the condition actuates an alarm an the respective

430.103 emergency generator panel and the emergency generator trouble alarm on the main control board. Each receiver tank is also provided with a local pressure indicator.

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

430.107

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

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

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

The diaphragm operated three-way valve is controlled by a positioner that receives the controller output pressure and air at 45 psi from the starting air system. This causes the valve to open and close its ports to control the flow of jacket coolant through the heat exchanger or divert the coolant around the heat exchanger so that the temperature of the coolant discharged from the engine will remain at the value set into the controller at all loads and ambient temperatures. The port controlling the flow of jacket coolant into the shell side of the heat exchanger is fully open when the positioner receives a controller output pressure of 3 psi or less and fully closed with a controller output pressure of 15 psi. Pressures 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 air systems. 430.107

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

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

9.5.7 Emergency Diesel Engine Lubrication System

Each emergency diesel engine lubrication system (Figure 9.5-[illegible]) lubricates and cools various emergency diesel engine components.

9.5.7.1 Design Bases

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

Insert A

430.107

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

NRC Letter: May 31, 1983 1.9

Question Q430.108 (Section 9.5.6) 1.12

It is [illegible] in the FSAR that the air start system and engine (air 1.13
over piston) is designed for an air start pressure of 425 psig. Most 1.14
air starting systems provided by other manufacturers have an air
starting system design pressure of no more than 250 psig.

Provide a discussion as to why such a high pressure is needed to 1.15
start the engine. Include in the discussion the minimum pressure 1.16
needed to start the engine.

Response: 1.17

The air start system and engine is designed at 425 psig rather than 1.18
250 psig in order to reduce the size of the air receiver tanks 1.19
required to store a sufficient quantity of air for the fast start
requirements.

The engine is equipped with a combination of air start control and 1.20
pressure regulating valves that restric* the air pressure admitted to 1.21
the engine cylinders to approximately 250 psig.

For a discussion of the minimum air starting system pressure, refer 1.22
to the response to NRC Question 430.111.

NRC Letter: May 31,1983 1.8

Question Q430.109 (Section 9.5.6) 1.11

The air starting system for your plant is defined as a high energy 1.12
system. A high energy line pipe break in the air starting system of 1.13
one diesel generator, plus any single active failure in any auxiliary 1.14
system of the other diesel generator will result in loss of all
onsite ac power. This is unacceptable. Provide the following 1.16
information.

a. Assuming a pipe break at any location in the high energy 1.18
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 1.19
either of the two diesel generators or their auxiliary
systems.

b. Section 9.5.6.3 states that the air receivers, valves, and 1.20
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 1.22
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. 1.23
Show that you comply with this position. 1.24

Response: 1.27

A review of the high energy air start system on the emergency 1.28
generator will be performed in accordance with the acceptance 1.29
requirements of FSAR Section 3.6. The definition of loss of offsite 1.30
power coincident with postulated piping failure found in FSAR
Section 3.6 has been revised to reflect the assumptions of BTP ASB 1.31
3-1, Paragraph 3.b1 to clarify postulated events.

Corrective measures will be taken if the review determines that pipe 1.32
breaks in this system do not meet the acceptance criteria of FSAR 1.33
Section 3.6.

The piping and component classification of the high energy air start 1.34
system is shown on revised Figure Q430.74-4. All other diesel 1.35
generator auxiliary systems, lube oil, jacket water, intercooler
water, and control air are considered moderate energy systems. Their 1.37
piping and component classifications are shown on Figures Q430.73-1
through Q430.73-4. The effects of moderate energy pipe breaks are 1.38
considered negligible.

NRC Letter: May 31, 1983

Question Q430.111 (Section 9.5.6)

You state in Section 9.5.6.1 of the FSAR that each independent starting system is designed to be capable of starting the engine five times from an initial pressure of 425 psig without recharging the starting air tanks. The first two starts from each independent system provide for starting the engine and reaching synchronous speed and voltage within 10 seconds. Each system is also capable of starting the engine once and reaching synchronous speed and voltage within 10 seconds from a starting air tank pressure greater than 350 psig (low pressure alarm setting). Some information has been provided on system pressure alarms, compressor cut-in or cut-out. Provide the following:

(a) Expand Section 9.5.6 of your FSAR to clarify the statement regarding the capability of the air start system of five consecutive start attempts without recharging the air receivers. A successful diesel generator start is defined as the ability of the air start system to crank the diesel engine to the manufacturer's recommended RPM, to enable the generator to reach voltage and frequency and begin load sequencing in 10 seconds or less. With the receiver at rated pressure and without recharging provide a tabulation of receiver pressure and diesel engine starting times for each of the five consecutive starts. In addition describe the sequence of events when an emergency start signal exists. State whether the diesel engine cranks until all compressed air is exhausted, or cranking stops after a preset time to conserve the diesel starting air supply. Describe the electrical features of this system in Section 8.0 of the FSAR (in the appropriate subsection)

(b) Provide the pressures at which the following alarms actuate: low low pressure alarm, and high pressure alarm

(c) Verify that the low pressure alarm setpoint indicates to the operator that the compressor is not maintaining system pressure and that at this setpoint the system pressure and capacity is sufficient to start within 10 seconds the diesel generator five (5) times

Response:

(a) A discussion on the capability of the air start system for consecutive starts without recharging the air receiver is given in revised FSAR Section 9.5.6.1.

(b) Actuation of low low pressure alarm and high pressure alarm is given in revised FSAR Section 9.5.6.5.

(c) The ability of the diesel generator to start 5 times is based upon an initial pressure of 425 psig. Refer to new FSAR Table

9.5-11. Low-low pressure is alarmed at 350 psig. Refer to FSAR Section 8.3.1.1.3 for the electrical features of this system.

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 assure 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.

430.107

9.5.6.4 Inspection and Testing Requirements

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

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

430.105

Section 8.3.1 discusses the emergency generator functional testing requirements.

430.103

9.5.6.5 Instrumentation Requirements

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

430.111

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

430.111 430.103 430.111

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

430.107

NRC Letter: May 31, 1983

Question Q430.114 (Section 9.5.7)

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

Response:

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

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

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

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

5. Millstone 3 operating procedures address actions to be taken in response to alarm conditions. These actions are consistent with the engine manufacturer's guidelines and prevent harmful effects to the diesel engine.

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

ASME III isolation valves. The loop will only be used during the monthly diesel engine testing. 430.124

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. 430.113

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. 430.117

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 two 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. 430.114

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.

A high-level alarm switch is provided to alert personnel when the oil level in the separate rocker are 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 arm lube oil system.

430.114

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 two (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

430.114

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)

Air is supplied from outside through filter and silencer to the diesel engine and is exhausted through a muffler to atmosphere. The system is QA Category I, Nuclear Safety Related except for the pipe from the muffler to the atmosphere which is QA Category II.

NRC Letter: May 31, 1983

Question Q430.118 (SRP Section 9.5.7)

An emergency diesel generator unit in a nuclear power plant is normally in the ready standby mode unless there is a loss of offsite power, an accident, or the diesel generator is under test. Long periods on standby have a tendency to drain or nearly empty the engine lube oil piping system. On an emergency start of the engine as much as 5 to 14 or more seconds may elapse from the start of cranking until full lube oil pressure is attained even though full engine speed is generally reached in about five seconds. With an essentially dry engine, the momentary lack of lubrication at the various moving parts may damage bearing surfaces producing incipient or actual component failure with resultant equipment unavailability.

The emergency condition of readiness requires this equipment to attain full rated speed and enable automatic sequencing of electric load within ten seconds. For this reason, and to improve upon the availability of this equipment on demand, it is necessary to establish as quickly as possible an oil film in the wearing parts of the diesel engine. Lubricating oil is normally delivered to the engine wearing parts by one or more engine driven pump(s). During the starting cycle the pump(s) accelerates slowly with the engine and may not supply the required quantity of lubricating oil where needed fast enough. To remedy this condition for the rocker arm assembly lubrication system, as a minimum, an electrically driven lubricating oil pump, powered from a reliable dc power supply, should be installed in the rocker arm lube oil system to operate in parallel with the engine driven rocker arm lube pumps. The electric driven prelube pump should operate only during the engine cranking cycle or until satisfactory lube oil pressure is established in the engine rocker arm lube oil distribution header. The installation of this prelube pump should be coordinated with the respective engine manufacturer.

Confirm your compliance with the above requirement or provide your justification for not installing an electric prelube oil pump.

Response:

Refer to revised FSAR Sections 9.5.7.1 and 9.5.7.2 for the response to this question.

9.5.7.1 Design Bases

The engine-driven lubricating oil and rocker-arm lubricating oil pumps have sufficient capacity to ensure adequate lubrication of main bearings, crank pins, camshaft bearings, valve gear, rocker arms, and all other wearing parts. The oil also provides a cooling media for the pistons.

A motor-driven prelubricating oil pump and electric heater are provided to supply warmed (125°F) lubricating oil to the engine sump and other necessary components when the engine is not running so as to enhance the "first try" starting reliability of the engine in the standby condition.

The SAE 30 lubricating oil in the rocker arm lubrication system has a pour point of -5°F. The oil is heated by conduction from the standby jacket coolant heating system which has a minimum temperature of 95°F. This will maintain the operability of the rocker arm lubrication system when room temperatures are within expected ranges. If a failure of either emergency generator enclosure heating system occurs, a low room temperature alarm actuates at 45°F on Ventilation Panel 1 in the control room. In response to this alarm, operator corrective action would be taken. Actions that may be taken include: 430.122

1. bringing in portable space heaters

2. increasing room temperature by turning on lights or equipment

3. starting the emergency diesel generator.

The rocker arm assembly will be prelubricated once a week for 5 minutes to establish an oil film on the rocker arm assembly. The oil film remains on the wearing parts of the rocker arm assembly to ensure lubrication during any emergency start. Therefore, it is not necessary to operate the motor-driven rocker arm pump in parallel with the engine-driven rocker arm pump. the electric motor-driven rocker arm prelube oil pump, which is powered by an electrical Class 1E power source. 430.118

Portions of the emergency diesel engine lubrication system are also designed to the following criteria:

1. General Design Criterion 2 for structures housing the system and the system itself being capable of withstanding the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, and floods

2. 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

Moisture-Detector Circulating Pump Suction Strainer (3EGO-STR3A):

This line strainer is provided to keep foreign particles, suspended in the oil that leave the lubricating oil heat exchanger, from entering the water detector circulating pump.

Moisture Detector:

This detector is provided to detect water leakage into the crankcase lubricating oil. Water detection energizes an annunciator that sounds an alarm.

The protective measures for the lubricating oil system consist of oil filters and strainers that do not require power sources or alarms and are of the multiple element, continuous full-flow type.

The crankcase vacuum system (Figure 9.5-3) includes a crankcase vacuum pump, oil separator, piping, and fittings. The crankcase vacuum system removes oil vapors from the diesel crankcase preventing the leakage of oil vapors through crankcase seals. The crankcase vacuum system can be started manually whenever the vacuum pump control switch is in the start position, or automatically whenever the control switch is in the auto position and the emergency diesel generator is running at greater than 360 rpm. Both operating modes are possible provided there is no vacuum pump motor thermal overload. The vacuum pump is powered from a safety related motor control center as described in Table 9.5-9. The diesel crankcase is equipped with relief ports to mitigate the consequences of a crankcase explosion.

A 1200 gallon capacity lubricating oil sump is provided to supply the engine with an adequate amount of lubricating oil during engine operation. The minimum recommended sump level of approximately 1000 gallons would be reached after 5 days of operation at full rated load with a normal oil usage rate of 40 gallons per day. This low level is alarmed in the control room to alert the operators. Upon reaching this minimum level, oil will be added to the system without an engine shutdown. Adequate lubricating oil is stored onsite to assure seven days of operation at rated load. An oil usage rate of 65 to 70 gallons per day is considered excessive and is one indication that an engine overhaul is needed.

Table 9.5-4 provides the design data for the major components in the emergency diesel lubricating oil system.

9.5.7.3 Safety Evaluation

The lubrication system is housed in the Seismic Category I emergency generator enclosure (Section 3.8.4). There is no sharing of lubricating system components between the two emergency generators. A single failure in the diesel engine lubrication system would not lead to the loss of more than one emergency diesel engine.

NRC Letter: May 31, 1983 1.9

Question Q430.121 (Section 9.5.7) 1.12

Assume an unlikely event has occurred requiring operation of a diesel 1.13
generator for a prolonged period that would require replenishment of 1.14
lube oil without interrupting operation of the diesel generator.
Provide the following: 1.15

a What provision has been made in the design of the lube oil 1.17
system to add lube oil to the sump. These provisions shall 1.18
include procedures or instructions available to the operator
on the proper addition of lube oil to the diesel generator 1.19
as follows:

1. How and where lube oil can be added while the equipment 1.21
is in operation.

2. Particular assurance that the wrong kind of oil is not 1.22
inadvertently added to the lubricating oil system, and

3. That the expected rise in level occurs and is verified 1.23
for each unit of lube oil added.

b. Verification that these operating procedures or instructions 1.25
will be posted locally in the diesel generator rooms.

c. Verification that personnel responsible for the operation 1.26
and maintenance of the diesel are trained in the use of
these procedures. Verification of the ability of the 1.28
personnel on the use of the procedures shall be demonstrated
during preoperational tests and during operator 1.29
requalification.

d. Verification that the color coded, or otherwise marked, 1.30
lines associated with the diesel-generator are correctly
identified and that the line or point for adding lube oil 1.31
(when the engine is on standby or in operation) has been
clearly identified. 1.32

Response: 1.35

Millstone Unit 3 will have a written station procedure for the 1.36
addition of lube oil to an operating diesel generator. This 1.39
procedure will address how and where to add lube oil and the type of
lube oil to be used and will verify the expected rise in oil level. 1.40
Specific procedural steps will be posted locally in the diesel 1.41
generator rooms.

The use of this procedure will be demonstrated during preoperational 1.42
testing which affords training to personnel in its use. Periodic 1.44
diesel generator training will be conducted onsite for responsible
maintenance personnel.

The diesel ~~lube oil addition~~ generator skid is clearly labeled, including the lube 1.45
oil addition point.

NRC Letter: May 31, 1983

Question Q430.122 (Section 9.5.7)

You state in Section 9.5.7.1 of the FSAR under "specific design criteria" that "the temperature of the lubricating oil is automatically maintained above a minimum value by means of an independent recirculation loop including its own pump and heater, to enhance 'first try' starting reliability of the engine in the standby condition". The rocker arm lubrication system is an independent subsystem of the diesel lube oil system which is connected to the main system by a float valve (V8A) in the rocker arm oil reservoir. From the information available it appears that the lube oil in the rocker arm lubrication system will never be preheated unless the oil level is low enough to open the float valve. If this is the case, what means have you provided for preheating the rocker arm lubricating oil or justify why preheating is unnecessary. (See request 430.134 for conditions when preheating may be necessary).

Response:

Refer to revised FSAR Section 9.5.7.1 for the response to this question.

9.5.7.1 Design Bases

The engine-driven lubricating oil and rocker-arm lubricating oil pumps have sufficient capacity to ensure adequate lubrication of main bearings, crank pins, camshaft bearings, valve gear, rocker arms, and all other wearing parts. The oil also provides a cooling media for the pistons.

A motor-driven prelubricating oil pump and electric heater are provided to supply warmed (125°F) lubricating oil to the engine sump and other necessary components when the engine is not running so as to enhance the "first try" starting reliability of the engine in the standby condition.

The SAE 30 lubricating oil in the rocker arm lubrication system has a pour point of -5°F. The oil is heated by conduction from the standby jacket coolant heating system which has a minimum temperature of 95°F. This will maintain the operability of the rocker arm lubrication system when room temperatures are within expected ranges. If a failure of either emergency generator enclosure heating system occurs, a low room temperature alarm actuates at 45°F on Ventilation Panel 1 in the control room. In response to this alarm, operator corrective action would be taken. Actions that may be taken include: 430.122

1. bringing in portable space heaters

2. increasing room temperature by turning on lights or equipment

3. starting the emergency diesel generator.

The rocker arm assembly will be prelubricated once a week for 5 minutes to establish an oil film on the rocker arm assembly. The oil film remains on the wearing parts of the rocker arm assembly to ensure lubrication during any emergency start. Therefore, it is not necessary to operate the motor-driven rocker arm pump in parallel with the engine-driven rocker arm pump. the electric motor-driven rocker arm prelube oil pump, which is powered by an electrical Class 1E power source. 430.118

Portions of the emergency diesel engine lubrication system are also designed to the following criteria:

1. General Design Criterion 2 for structures housing the system and the system itself being capable of withstanding the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, and floods

2. 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

NRC Letter: May 31, 1983

Question Q430.127 (Section 9.5.8)

Describe the instrumentation, controls, sensors, and alarms provided in the design of the diesel engine combustion air intake and exhaust system which alert the operator when parameters exceed ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided. Revise your FSAR accordingly.

Response:

a. For a description of the instrumentation, controls, sensors, and alarms, refer to FSAR Section 9.5.8.5. Testing will comply with requirements stated in IEEE Standards 279-1971 and 338-1971 (reference FSAR Sections 7.1.2.11 and 7.3.1.1.5) and a minimum calibration frequency of once every 18 months or more frequently as specified in Millstone Station Procedures.

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

c. There are no interlocks generated from the emergency diesel combustion air intake and exhaust system instrumentation.

NRC Letter: May 31, 1983 1.9

Question Q430.129 (Section 9.5.8) 1.12

Discuss the provisions made in your design of the diesel engine 1.13
combustion air intake and exhaust system to prevent possible 1.14
clogging, during standby and in operation, from abnormal climatic
conditions (heavy rain, freezing rain, dust storms, ice and snow) 1.15
that could prevent operation of the diesel generator on demand.

Response: 1.17

Each emergency diesel generator exhaust pipe is a 40-inch diameter 1.18
pipe which protudes about 36 inches over the top of the diesel 1.19
generator enclosure. The pipe is located toward the edge of the 1.20
building. Typical snowfall depths would not exceed 36 inches in a 1.21
24-hour period. In addition, the Millstone 3 Environmental Report, 1.22
Section 2.3.1.9, indicates a maximum snowfall depth of 48 inches in 2 1.23
days. Based on past experience with the Millstone Units 1 and 2 1.24
diesel generators, (whose stacks are a significantly smaller
diameter, 24 inches) snow accumulation in exhaust pipes has not been 1.26
a problem. Since the exhaust pipes are located close to the edge of 1.27
the building, drifting of snow into the pipe is not likely.
Consequently, snowfall does not pose a problem for Milltone 3 diesel 1.28
generator operability.

Refer to revised FSAR Section 9.5.8.3 for additional information. 1.29

intercepts particulate matter before it reaches the diesel combustion chambers. Filter differential pressure is sensed by a differential pressure switch which actuates a high differential pressure alarm locally and in the control room alerting operators. Surveillance will be performed during diesel monthly availability testing (Section 8.3) to ensure diesel generator availability on demand. 430.129

The point of exhaust of combustion gases to the atmosphere is 27-1/2 feet above the combustion air intake; therefore, oxygen content requirements for combustion are not restricted.

The emergency diesel generator exhaust is equipped with a normally open low point drain. Any frozen precipitation would be melted during the monthly diesel generator availability tests and drained through the diesel exhaust low point drain. Due to the large exhaust pipe diameter, it is not credible that any precipitation which collects and freezes, before it can pass through the drain line, will be sufficient to cause exhaust restriction. In addition, running of the diesel generator for availability testing will blow collected dust out of the exhaust. Therefore clogging of the exhaust pipe with snow is not a problem. 430.129

The emergency generator diesel engines and all auxiliary systems are designed to start and operate at rated load during a tornado which results in a decrease in atmospheric pressure of 3 psi in 3 seconds. Damage to the diesel exhaust pipe by a postulated tornado missile has been considered. A tornado protected access hatch will be manually opened during alerts, functioning as an exhaust bypass that will provide a secondary exhaust path in the event the primary path is damaged by a tornado missile.

The possibility of pipe whip does not exist in either emergency generator enclosure. All combustion air intake equipment and ductwork and the exhaust equipment and piping are seismically designed. There are no gas storage tanks in the vicinity of the emergency diesel generator enclosure which eliminates the possibility of any accidental gas release at the combustion air intake.

9.5.8.4 Inspection and Testing Requirements

The emergency generator combustion air intake and exhaust system is tested and inspected at the same time as the emergency generator set (Section 8.3.1).

9.5.8.5 Instrumentation Requirements

The emergency diesel combustion air intake and exhaust system operations parameters are monitored, indicated, recorded and controlled as follows:

The combustion air intake and exhaust system is available when the diesel engine is started.

When air is drawn in through the filter and silencer, a manometer measures pressure drop.

NRC Letter: May 31, 1983 1.9

Question Q430.139 (Section 10.2) 1.12

In Section 10.2.3.6 you discuss inservice inspection, and excercising 1.13
of the main steam turbine stop and control and reheater stop and 1.14
intercept valves, and the ability to test the extraction steam
valves. You do not discuss the inservice inspection, testing, and 1.15
exercising of the extraction steam valves. Provide a detail 1.16
description of: 1) the extraction steam valves, and 2) your inservice
inspection and testing program for these valves. Also provide the 1.18
time interval between periodic valve exercising to assure the
extraction steam valves will close on turbine trip. 1.19

Response: 1.20

A description of the extraction line non-return valves is contained 1.21
in revised FSAR Section 10.2.2.1. Extraction steam valve exercising 1.22
will be performed at least quarterly in accordance with the
manufacturer's recommendations. 1.23