ILLINOIS POWER COMPANY

U-0368
L30-81 (12-02)-6
500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

December 2, 1981

Mr. James R. Miller, Chief
Standardization & Special Projects Branch
Division of Licensing
Office of Nuclear Reactor Regulations
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Miller:

Clinton Power Station Unit 1
Docket No. 50-461

Attached are details related to the following items which were discussed with R. Giardina, Power Systems Branch, during a meeting of November 30, 1981 to resolve issues for the Clinton SER:

ISSUES

"Responses to NRC Power Systems Branch Questions/Concerns"

Additional Responses to Questions 40.17, 40.18, 40.23, 40.24 and 430.136

The above encompass a total of 47 responses (issues) which are considered by the NRC and IP to be closed for licensing purposes.

Sincerely,

G. E. Huller for J. D. Geier
J.D. Geier
Manager, Nuclear Station Engineering

Attachments

cc: J.H. Williams, NRC Clinton Project Manager
H.H. Livermore, NRC Resident Inspector
R. Giardina, NRC Power Systems Branch

B001 S 1/1

040.17 (3.2) "Table 3.2-1 is incomplete with regards to the design characteristics for diesel generator systems. The diesel engine cooling water, lubrication, and parts of the combustion air systems are not included in the table. Revise the table accordingly.

REVISED RESPONSE

Refer to Question 430.136, revised Response

040.18 (3.2) "The FSAR text and Table 3.2-1 states that the diesel engine mounted components and piping for the fuel, cooling water, lubrication and air starting system are designed Seismic Category I Quality Group C. Provide the industry standards that were used in the design, manufacture, and inspection of the engine mounted piping and components."

REVISED RESPONSE

Refer to revised Question 430.136

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

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

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

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

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

   1. the page party (public address) communications systems, and

   2. any other additional communication system provided that working station.

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

f. Identify and describe the power source(s) provided for each of the communications systems.

g. Discuss 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 a communication line or trunk as a result of an accident or fire.

Answer:

Cut. 23

A dial telephone and a public address handset are located adjacent to the remote shut down panel. In addition, a sound power jack is located on the back of the panel.

Located within the central area of the Main Control Room, are a dial telephone, four (4) public address handsets, four (4) public address maintenance jacks, two (2) remote control consoles (to control the Operations and Maintenance Radio Base Stations), and ten (10) sound power jacks.

Communications to the Control Room or Remote Shutdown Panel may be accomplished from any one of the approximately 291 PA handset stations, or 215 telephone stations located throughout the plant. Also, many portable "handie talkie" radios will be carried by key plant personnel who will be able to communicate to the control room or remote shutdown panel from any location within the plant. In addition, approximately 350 sound power jacks are located at control and instrumentation panels located throughout the plant.

In areas of high noise, public address handsets and telephones are located at or in noise attenuating booths to facilitate communications. In addition, special noise attenuating headsets for sound power and earphones for radio "handie-talkies" will be utilized.

The large diversification of communications at the control room, remote shutdown panel, and working stations (spread throughout the plant) assure reliable communications between these locations under all operating conditions.

The communications systems conform with applicable local codes, standards, ordinances, and Federal Communications Commission regulations. These systems have a history of successful operation at existing plants and are in use daily which assures their availability. In addition, sound power, public address, and radio/telephone are in separate raceways which assure their independance. Radio and telephone do share raceways and cables in some areas of the plant.

The power sources to the various communications systems are ultimately supplied from the divisional diesel generators and not shed during LOCA. They are separately fed as follows:

Sound Power System	- (Voice Operated)
Public Address System	- Mixture of Division 1 & 2 Standby Lighting Cabinets
Operations Radio System	- Division 1 Motor Control Center
Maintenance Radio System	- Division 2 Motor Control Center
Telephone System	- Normal supply is from a non-1E MCC; manually operated switch to Division 1 MCC.

040.23

Additional Response

a) A fire within Clinton Power Station could occur anywhere; therefore, to 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 a fire is impractical. However, due to the approximately 291 public address handset stations, 215 telephone stations, and 350 sound power jacks spread throughout the plant and due to the many portable "handie talkie" radios which will be carried by key plant personnel, we believe our design is so diversified that the necessity for plant personnel to communicate with the control room or emergency shutdown panel due to a fire anywhere within the station is met.

The following working stations on the plant site have been identified as locations where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents in order to mitigate the consequences of the event and to attain a safe cold plant shutdown:

1) Auxiliary and Control Building Switchgear Floor Elevation 781.

   Division 1, 2, 3, and 4 battery room.
   Division 1, 2, 3, and 4 inverters.
   Division 1, 2, and 3 1E 4.16KV switchgear.
   Turbine EHC Control Cabinet.

2) Diesel Generator Building Elevation 737.

   Division 1, 2, and 3 Diesel Generator Bays

3) Auxiliary Building Basement Elevation 707.

   RHR Pump A Room.
   RHR Pump B Room.
   RHR Pump C Room.
   RCIC Pump Room.
   LPCS Pump Room.

4) Fuel Building Basement Elevation 712.

   HPCS Pump Room.

Additional Response (Continued)

b) Due to the large number of noise sources located within the station and because most, if not all, surfaces will be reflective, it is difficult at best to ascertain the maximum sound levels that could exist at each of the above identified working stations. However, for comparison, the following reasonable assumptions are made:

1) For the Auxiliary and Control Building Elevation 781 working stations, the maximum sound levels should be less than that level encountered within the RHR pump rooms (90 dBA).

2) For the Diesel Generator Bays, the maximum sound level is expected to be less than 115 dBA.

3&4) For the Auxiliary and Fuel Building Pump Rooms, the maximum sound level is expected to be 90 dBA.

c) The types of communication systems available at each of the above working stations is as follows:

1) Division 1, 2, 3, and 4 battery - portable radio and sound power (PA and telephone nearby).

2) Division 1, 2, 3, and 4 inverter - portable radio and sound power (PA and telephone nearby).

3) Division 1, 2, and 3 1E 4.16KV switchgear-PA, telephone, portable radio (sound power nearby).

4) Turbine EHC Cabinet - portable radio, PA, telephone (sound power nearby).

5) Division 1, 2, and 3 Diesel Generator Bays - portable radio, PA, sound power, telephone.

6) RHR, RCIC, LPCS, HPCS Pump Rooms - Sound Power, PA, Portable Radio.

d) As indicated in part (b), the expected maximum background noise levels for all working stations is 90 dBA except for the diesel generator bays, which is expected to be less than 115 dBA.

The sound power headsets are normally usable in an environment of 110 dBC. However, special headsets are available for high noise areas capable of effective communications up to 125 dBC. Therefore, no difficulty is expected at any working station utilizing sound power to communicate with the control room.

Additional Response (Continued)

Public Address Handsets are usable in an environment of 115 dBA or less. However, PA handsets in high noise areas are placed in Burgess Day Acoustic-Booths which provide approximately 16 dB sound rejection at 1000 HZ. Also, it is planned to use "double headset assemblies" on maintenance channels in high noise areas (where required) which provide an additional sound rejection of 30 dB at 1000 HZ. Therefore, no difficulty is expected at any working station utilizing PA to effectively communicate with the control room.

Headsets will be used with portable radios in high noise levels which permit effective communication up to 115 dB. Should the need arise, a special headset will be used which has double ear phones and a mouth cup. This headset allows effective communication up to 135 dB.

To permit effective communications utilizing telephone in high noise levels, transmit confidencers, receiver amplifier, push-to-talk handsets (which silences the talk channel until ne[illegible] . or Burgess Day Acoustic-Booths will be added as required.

e) The communication systems at the working stations will be tested during pre-ops to assure adequate communications. Thereafter, these systems will be used frequently and any difficulty discovered due to background noise levels will be corrected by special sound attenuation equipment.

f) The power sources to the communications systems are as given in the initial response to 040.23.

g) Protective measures were incorporated into the design of the communication systems to assure a functionally operable onsite communication system. Sound power, public address and radio/telephone are in separate raceways. Sound power, radio, telephone and PA are all independent from each other, and so designed that component failure or the severing of a communication line will only disable a small portion of that particular communication system.

040.24 (8.5.3) "Identify the 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 an accident. Tabulate the lighting system provided in your design to accommodate those areas so identified."

RESPONSE

The location and use of plant lighting is listed in Table 1 attached and is also discussed below:

NORMAL OPERATION

Approximately 87.5 percent of plant lighting is provided from regular lighting panels.

Approximately 10 percent of plant lighting is provided from standby lighting panels from onsite power.

Approximately 2.5 percent of plant lighting, (only upon loss of regular power) is provided from emergency d-c lighting panels.

SAFE SHUTDOWN

Standby and d-c emergency lighting is provided for control room operation.

EGRESS

Battery packs are located throughout the plant to provide up to 8 hours of lighting for evacuation of personnel on loss of standby lighting power.

TABLE 1

LIGHTING SYSTEM TABULATION

	NORMAL	STANDBY	EMERGENCY	EMERGENCY BATTERY PACKS
Plant Lighting	Yes	Yes	Yes	Yes
Site Lighting	Yes	No*	No	No
Special Areas:				
Aux. Bldg. - Elect. Swgr. Rms. El. 781/-0"	Yes	Yes	No	No
Control Bldg.				
Elect. Swgr. Rms.	Yes	Yes	No	No
Main Control Rm.	Yes	Yes	Yes	Yes
Stairs Adjacent to Elevators	Yes	No	Yes	No
Screen House				
SSW Pump Room	Yes	Yes	No	Yes
Fire Pump Room	Yes	No	No	Yes

*Security lighting is fed from onsite power.

040.24

Additional Response

As indicated in the revised response to 040.23, working stations have been identified at which it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents in order to mitigate the consequences of the event and to attain a safe cold plant shutdown.

These working stations are indicated below along with the type of lighting available at each.

Note: a) Standby Lighting Cabinets (SLC) are fed from 1E MCC's not shed during LOCA.

b) Emergency Lighting Cabinets (ELC) are fed from 1E D.C. MCC's not shed during LOCA.

c) Regular Lighting Cabinets (RLC) are fed from non-1E sources and may not be available during a transient or accident.

d) Battery Packs are two emergency light heads mounted on a 6 volt nickel cadmium battery with an 8 hour rating. These are fed from standby lighting cabinets.

1) Division 1, 2, 3, and 4 battery room
Fluorescent lighting fed from SLC
Battery Pack fed from SLC

2) Division 1, 2, and 4 inverters
Fluorescent lighting fed from RLC

3) Division 1, 2, and 3 1E 4.16 KV switchgear
Fluorescent lighting fed from SLC

4) Turbine EHC Control Cabinet
Fluorescent lighting fed from SLC

5) Division 1, 2, and 3 Diesel Generator Bays
Fluorescent lighting fed from SLC
Battery Pack fed from SLC

2)(CONT) DIVISION 3 INVERTER
FLUORESCENT LIGHTING FED FROM SLC

Q40.24

Additional Response (Continued)

6) RHR and RCIC Pump Rooms
 Mercury Vapor lighting fed from SLC

7) LPCS Pump Room
 Incandescent lighting fed from ELC
 Mercury Vapor lighting fed from SLC

8) HPCS Pump Room
 Mercury Vapor lighting fed from SLC
 Fluorescent lighting fed from SLC

9) REMOTE SHUT DOWN PANEL
 FLUORESCENT LIGHTING FED FROM SLC

IN ADDITION, SUITABLE SEALED-BEAM BATTERY-POWERED PORTABLE HAND LIGHTS WILL BE PROVIDED FOR EMERGENCY USE BY THE FIRE BRIGADE AND OTHER OPERATIONS PERSONNEL REQUIRED TO ACHIEVE SAFE PLANT SHUTDOWN.

430.136 (3.2) (9.5.4) (9.5.5) (9.5.6) (9.5.7) (9.5.8) The FSAR text and Table 3.2-1 states 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. The engine mounted components and piping are designed and manufactured to DEMA standards, and are seismic Category I. This is not in accordance with Regulatory Guide 1.26 which requires the entire diesel generator auxiliary systems be designed to ASME Section III Class 3 or Quality Group C. Provide the industry standards that were used in the design, manufacture, and inspection of the engine mounted piping and components. Also show on the appropriate P&ID's where the Quality Group Classification changes from Quality Group C.

REVISED RESPONSE

The requirements for engine-mounted components and piping differ as to whether these components were designed, manufactured, and inspected by Stewart & Stevenson (S&S), the engine generator assembler, and General Motor's Electromotive Division (GM-EMD), the engine manufacturer. Those components within GM-EMD scope are not designed, manufactured, and installed to the requirements of ASME Section III Class 3 or Quality Group C. GM-EMD has stated:

> "The design, manufacture and inspection of GM-EMD engine mounted piping and components are to EMD proven standards established through many years of experience in the building of diesel engines that are in service worldwide and in general EMD meets or exceeds the industry standards."

For the engine piping within GM-EMD's scope, the material, diameter, wall thickness design pressure, operating temperature, and support spacing have been reviewed. The piping stresses due to normal operating loads (pressure and temperature) and due to support reactions are less than 10% of the allowable material stresses per ANSI B31.1.

(430.136 Cont'd)

Those components within S&S scope are designed, manufactured, and installed to the requirements of ASME Section III, but without an "N" stamp.

Stewart & Stevenson P&ID's are proprietary information, but a brief description will be given of the S&S installed components and piping for each of the various diesel generator auxiliary systems:

1. Cooling water system: heat exchanger ("N" stamp) and piping to, but not including the thermostatic valve.

2. Fuel system: there are no S&S installed components or piping.

3. Lube oil system: there are no S&S installed components or piping.

4. Starting air system: from the DG skid inlet flange to the Y-type strainer before the starting solenoid valve is designed, built, and inspected to the intent of ASME Section III.

SUBJECT: Clinton Power Station
Responses to NRC Power Systems Branch Questions/Concerns

1. Revised FSAR Questions and Responses:

040.22	040.46	040.56	040.63
040.40	040.47	040.57	040.64
040.41	040.50	040.60	040.66
040.43	040.54	040.61	
040.44	040.55	040.62	

2. The following Questions and Responses were closed as a result of the November 4-5, 1981 meeting.

040.19	040.36	040.48	040.72	430.137
040.21	040.37	040.49	040.73	430.138
040.26	040.39	040.52	040.83	
040.27	040.42	040.59	040.89	
040.33	040.45	040.68	040.90	
		040.70		
		040.71		

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

"Therefore, except for sensors and other equipment that must be directly mounted on the engine are associated piping, the controls and monitoring instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area or equipped with vibration mounts.

"Confirm your compliance with the above requirement or provide justification for noncompliance."

RESPONSE

The diesel generator control devices, including relay contacts for alarms and instruments which require setpoint calibrations are located on a free-standing floor-mounted panel separate from the engine skids. The only instruments located on the engine skid are the engine sensing devices and sensing device gauges, or the engine gauge panel, which, except for the governor overspeed lockout, perform no safety related function. Various owners, (including Illinois Power Company) of Stewart and Stevenson equipment are embarking in a testing program with Stewart and Stevenson for qualification of Class IE electrical components to IEEE 323-1974. Non-1E instrumentation shall be shown by failure analysis not to impact on the availability of IE components. The results of this test in regard to vibration analysis of skid-mounted instrumentation will be provided when available.

Corrective actions that are required as a result of the test program analysis will be implemented.

(Refer to 040.43)

040.40 (9.5.5) "Section 9.5.5 indicates that the function of the diesel generator cooling water system is to dissipate the heat transferred through the: 1) engine water jacket, 2) lube oil cooler, and 3) engine air water coolers. Provide information on the individual component heat removal rates (Btu/hr), flow (lbs/hr) and temperature differential (°F) and the total heat removal rate required. Also provide the design margin (excess heat removal capacity) included in the design of major components and subsystems (SRP 9.5.5, Part III, Item 1)."

RESPONSE

The individual components for which detailed information is requested are integral parts of the diesel generator cooling water system as supplied by the diesel engine manufacturer. The engine manufacturer has designed the total cooling system, including these components, for adequate cooling under all conditions of operation, including overload. Revised Table 9.5-3 provides diesel generator cooling water system component data.

Estimated engine heat rejection will be 35 Btu per minute per horsepower produced. The heat exchanger on the diesel generator skid is an ASME Section III, Class 3 vessel designed to maintain an engine cooling water temperature of 190° F at full load at any ambient environment temperature. The design operating pressure for the tubes and water boxes is 200 psig. The inlet shutdown service water temperature range is 32° to 95° F. A fouling factor of 0.002 was used in the design of the heat exchanger tubes. Two percent of the tubes could be plugged without adversely affecting the cooling capability of the cooling water heat exchanger. The heat exchanger is sized, when clean, to provide more than twice the required heat transfer rate to keep the engine cooled.

The turbocharger after coolers are water to air heat exchangers. Their purpose is to increase the combustion air density and improve fuel economy. In the event of tube failure, it is anticipated that the tube would be repaired, rather than plugged, or a substitute core be installed.

The lube oil cooler is of the fin-tube type construction, with the cooling water inside the tubes and the oil flowing over the tubes and fins. Two percent of the tubes could be plugged, with no more than four adjacent tubes plugged, without adversely affecting heat exchanger efficiency.

(See revised Table 9.5-3)

040.41 (9.5.5) "Provide the results of a failure mode and effects analysis to show that failure of a piping connection between subsystems (engine water jacket, lube oil cooler, and engine air intercooler) does not cause total degradation of the diesel generator cooling water system (SRP 9.5.5, Part III, Item 1a)."

RESPONSE

A failure analysis of the Division 1 and Division 2 diesel generator cooling water systems is given in new Table 9.5-8.

Since there is no quantitative measurement guide in any regulations against which to measure a FM&E analysis, there is no way to accept or reject the results produced. The HPCS system meets the single failure criteria on a network basis as part of the ECCS system. There is no requirement for HPCS to withstand a single failure within itself. An FM&E analysis of any part within HPCS is equal to or less than a failure of the total system. Since the ECCS system is designed to meet the single failure of the total HPCS system, there is no need to do any FM&E analysis. Failure of HPCS in any mode does not affect any other ECCS system.

The engine cooling water and lube oil systems are designed to operate as sealed systems. It is therefore difficult to hypothesise about what effects water in the oil or oil in the water systems would cause. Generally, however, oil leakage (if it were to occur) into the water system would not be of undue concern. With a large leak, or a small leak over a period of time, the oil would eventually reduce the efficiency of the water heat exchangers.

Of course, many features of the engines would warn of this type leak and allow the on-duty operator to take action to preclude damage to the engine. Such warning devices include: the lube oil low level alarm, low pressure alarm, and high temperature alarm; the cooling water high temperature alarm; the cooling water expansion tank sight glass (oil plateout would be visible on the glass); and cooling water expansion tank overflow (a sudden expansion of the water system would cause overflow on to the floor, which the operator would observe).

Water to oil contamination is a much more severe concern. While small amounts of water in the oil, evenly dispersed, would not cause an immediate problem, larger amounts, or slugs of water, would cause eventual failure of oil pumps and/or bearings of other engine components. A low point drain on the engine sump will be periodically opened to drain condensation and monitor for excess water contamination during diesel standby periods.

The intent is to make all divisions of diesels as reliable as possible, however in the event of failure, divisional backup will be available. (See revised Subsection 9.5.5.3 and new Table 9.5-8)

040.43 (9.5.5) Describe the instrumentation, controls, sensors and alarms provided for monitoring of the diesel engine cooling water system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors, and alarm system, and where the alarms are annunciated. Identify the temperature, pressure, 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 during alarm conditions to prevent harmful effects to the diesel engine. Discuss the systems interlocks provided (SRP 9.5.6, Part III, Item 1c).

RESPONSE

Subsection 9.5.5 describes the functions of the instrumentation, controls, sensors, and alarms provided for monitoring of the diesel engine cooling water system. Additional information in regard to the Division 3 diesel engine cooling water system is provided in NEDO 10905. Figure 9.5-3, sheet 5 and new sheet 6, show the signal flow and list in detail the instruments, sensors, and alarms used in the Division III system. The system interlock and testing necessary to maintain and assure the proper operation of D/G CWS are also described in Subsection 9.5.5. Information regarding Operator action, in case the operating parameters exceed the recommended ranges, is also provided in Subsection 9.5.5. Table 1 provides a listing of diesel engine instrumentation, including diesel engine cooling water.

(See new sheet of Figure 9.5-3)

TABLE 1

DIESEL ENGINE INSTRUMENTATION

Division 1 and 2

Instrument Number	Function	*MCR Indication	Maintenance & Test Frequency
1PS-DG003A	Air Receivers Cmpsr. Cntl. Cmpsr 1A DG 1A Eng A&B		TEST FREQUENCIES HAVE NOT YET BEEN ESTABLISHED, BUT FOR ALL INSTRUMENTS WILL NOT EXCEED ONE YEAR.
1PS-DG003B	Air Receivers Press Lo Cmpsr 1A DG 1A Eng A&B	1H13-P877 via 1PL 12JA	
1PS-DG004A	Air Receivers Cmpsr. Cntl. Cmpsr 2A DG 1B Eng C&D		
1PS-DG004B	Air Receivers Press Lo Cmpsr 2A DG 1B Eng C&D	1H13-P877 via 1PL 12JB	
1PS-DG005A	Air Receivers Cmpsr. Cntl. Cmpsr 1B DG 1A Eng A&B		
1PS-DG005B	Air Receivers Press Lo Cmpsr 1B DG 1A Eng A&B	1H13-P877 via 1PL 12JA	
1PS-DG006A	Air Receivers Cmpsr. Cntl. Cmpsr 2B DG 1B Eng C&D		
1PS-DG006B	Air Receivers Press Lo Cmpsr 2B DG 1B Eng C&D	1H13-P877 via 1PL 12JB	
1PI-DG034	Starting Air Press Cmpsr 1B DG 1A Eng A		
1PI-DG035	Starting Air Press Cmpsr 1A DG 1A Eng B		
1PI-DG036	Starting Air Press Cmpsr 2B DG 1B Eng C		
1PI-DG037	Starting Air Press Cmpsr 2A DG 1B Eng D		

* MAIN CONTROL ROOM

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1PI-DG038	Air Receiver Press Cmpsr 1A DG 1A Eng A&B		
1PI-DG039	Air Receiver Press Cmpsr 1B DG 1A Eng A&B		
1PI-DG040	Air Receiver Press Cmpsr 2A DG 1B Eng C&D		
1PI-DG041	Air Receiver Press Cmpsr 2B DG 1B Eng C&D		
1PI-DG160	Starting Air Press Cmpsr 1A DG 1A Eng A		
1PI-DG161	Starting Air Press Cmpsr 1B DG 1A Eng B		
1PI-DG162	Starting Air Press Cmpsr 2A DG 1B Eng C		
1PI-DG163	Starting Air Press Cmpsr 2B DG 1B Eng D		
1TS-DG011A	Clg Temp Hi DG 1A Eng B Shutdn		
1TS-DG011B	Clg Temp Hi DG 1A Eng B	1H13-P877 via 1PL12JA	
1TS-DG012A	Clg Temp Hi DG 1A Eng A Shutdn		
1TS-DG012B	Clg Temp Hi DG 1A Eng A	1H13-P8[illegible] ia 1PL12JA	
1TS-DG013A	Clg Temp Hi DG 1B Eng D Shutdn		

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
ITS-DG013B	Clg Temp Hi DG 1B Eng D	1H13-P877 via 1PL12JB	
ITS-DG014A	Clg Temp Hi DG 1B Eng C Shutdn		
ITS-DG014B	Clg Temp Hi DG 1B ENG C	1H13-P877 via 1PL12JB	
1TI-DG079	Oil Cooler Sply Temp DG 1A Eng B		
1TI-DG078	Oil Cooler Sply Temp DG 1A Eng A		
1TI-DG081	Oil Cooler Supply Temp DG 1B Eng D		
1TI-DG080	Oil Cooler Sply Temp DG 1B Eng C		
1TI-DG-083A	Clg Temp DG 1A Eng B		
1TI-DG083B	Clg Temp DG 1A Eng B		
1TI-DG082A	Clg Temp DG 1A Eng A		
1TI-DG082B	Clg Temp DG 1A Eng A		
1TI-DG085A	Clg Temp DG 1B Eng D		
1TI-DG085B	Clg Temp DG 1B Eng D		

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1TI-DG084A	Clg Temp DG 1B Eng C		
1TI-DG084B	Clg Temp DG 1B Eng C		
1TS-DG087	Immersion Htr DG 1A Eng B		
1TS-DG086	Immersion Htr DG 1A Eng A		
1TS-DG089	Immersion Htr DG 1B Eng D		
1TS-DG088	Immersion Htr DG 1B Eng C		
1PI-DG042	Fuel Sply DG LA		
1PI-DG043	Fuel Sply DG 1A		
1PI-DG044	Fuel Sply DG 1B		
1PI-DG045	Fuel Sply DG 1B		
1PDS-DG047	Fuel Filter Restricted DG 1A	1H13-P877 via 1PL12JA	
1PDS-DG046	Fuel Filter Restricted DG 1A	1H13-P877 via 1PL12JA	
1PDS-DG049	Fuel Filter Restricted DG 1B	1H13-P877 via 1PL12JB	
1PDS-DG048	Fuel Filter Restricted DG 1B	1H13-P877 via 1PL12JB	
1PDS-DG050	Lube Oil Filter Restricted DG 1A	1H13-P877 via 1PL12JA	
1PDS-DG051	Lube Oil Filter Restricted DG 1A	1H13-P877 via 1PL12JA	

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1PDS-DG052	Lube Oil Filter Restricted DG 1B	1H13-P877 via 1PL12JB	
1PDS-DG053	Lube Oil Filter Restricted DG 1B	1H13-P877 via 1PL12JB	
1LS-DG054	Lo Oil Lvl DG 1A	1H13-P877 via 1PL12JA	
1LS-DG055	Lo Oil Lvl DG 1A	1H13-P877 via 1PL12JA	
1LS-DG056	Lo Oil Lvl DG 1B	1H13-P877 via 1PL12JB	
1LS-DG057	Lo Oil Lvl DG 1B	1H13-P877 via 1PL12JB	
1PI-DG058	Oil Press DG 1A		
1PI-DG059	Oil Press DG 1A		
1PI-DG060	Oil Press DG 1B		
1PI-DG061	Oil Press DG 1B		
1PS-DG062A	Lo Oil Press DG 1A	1H13-P877 via 1PL12JA	
1PS-DG062B	Lo Oil Press DG 1A		
1PS-DG062C	Oil Press Lkout DG 1A	1H13-P877 via 1PL12JA	
1PS-DG063A	Hi Oil Press DG 1A	1H13-P877 via 1PL12JA	
1PS-DG063B	Hi Oil Press DG 1A		
1PS-DG063C	Oil Press Lkout DG 1A	1H13-P877 via 1PL12JA	

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1PS-DG064A	Lo Oil Press DG 1B	1H13-P877 via 1PL12JB	
1PS-DG064B	Lo Oil Press DG 1B		
1PS-DG064C	Oil Press Lkout DG 1B	1H13-P877 via 1PL12JB	
1PS-DG065A	Hi Oil Press DG 1B	1H13-P877 via 1PL12JB	
1PS-DG065B	Hi Oil Press DG 1B		
1PS-DG065C	Oil Press Lkout DG 1B	1H13-P877 via 1PL12JB	
1TI-DG066	Oil Clr Sply DG 1A		
1TI-DG067	Oil Clr Sply DG 1A		
1TI-DG068	Oil Clr Sply DG 1B		
1TI-DG069	Oil Clr Sply DG 1B		
1TI-DG070	Oil Clr Dsch DG 1A		
1TI-DG071	Oil Clr Dsch DG 1A		
1TI-DG072	Oil Clr Dsch DG 1B		
1TI-DG073	Oil Clr Dsch DG 1B		
1TS-DG074A	Oil Temp Lo DG 1A	1H13-P877 via 1PL12JA	
1TS-DG074B	Oil Temp Hi DG 1A	1H13-P877 via 1PL12JA	
1TS-DG075A	Oil Temp Lo DG 1A	1H13-P877 via 1PL12JA	
1TS-DG075B	Oil Temp Hi DG 1A	1H13-P877 via 1PL12JA	

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1TS-DG076A	Oil Temp Lo DG 1A	1H13-P877 via 1PL12JB	
1TS-DG076B	Oil Temp Lo DG 1A	1H13-P877 via 1PL12JB	
1TS-DG077A	Oil Temp Lo DG 1B	1H13-P877 via 1PL12JB	
1TS-DG077B	Oil Temp Lo DG 1B	1H13-P877 via 1PL12JB	
1PS-DG122	Crankcase Press DG 1A	1H13-P877 via 1PL12JA	
1PS-DG123	Crankcase Press DG 1A	1H13-P877 via 1PL12JA	
1PS-DG124	Crankcase Press DG 1B	1H13-P877 via 1PL12JB	
1PS-DG125	Crankcase Press DG 1B	1H13-P877 via 1PL12JB	
1PI-DG152	Oil to Filter DG 1A		
1PI-DG153	Oil to Filter DG 1A		
1PI-DG154	Oil to Filter DG 1B		
1PI-DG155	Oil to Filter DG 1B		
1TI-DG156	Oil Clr Dsch DG 1A		
1TI-DG157	Oil Clr Dsch DG 1A		
1TI-DG158	Oil Clr Dsch DG 1B		
1TI-DG159	Oil Clr Dsch DG 1B		
1PS-DG164	Turbo Oil Pmp Press DG 1A	1H13-P877 via 1PL12JA	
1PS-DG165	Turbo Oil Pmp Press DG 1A	1H13-P877 via 1PL12JA	

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
1PS-DG166	Turbo Oil Pmp Press DG 1B	1H13-P877 via 1PL12JB	
1PS-DG167	Turbo Oil Pmp Press DG 1B	1H13-P877 via 1PL12JB	
1SI-DG146	TACH DG 1A		
1SI-DG147	TACH DG 1B		
1TI-DG148	Xhst Temp DG 1A		
1TI-DG149	Xhst Temp DG 1A		
1TI-DG150	Xhst Temp DG 1B		
1TI-DG151	Xhst Temp DG 1B		
Division 3			
S9	Lo Oil Press		
S10	Lo Oil Press	1E22-S001 & 1H13-P877	
S11	Hi Water Temp		
S12	Hi Water Temp	1E22-S001 & 1H13-P877	
S13	Lo Air Press	1E22-S001 & 1H13-P877	
S13A	Lo Air Press	1E22-S001 & 1H13-P877	
S14	Lo Oil Temp	1E22-S001 & 1H13-P877	
S16	Lo Water Level	1E22-S001 & 1H13-P877	
S20	Hi Crankcase Press	1E22-S001 & 1H13-P877	

TABLE 1 (cont'd)

Instrument Number	Function	MCR Indication	Maintenance & Test Frequency
S21	Hi Oil Temp	1E22-S001 & 1H13-P877	
S23	Lo Cool Water Press	1E22-S001 & 1H13-P877	
S23A	Lo Cool Water Press	1E22-S001 & 1H13-P877	
S35	Immersion Heater Cntl		
S38	Air Cmpsr Cntl		
S41	Restricted Fuel Filter	1E22-S001 & 1H13-P877	
S42	Restricted Lube Oil Filter	1E22-S001 & 1H13-P877	
S43	Fuel Press	1E22-S001 & 1H13-P877	
S44	Fuel Press	1E22-S001 & 1H13-P877	
S52	Engine Heater Cntl		
S53	Air Cmpsr Cntl		
S55	Lo Oil Press	1E22-S001 & 1H13-P877	
M15	Tachometer		
M16	Pyrometer		

040.44 (9.5.5) "Describe the provisions made in the design of the diesel engine cooling water system to assure that all components and piping are filled with water (SRP 9.5.5, Part III, Item 2)."

RESPONSE

The Diesel Generator Cooling Water system has a built in provision to assure all components and piping are completely filled with water by having two system high point vents, one coming off the manifold, and the other coming off the water side of the lube o l cooler. These high point vents are attached directly to the cooling water expansion tank to maintain the closed system. In addition there is a low positive pressure in the system from the engine driven water circulating pump, which helps drive out any entrapped air in the system. The manufacturer has demonstrated through long and extensive use of these engines, both in stationary power plants and in locomotives, the success of this type of system.

The high point vents are of adequate size upon startup to remove air in the cross over manifold, above the expansion tank, to prevent the air from reaching the circulating pumps and causing binding.

Upon a cold start, if any air is pushed out of the manifold, before it can be vented to the expansion tank, it will travel to the top of the lube oil cooler where a second vent line will vent to the expansion tank. The design of the cooler and its mounting configuration results in the air bubble being unable to travel to the discharge of the cooler and ultimately to the cooling water pumps.

In the unlike[illegible] vent that the crossover manifold developes an air pocket prior to a hot restart, and the water thermostat is now open, any air not vented from the manifold WILL travel through the cooling water heat exchanger, before entering the lube oil heat exchanger. Air entrapment in the cooling water heat exchanger is not possible due to its design and mounting configuration. Baffles, which support the tubes are not attached to the shell side of the exchanger, but are part of the tube bundle. The exchanger is laid horizontal with the water intake and discharge on opposite ends. Once the bubble clears the exchanger it WOULD travel directly to the lube oil heat exchanger, whose venting is described above.

TOTAL Water thermostat failure upon startup would require nine INDIVIDUAL thermostat element failures on the 16 cylinder and four on the 12 cylinder engines. Failure of one or more elements would cause the engine to exhibit higher water temperatures than normal. Also, a high water temperature alarm will sound at 200° F. It is anticipated that monthly engine testing would allow the determination of possible thermostat failure. Maintenance of the thermostat will be done in accordance with GM-EMD recommendations.

040.46 (9.5.5) "You state in Section 9.5.5.2 each diesel engine cooling water system is provided with an expansion tank to provide for system expansion and for venting air from the system. In addition to the items mentioned, the expansion tank is to provide for minor system leaks at pump shafts seals, valve stems and other components, and to maintain required NPSH on the system circulating pump. Provide the size of the expansion tank and location. Demonstrate by analysis that the expansion tank size will be adequate to maintain required pump NPSH and make-up water for seven days continuous operation of the diesel engine at full rated load without make-up, or provide a seismic Category I, safety Class 3 make-up, water supply to the expansion tank."

RESPONSE

There is no coolant loss under normal conditions. Should a minor leak occur, make-up water can be added, if the level in the expansion tank sight glass indicates the necessity, while the system is in operation. The expansion tank cap is vented and can be removed during operation of the diesel generator. Although the cooling water system is normally pressurized to 4 psig during operation, the level in the expansion tank will not change when the cap is removed and the coolant will continue to circulate through the system components. This condition has been verified by test during operation of the diesel generators. The vent lines from the crossover manifold and the lube oil heat exchanger to the expansion tank are orificed to prevent excessive amounts of pressurized water from entering the tank while the cap is off and will therefore allow adequate refilling time.

Additionally, a low-expansion tank-level alarm is provided locally on the diesel generator control panel. Detection of system leakage is accomplished by increased frequency of low-expansion, tank-level annunciations. A diesel generator room common trouble alarm annunciates in the control room in the event of a system malfunction. During emergency and standby operation of the diesel generators, operations personnel will be stationed in the diesel generator building to monitor and service the diesel generators.

040.47 (9.5.5) "Provide the source of power for the electric jacket water heater. Provide electric heater characteristics, i.e., operating voltage, phase(s), frequency and kw output as applicable. Also provide sufficient information to justify that the thermo-syphon action of the engine cooling water will keep the lube oil as well as the engine block warm to enhance engine starting. Otherwise, provide a motor driven jacket water keep warm pump. Revise the FSAR accordingly."

RESPONSE

Each immersion heater is 15 kw, 460 vac, 3 phase, and 60 Hz and is fed from its associated Class 1E motor control center.

The jacket water heater flow causes a thermosiphon effect, drawing cooler water over the heater, and is set to turn on at 125° F and shut off at 155° F. The heat conduction from the water channels and the engine will keep the lube oil as well as the engine block warm. Operating experience has demonstrated that a motor-driven jacket heating-water pump is not necessary.

(See revised Subsection 9.5.5.2 and 040.48)

040.50 (9.5.6) "Describe the instrumentation, 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 these parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided. Revise your FSAR accordingly (SRP 9.5.6, Part III, Item 1)."

RESPONSE

Subsection 9.5.6 describes the functions of the instrumentation, controls, sensors, and alarms provided for monitoring of the diesel engine air starting system. Additional information in regard to the Division 3 diesel engine air starting system is provided in NEDO 10905. Figure 9.5-4 gives the signal flow and lists the instruments, sensors, and alarms used in the system. The testing necessary to maintain and assure the proper operation of the diesel engine air starting system is also described in Subsection 9.5.6. There are no interlocks associated with the diesel engine air start system. Information regarding operator action, in case the operating parameters exceed the recommended ranges, is provided in Subsection 9.5.6. Table 1 of the response to question 040.43 provides a listing of diesel engine instrumentation, including the diesel engine air starting system.

040.54 (9.5.7) "For the diesel engine lubrication system in Section 9.5.7, provide the following information: 1) define the temperature differentials, flow rate, and heat removal rate of the interface cooling system external to the engine and verify that these are in accordance with recommendations of the engine manufacturer; 2) discuss the measures that will be taken to maintain the required quality of the oil, including the inspection and replacement when oil quality is degraded; 3) describe the protective features (such as blowout panels) provided to prevent unacceptable crankcase explosion and to mitigate the consequences of such an event; and 4) describe the capability for detection and control of system leakage (SRP 9.5.7, Part II, Items 8a, 8b, 8c, Part III, Item 1)."

RESPONSE

Part 1 - The diesel engine lube oil cooling system is part of the engine designed by the engine manufacturer. The lube oil is cooled by engine cooling water system which is also a part of the engine designed by the manufacturer. No external cooling is needed for the lube oil system. (refer to 040.40)

Part 2 - The lubricating oil will be sampled as indicated in Subsection 9.5.7.4. If the oil does not meet manufacturer's recommendations, the oil will be either purified or replaced.

Part 3 - A crankcase pressure detector is provided to detect a change in the normally negative crankcase pressure to a positive pressure. If the crankcase pressure should become positive, the high crankcase pressure alarm annunciates. The operator takes the appropriate action to rectify this condition. Engine blow out panels are also provided.

Part 4 - During the initial startup and periodic testing, the lube oil system is visually checked for leaks. High lube oil temperature, low lube oil level or low lube oil pressure could be partly attributed to lube oil leakage. Excessive oil use may be partly due to oil leakage. This is checked during routine inspection. (refer to 040.41)

040.55 (9.5.7) What measures have been taken to prevent entry of deleterious materials into the engine lubrication oil system due to operator error during recharging of lubricating oil or normal operation. (SRP 9.5.7, Part III, Item 1c).

RESPONSE

Entry of deleterious materials into the engine lubrication oil system is precluded by providing administrately controlled access into the diesel generator rooms. In addition, operators will receive training on and will exercise caution when recharging the lubricating oil system to prevent entry of deleterious materials.

The engines are equipped with emersion heater systems which include an additional circulation pump powered by an AC motor. Fittings on this pump allow oil to be supplied to, or removed from, the engine without opening the strainer sump, as would normally be required. To supply additional oil to the sump the operator will remove a pipe plug from the suction side of the pump, attach a short length of clean hose to the pump and put the other end of the hose into a new drum of lube oil. Local control of the pump by the operator allows him to accurately control the amount of lube oil supplied to the engine. It is not anticipated that an in-line filter would be needed when filling an engine sump with new oil. Before the oil reaches the sump it must travel through an in-line strainer, the main lube oil filter, and the engine strainer sump.

(See subsection 9.5.7.3)

040.56 (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 (SRP 9.5.7, Part III, Item 1e)."

RESPONSE

Please refer to Subsections 9.5.7.4 and 9.5.7.5 of Clinton FSAR for the answer to this question. Also, Table I of the response to question 040.43 provides a listing of diesel engine instrumentation, including the diesel engine lubrication oil system.

040.57 (9.5.7) "Expand your description of the diesel engine lube oil system. The FSAR text should include a detail system description of what is shown on Figures 9.5.5 and 9.5.7. The FSAR text should also describe: 1) components and their function, 2) instrumentation, controls, sensors and alarms, and 3) a diesel generator starting sequence for a normal start and an emergency start. Revise your FSAR accordingly."

RESPONSE

The engine sump is monitored by a level switch and a pressure switch. The level switch is used for the low oil level alarm. The pressure switch is used for the high crankcase pressure alarm. Both alarms are on the local control panel and the common trouble alarm in the main control room.

The engine turbocharger is monitored by a pressure switch which alarms on low oil pressure. This alarm is on the local control panel and the common trouble alarm in the main control room.

Additional information is given in Subsection 9.5.7.3, revised Subsection 9.5.7.5 and in the item listing of Figure 9.5-5.

(See revised Subsection 9.5.7.5 and 040.60)

040.60
(9.5.7)
RSP

"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, as a minimum, an electrically driven lubricating oil pump, powered from a reliable DC power supply, should be installed in the lube oil system to operate in parallel with the engine driven main lube pump. The electric driven prelube pump should operate only during the engine cranking cycle or until satisfactory lube oil pressure is established in the engine main lube distribution header. The installation of this prelube pump should be coordinated with the respective engine manufacturer. Some diesel engines include a lube oil circulating pump as an integral part of the lube oil preheating system which is in use while the diesel engine is in the standby mode. In this case, an additional prelube oil pump may not be needed.

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

RESPONSE

The diesel generators have an electric lube oil circulating pump and a soak back pump in the lube oil preheating system which will circulate oil during standby operation. GM-EMD MI-9644 is being evaluated for use at the Clinton Power Station. In the event that an automatic prelube feature is not installed prior to plant start-up the engines will be manually prelubed once per week and prior to any manual start to ensure adequate dispersion of lube oil on all engine wearing parts.

040.61 (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 (SRP 9.5.8, Part III, Items 1 and 4)."

RESPONSE

Subsection 9.5.8 describes the functions of the instrumentation, controls, sensors, and alarms provided for monitoring of the diesel engine combustion air intake and exhaust system. Additional information in regard to the Division 3 diesel engine combustion air intake and exhaust system is provided in NEDO 10905. There are no interlocks associated with the combustion air intake and exhaust system. Figure 9.5-4 shows the signal flow and lists the instruments, sensors, and alarms used in the system. The testing necessary to maintain and assure the proper operation of diesel generator air intake and exhaust is also described in Subsection 9.5.8. Information regarding operator action, in case the operating parameters exceed the recommended ranges, is provided in Subsection 9.5.8. Table 1 of the response to question 040.43 provides a listing of diesel engine instrumentation, including the diesel engine combustion air intake and exhaust system.

040.62 (9.5.8) Provide the results of an analysis that demonstrates that the function of your diesel engine air intake and exhaust system design will not be degraded to an extent which prevents developing full engine rated power or cause engine shutdown as a consequence of any meteorological or accident condition. Include in your discussion the potential and effect of fire extinguishing (gaseous) medium, recirculation of diesel combustion products, or other gases that may intentionally or accidentally be released on site, on the performance of the diesel generator (SRP 9.5.8, Part III, Item 3)."

RESPONSE

The accidental releases of carbon dioxide from the 5-ton and 6-ton storage tanks located at the Clinton Power Station along the north exterior wall of the radwaste building were evaluated using the instantaneous puff release model given in Regulatory Guide 1.78. The analysis was based on a Pasquill F Stability Class. The effect of the building wake on the plume was considered per Regulatory Guides 1.24 and 1.78. The results indicate that the oxygen (O_2) concentration at the diesel combustion air intake is greater than 18% O_2 by volume; therefore, the diesel generator will not be "snuffed" in the event of an onsite release of CO_2.

The accidental release of hydrogen from the tank farm was evaluated for 1 to 8 hydrogen storage cylinders rupturing completely. The instantaneous puff release model given in Regulatory Guide 1.78 was used. The effect of the building wake on the plume was also considered. The oxygen concentration at the diesel combustion air intake will be at least 19.9% O_2 by volume for an eight cylinder rupture.

Icing and show clogging of the diesel generator air intake louvers is not credible due to the 5-3/4 inch spacing between the individual louvers. Recirculation of the diesel generator exhaust gases during an atmosphere temperature inversion is not credible since the gas high temperature would cause rapid dispersion of the exhaust. Ice and snow clogging of the exhaust silencers is not credible since an open drain is [illegible]vided to remove moisture from the muffler discharge line. Additionally, ice buildup sufficient to exceed the diesel engine manufacturer's backpressure limits would require throttling the existing pipe internal diameter from approximately 36 inches to 5 inches.

(Refer to 040.66)

040.62 (9.5.8) Provide the results of an analysis that demonstrates that the function of your diesel engine air intake and exhaust system design will not be degraded to an extent which prevents developing full engine rated power or cause engine shutdown as a consequence of any meteorological or accident condition. Include in your discussion the potential and effect of fire extinguishing (gaseous) medium, recirculation of diesel combustion products, or other gases that may intentionally or accidentally be released on site, on the performance of the diesel generator (SRP 9.5.8, Part III, Item 3)."

RESPONSE

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Icing and show clogging of the diesel generator air intake louvers is not credible due to the 5-3/4 inch spacing between the individual louvers. Recirculation of the diesel generator exhaust gases during an atmosphere temperature inversion is not credible since the gas high temperature would cause rapid dispersion of the exhaust. Ice and snow clogging of the exhaust silencers is not credible since an open drain is provided to remove moisture from the muffler discharge line. Additionally, ice buildup sufficient to exceed the diesel engine manufacturer's backpressure limits would require throttling the existing pipe internal diameter from approximately 36 inches to 5 inches.

(Refer to Q40.66)

040.63 (9.5.8) "Discuss the provisions made in your design of the diesel engine combustion air intake and exhaust system to prevent possible clogging, during standby and in operation, from abnormal climatic conditions (heavy rain, freezing rain, dust storms, ice and snow) that could prevent operation of the diesel generator on demand (SRP 9.5.8, Part III, Item 5)."

RESPONSE

The diesel generator air intake and piping is located within the diesel generator building which affords protection from clogging due to rain, snow, sleet and ice. The diesel air intake filters are disposable fiberglass cell type, remove airborne dust or other particles, and prevent clogging of the air intake line. Additionally, the air intake filters are provided with "filter clogged" alarm devices.

The diesel engine exhaust system is located within the diesel generator building, with the exception of the diesel engine exhaust silencer which is located on the building roof as shown on Figure 1.2-9. The exhaust piping upstream of the exhaust silencer is provided with an open drain to relieve any condensate which may collect due to rain or melting snow and ice.

(See revised Subsection 9.5.8.3. and revised response to Question 040.62.)

040.64 (9.5.8) "Show by analysis that a potential fire in the diesel generator building together with a single failure of the fire protection system will not degrade the quality of the diesel combustion air so that the remaining diesel will be able to provide full rated power."

RESPONSE

The effect of the combustion of flammable materials in Zones D.3.3, D.3.5, and D.3.7 (as defined by the Clinton Fire Protection Evaluation Report) located in the diesel generator building, combined with a failure of the fire protection system on diesel generator operation was evaluated. The analysis was based on the complete combustion of all flammable materials in the zones as described with Clinton FPER. The results of the analysis, as shown below, indicate that sufficient oxygen (18%) in the combustion air to the diesels will prevent "snuffing" of the diesel generators:

Zone	Oxygen Concentration in Air to Diesels % O_2 by Volume
D.3.3	19.2%
D.3.5	19.9%
D.3.7	19.9%

There are no deleterious effects from the initiation of the carbon dioxide fire suppression system in one diesel generator bay, the adjacent bays or any of the diesel generator air intake cubicles. Each diesel generator bay is enclosed within a 4 hr. fire rated enclosure. Penetrations are sealed to obtain a 3 hr. fire rating. All HVAC duct penetrations have a pair of 1-1/2 hr. fire rated dampers.

It is not credible for the CO_2 to migrate into the diesel air intake cubicle since CO_2 is heavier than air. The CO_2 would remain in the diesel generator bay and not rise to the diesel air intake cubicles. Additionally, it would require failure of 4 fire dampers to allow a CO_2 circulation flow path.

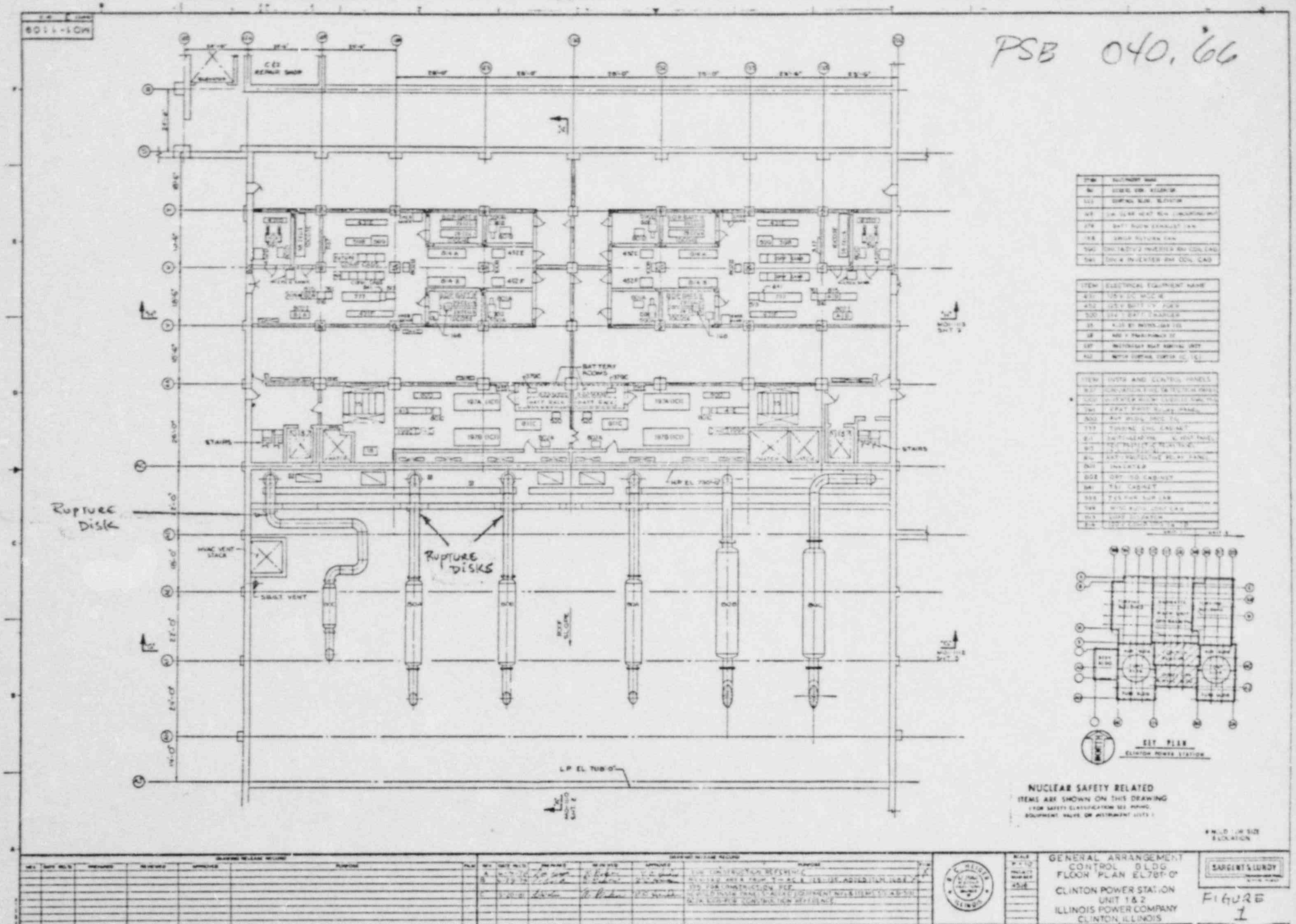
040.66 (9.5.8) "The diesel engine exhaust silencers and associated piping are located on the roof of the diesel generator building, and are exposed to tornado missiles. A tornado missile could damage all the diesel engine exhaust piping so that the exhaust systems for all engines become restricted or blocked. This is an unacceptable situation. In addition, Table 3.2-1 shows this portion of the system as non-seismic. If such failure modes could cause a loss to diesels, a seismic Category I, tornado missile protected diesel engine exhaust system should be provided."

RESPONSE

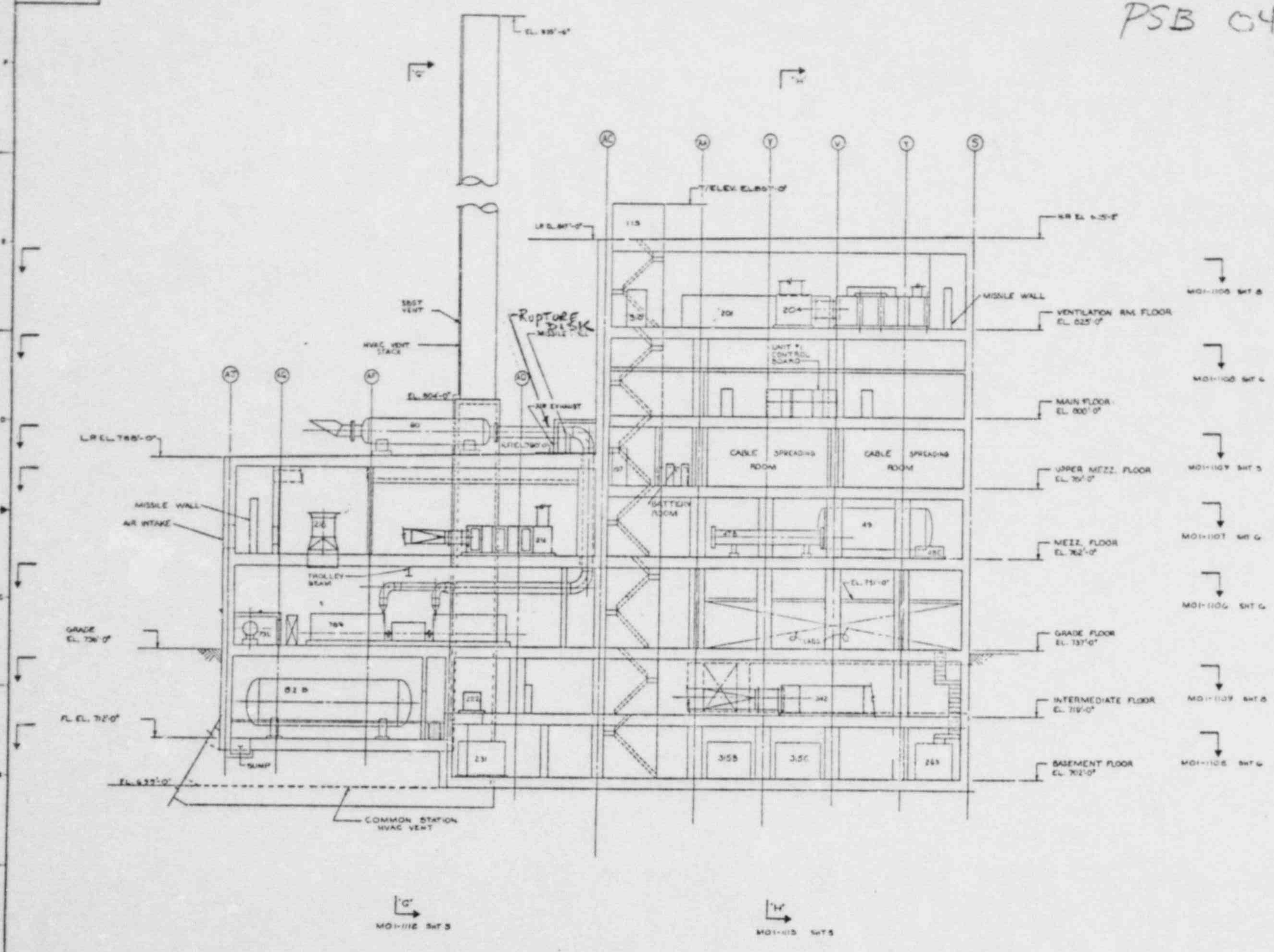
The horizontal portions of the diesel generator exhaust pipes located exterior to the missile wall will be exposed to horizontal tornado missiles and have not been designed to withstand these missiles. Damage to the diesel exhaust pipes from a tornado missile would result in minor deformation of or severing of the exhaust pipe. The severing of the exhaust pipe would not affect the operation of the diesel generator. Deformation of the exhaust pipe could result in a decrease in the operational performance of the corresponding diesel generator. The spacing of the diesel exhaust lines is greater than the longest credible tornado missile. A tornado missile traveling along a south - north trajectory could only damage a single exhaust line. A tornado missile traveling along an east - west trajectory would strike the first exhaust pipe and would lose energy or be deflected so that damage to the remaining pipes would not be expected.

In the unlikely event that a tornado missile crimps the diesel generator exhaust line sufficiently to exceed the diesel engine back pressure requirements, a rupture disk set at approximately 0.5 psia lower than the manufacturer's pressure limit is installed immediately next to the external head fitting on the diesel exhaust line. The location of the disk is shown on figures 1 AND 2, ATTACHED.

(See revised Subsection 9.5.8.3 and figures 1 AND 2).


PSB 040, 66
RUPTURE DISK
RUPTURE DISKS
BATTERY ROOMS
STAIRS
HVAC VENT STACK
C.E.2 REPAIR SHOP
L.P. EL 702'-0"
NUCLEAR SAFETY RELATED
ITEMS ARE SHOWN ON THIS DRAWING
KEY PLAN
CLINTON POWER STATION
GENERAL ARRANGEMENT
CONTROL BLDG
FLOOR PLAN EL781'-0"
CLINTON POWER STATION
UNIT 1 & 2
ILLINOIS POWER COMPANY
CLINTON, ILLINOIS
SARGENT & LUNDY
FIGURE 1

PSB 040.66



ITEM	EQUIPMENT NAME
47	COMPONENT COOL. WATER HX
48	COMPONENT COOL. WATER PUMP
49	COMPONENT COOL. WATER TANK
78	DIESEL GENERATOR
79	DIESEL GENERATOR DAY TANK
80	DIESEL GENERATOR SILENCER
82	DIESEL GEN. FUEL OIL STOR. TANKS
113	CONTROL BUILDING ELEVATOR
201	CONTROL ROOM AIR FILTER PKG.
204	CONTROL ROOM AIR HDLG. UNIT
214	DIESEL GEN. MAKE UP FAN
216	DIESEL GEN. VENT FAN
220	STANDBY GAS TREATMENT SYSTEM EQUIP. TRAINS
231	DRYWELL PURGE UNIT (FILTER)
242	TURBINE BLDG VENT SA UNIT
263	HYDROGEN RECOMBINERS
310	CONTROL ROOM SYSTEMS CHILLERS A&B
315	PLANT CHILLED WATER SYSTEMS CHILLERS

LAST HUM. REV. 9

FOR CONSTRUCTION REFERENCE

GENERAL ARRANGEMENT
CONTROL & DIESEL GEN. BLDG
SECTION "A-A"

CLINTON POWER STATION
UNIT 1
ILLINOIS POWER COMPANY
CLINTON, ILLINOIS

SARGENT & LUNDY

FIGURE 2