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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards responses to draft SER Open Items 103,106,116,118,
119, & 153.

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Carolina Power & Light Company

JUN 29 1983

SERIAL: LAP-83-243

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NOS. 1 AND 2
DOCKET NOS. 50-400 AND 50-401
DRAFT SAFETY EVALUATION REPORT RESPONSES
POWER SYSTEMS BRANCH

Dear Mr. Denton:

Carolina Power & Light Company (CP&L) hereby transmits one original and forty copies of responses to Shearon Harris Nuclear Power Plant Draft Safety Evaluation Report Open Items. These responses are for the Power Systems Branch, and are CP&L Open Item Nos. 103, 106, 116, 118, 119, 123, 149, and 153.

We will be providing responses to other Open Items in the Draft Safety Evaluation Report shortly.

Yours very truly,

M. A. McDuffie
Senior Vice President
Engineering & Construction

JDK/ccc (7095JDK)

Attachments

cc: Mr. N. Prasad Kadambi (NRC)
Mr. E. Tomlinson (NRC-PSB)
Mr. G. F. Maxwell (NRC-SHNPP)
Mr. J. P. O'Reilly (NRC-RII)
Mr. Travis Payne (KUDZU)
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Mr. John D. Runkle
Dr. Richard D. Wilson
Mr. G. O. Bright (ASLB)
Dr. J. H. Carpenter

B001 1/1

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 103
(FSAR Section 8.3, NRC Question 430.13)

Satisfaction of requirements of Regulatory Guide 1.108 and preventive maintenance.

Question 430.13

Periodic testing and test loading on an emergency diesel generator in a nuclear power plant is a necessary function to demonstrate the operability, capability, and availability of the unit on demand. Periodic testing coupled with good preventive maintenance practices will assure optimum equipment readiness and availability on demand. This is the desired goal.

To achieve this optimum equipment readiness status the following requirements should be met:

(1) The equipment should be tested with a minimum loading of 25 percent of rated load. No load or light load operation will cause incomplete combustion of fuel resulting in the formation of gum and varnish deposits on the cylinder walls, intake, and exhaust valves, pistons and piston rings, etc., and accumulation of unburned fuel in the turbocharger and exhaust system. The consequences of no load or light load operation are potential equipment failure due to the gum and varnish deposits and fire in the engine exhaust system.

(2) Periodic surveillance testing should be performed in accordance with the applicable NRC guidelines (R.G. 1.108), and with the recommendations of the engine manufacturer. Conflicts between any such recommendations and the NRC guidelines, particularly with respect to test frequency, loading and duration, should be identified and justified.

(3) Preventive Maintenance should go beyond the normal routine adjustments, servicing, and repair of components when a malfunction occurs. Preventive maintenance should encompass investigative testing of components which have a history of repeated malfunctioning and require constant attention and repair. In such cases consideration should be given to replacement of those components with other products which have a record of demonstrated reliability, rather than repetitive repair and maintenance of the existing components. Testing of the unit after adjustments or repairs have been made only confirms that the equipment is operable and does not necessarily mean that the root cause of the problem has been eliminated or alleviated.

(4) Upon completion of repairs or maintenance and prior to an actual start, run, and load test, a final equipment check should be made to assure that all electrical circuits are functional, i.e., fuses are in place, switches and circuit

breakers are in their proper position, no loose wires, all test leads have been removed, and all valves are in the proper position to permit a manual start of the equipment. After the unit has been satisfactorily started and load tested, return the unit to ready automatic standby service and under the control of the control room operator.

Provide a discussion of how the above requirements have been implemented in the emergency diesel generator system design and how they will be considered when the plant is in commercial operation, i.e., by what means will the above requirements be enforced.

Response

Preoperational and periodic testing on the diesel generator will comply with Regulatory Guide 1.108. The diesel generators will be tested and run at loads greater than 25% of rated load, except when under the special conditions discussed in SHNPP's response to DSER Open Item 119 (also enclosed with this letter).

Periodic surveillance testing will be performed in accordance with Regulatory Guide 1.108. The diesel engine manufacturer's recommendations are not anticipated to conflict with the testing program.

A preventive maintenance program will be in effect that will go beyond the normal repair and adjustment of components when malfunctions occur. The diesel engines will be included in the plant's trending analysis, which will be a predictive effort. Material history records will be maintained on the diesel generators, and the operating history of the diesel type will be obtained from the manufacturer. An overall goal of the preventive maintenance program will be the identification and correction of the root causes of malfunctions. Maintenance procedures, which are currently being developed, will enforce the requirements by monitoring all maintenance activities on a regular basis and by ensuring constant feedback. These procedures will be in place ninety days prior to fuel load.

All maintenance on the emergency diesel generator will be followed by a verified lineup and a post-maintenance test in accordance with the surveillance requirements of Technical Specifications.

The SHNPP FSAR position statement on Regulatory Guide 1.108 will be revised in a future amendment to indicate our compliance.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 106
(FSAR Section 9.5.3, NRC Question 430.17)

Emergency lighting in areas to ensure safe shutdown and personnel movements.

NRC Clarification of Open Item No. 106

Provide a more detailed and complete description of the plant emergency lighting system to include identification of areas covered, devices used, and system power diversity. Include in the description the provisions provided for adequate lighting for the control room and in particular during switchover from normal to emergency power assuming a single active failure of a Diesel Generator.

Response

The detailed description of the emergency lighting system design that includes source of power and its diversity is provided in FSAR Section 9.5.3.2 and previous responses to NRC review questions 430.17 and 430.18. FSAR Section 9.5.3.3 discusses the provision for lighting during transfer from normal power to AC emergency power and loss of the diesel generators.

The emergency lighting system consists of two independent systems, normal/emergency AC lighting and DC emergency lighting. The normal/emergency AC lighting is divided into two independent trains, each of which is connected to its associated diesel generator and corresponding safety division. Either independent train can provide adequate lighting to cover the areas shown in Table 9.5.3-1 (attached) for the safe and orderly operation of the plant during any mode of emergency operation.

The normal/emergency AC lighting normally receives power from the station safety related auxiliary power system through the unit auxiliary transformers or start-up transformer. In the event of the loss of offsite power, the power to the lighting system is provided from the onsite diesel generators. This design precludes the complete loss of lighting in the control room and other vital areas due to a single failure in any one of the safety divisions of its associated diesel generator. The attached Figure 106-1 identifies the various devices utilized for the normal/emergency AC lighting.

The DC emergency lighting system provides lighting in areas as shown in Table 9.5.3-1 which includes the control room, the auxiliary control room, and the computer room. The DC emergency lighting for the control room, auxiliary control room, and computer room is fed from the station non-safety DC batteries and is energized automatically in the event of loss of AC power in either train A or train B of the normal/emergency AC lighting. This design allows lighting control room during switchover from normal AC power (thru station auxiliary transformers) to the onsite emergency power (the diesel generator). The attached Figure 106-2 identifies the various devices utilized for the DC emergency lighting for the control room, auxiliary control room and computer room.

FSAR Section 9.5.3 will be revised in a future amendment to reflect this response.

SHEARON HARRIS NUCLEAR POWER PLANT
OUTLINE OF PLANT LIGHTING SYSTEMS

TABLE 9.5.3-1

Building	Elevation	Normal A. C. Lighting (1)	Normal/Emergency A. C. Lighting (1)	Emergency D. C. Lighting (2)
1 - Containment	221	Yes	Yes	No
	236	Yes	Yes	No
	261	Yes	Yes	No
	286	Yes	Yes	No
2 - Reactor Aux.	190	Yes	Yes	Yes
	216	Yes	Yes	Yes
	236	Yes	Yes	Yes
	261	Yes	Yes	Yes
	286	Yes	Yes	Yes (3)
	305	Yes	No	No
(Main Control Room and Computer Room)	305	Yes	Yes	Yes (4)
3 - Fuel Handling	216	Yes	Yes	Yes
	236	Yes	Yes	Yes
	261	Yes	Yes	Yes
	286	Yes	Yes	Yes
	305	Yes	Yes	Yes
	324	Yes	Yes	Yes
4 - Waste Processing	211	Yes	Yes	Yes
	236	Yes	Yes	Yes
	261	Yes	Yes	Yes
	276	Yes	Yes	Yes
	291	Yes	Yes	Yes
5 - Turbine Generator Area	240	Yes	Yes	Yes
	261	Yes	Yes	Yes
	286	Yes	Yes	Yes
	314	Yes	No	No
6 - Yard Lighting	---	Yes	No	No

NOTES TO TABLE 9.5.3-1

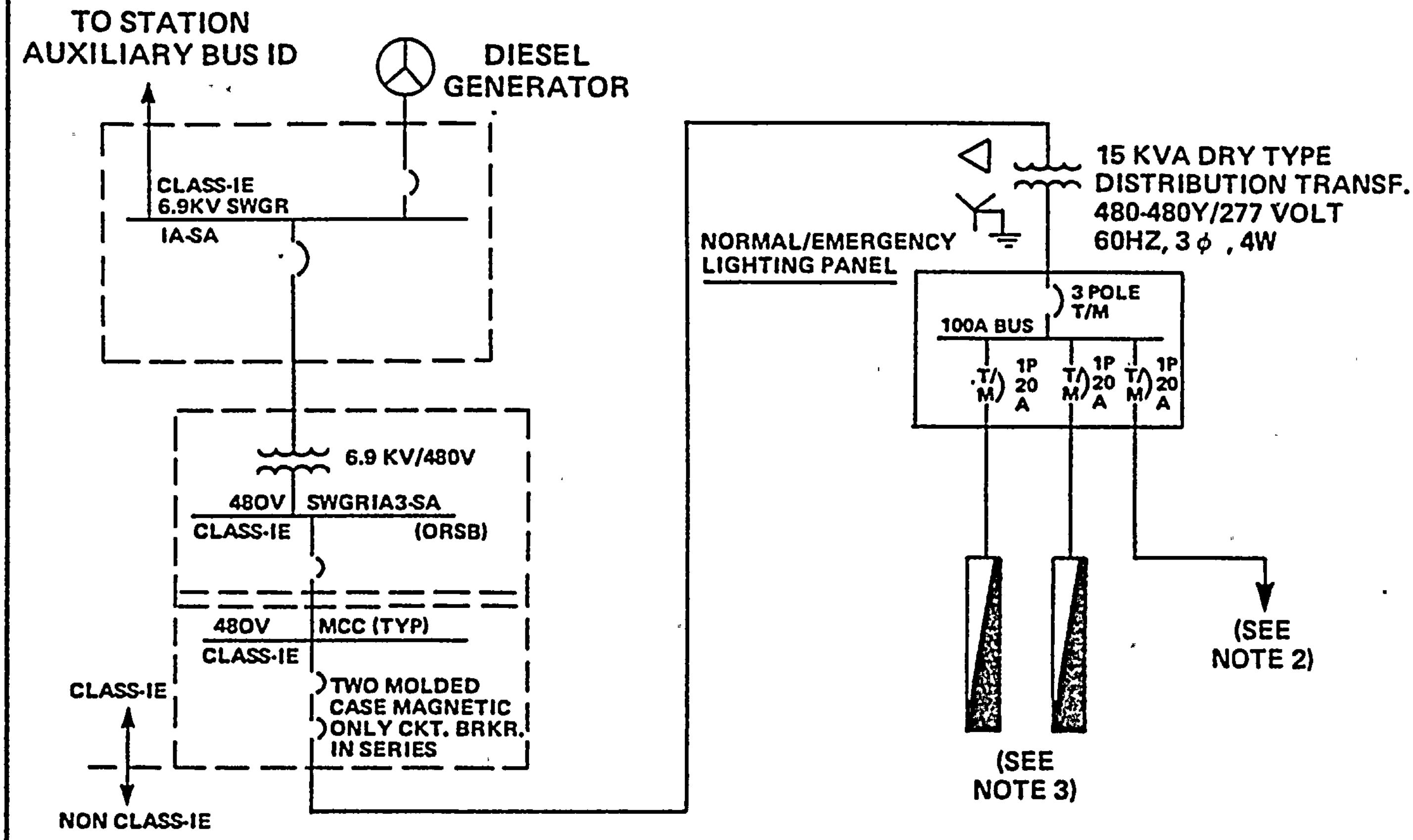
1. Lighting covers all floor area.

2. Emergency DC lighting provided only for egress through local self-contained battery lighting units (except as noted in the Reactor Auxiliary Building elev. 286 and in the Main Control Room and Computer Room).

3. Emergency DC lighting provided for egress through local self-contained battery lighting units except for Auxiliary Control Room, where Emergency DC lighting is provided through station batteries and covers all working areas.

4. Control Room and Computer Room Emergency lighting is supplied from the station batteries and covers all working areas.

NORMAL/EMERGENCY (N/E) AC LIGHTING
(SEE NOTE 1)



NOTES:

1 CONFIGURATION SHOWN IS TYPICAL FOR EACH SAFETY TRAIN A OR B REDUNDANT LIGHTING CONDUITS ARE SEPARATED AND INDEPENDENTLY SUPPORTED. THE FAILURE OF ONE REDUNDANT TRAIN WILL NOT JEOPARDIZE THE OPERATION OF THE OTHER TRAIN OR ANY SAFETY RELATED CIRCUIT

2 TO CONTACTOR IN D.C. EMERGENCY LIGHTING PANEL 140. LOSS OF A.C. POWER AT N/E PANEL AUTOMATICALLY ENERGIZES EMERGENCY DC LIGHTING SYSTEM

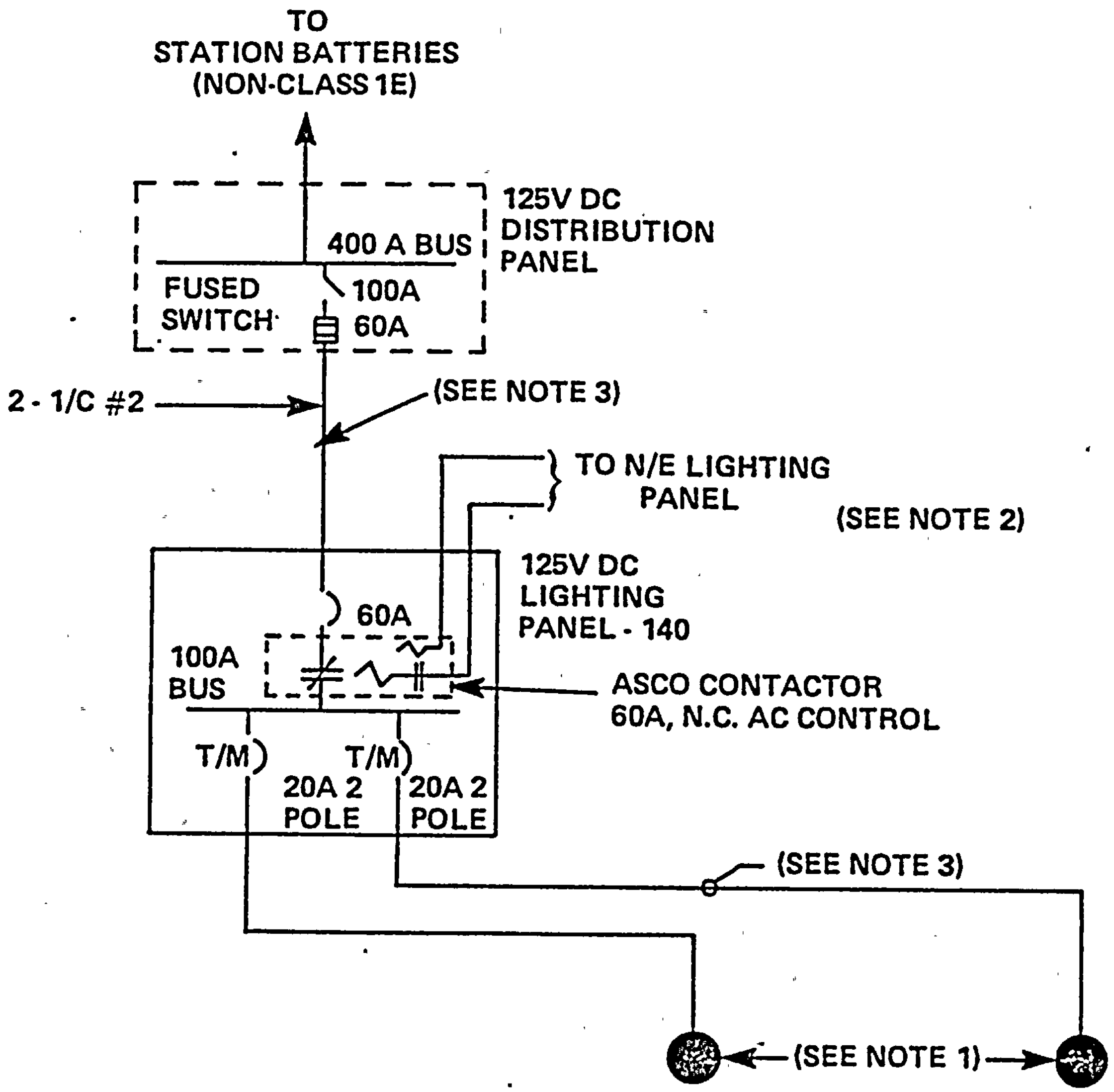
3 LIGHTING FOR N/E SYSTEM IS BY FLUORESCENT FIXTURES (TYPICALLY DAY-BRIGHT 4G42-65T-4) RATED FOR 120V OR 277V, 1ϕ OPERATION

LEGEND:

T/M — THERMAL MAGNETIC MOLDED CASE BREAKER

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company	PLANT LIGHTING	FIGURE 106-1

DC EMERGENCY LIGHTING
(FOR CONTROL ROOM, AUXILIARY CONTROL ROOM, AND COMPUTER ROOM ONLY)



NOTES

1 LIGHTING FOR DC EMERGENCY SYSTEM IS SUPPLIED BY INCANDESCENT FIXTURES (BENJAMIN TYPE 150/R/FL TYPICAL)

2 UPON LOSS OF POWER ON EITHER N/E TRAIN, DC EMERGENCY LIGHTING IS AUTOMATICALLY ENERGIZED

3 EMERGENCY LIGHTING CONDUITS ARE SEPARATED AND INDEPENDENTLY SUPPORTED FROM EITHER OF THE N/E TRAINS

LEGEND:

T/M - THERMAL MAGNETIC MOLDED CASE BREAKER

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company	PLANT LIGHTING	FIGURE 106-2

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 116

The NRC is concerned that corrosion sediment build-up on the tank bottom could be stirred up during refueling and drawn into the Diesel Generator during operation. They asked that we detail provisions for minimizing the turbulence in refueling operations (e.g. diffuser pipes) as described in ANSI N195. The NRC requested that we address tank refill during DG operation.

Response

A. The creation of turbulence of the sediment at the bottom of the tank is highly unlikely due to the high fuel oil level maintained in the storage tank at all times and the system design as described below:

1. Two 175,000 gallon capacity fuel oil storage tanks are provided for Units 1 and 2. Each fuel oil tank provides the design basis on site storage capacity for 7 days operation of two diesels plus adequate fuel supply for periodic testing. Two 100% diesel generator units are provided for each unit. When the tank level is reduced to 7 days reserve capacity for two diesels, additional fuel oil will be ordered. The oil can be delivered to the site within 8 hours (see NRC Questions 430.26 and 430.28).

2. Two 100% diesel engines (one for each unit) are connected to each fuel oil storage tank and belong to the same division as the tank (i.e. either division A or B of Unit 1 and Unit 2). Since it is highly unlikely that the diesel generator of the same division for both units will fail at the same time and that both units will require operation of a diesel engine for an extended period of time (7 days) simultaneously, the fuel oil storage capcaity in each tank can be expected to provide at least 14 days operation of a single diesel generator (i.e. 200% design fuel oil storage capacity required by ANSI N195 or Regulatory Guide 1.137).

Refilling of the storage tank at high fuel oil level will not create turbulence of the sediment at the bottom of the tank.

B. The potential for build-up of fuel oil sediment at the bottom of the fuel oil storage tank is lessened by the following provisions:

1. The Storage Tank is filled with high quality fuel oil, recommended by the diesel generator manufacturer. This requirement is reflected in the surveillance requirement described in FSAR Chapter 16 Section 4.8.1.1.2(b) and in FSAR Section 9.5.4.5.

2. Quality of the fuel oil at the bottom of the tank is checked by periodic sampling at the tank drain connection for water and other contaminents to ensure storage of high quality fuel oil throughout the tank. If necessary, the fuel oil storage tanks can be drained, cleaned, inspected, and refilled.

C. In the event of some sludge build-up at the bottom of the storage tank, its entry into the diesel engine is prevented as follows:

1. A sump is provided at the low point of each fuel oil storage tank to accumulate water and other contaminents. The bottom floor of the tank is sloped towards the sump which is located away from the transfer pump suction line nozzles. A drain connection is provided at the bottom of the sump for water and/or sludge removal.

2. The fuel oil transfer pump suction line is located about one foot above the tank bottom and is not located in the vicinity of the sump (as detailed in FSAR Figure 3.8.4-22). The low velocity in the fuel oil transfer pump suction lines (i.e. less than 2 fps) provides additional assurance that suspended sediment carry over is minimized. The velocity gradients in the storage tank due to the large volume will be negligibly small (i.e. suspended sediment will settle out in the tank even if active fuel oil transfer is being conducted).

3. Instrumentation is provided to check the conditions of the fuel oil strainers installed at the fuel oil transfer pump suction and at the inlet and outlet of diesel engines driven fuel oil pump (see FSAR Figure 9.5.4-2).

4. Each 3,000 gallon day tank provides approximately six hours of fuel oil storage assuming maximum engine fuel consumption. This will allow any sediment which is transferred to settle out in the day tank.

In view of the above, it is highly unlikely that diesel engine operation shall be impaired during refueling of a fuel oil storage tank.

FSAR Seciton 9.5.4 will be revised in a future amendment to reflect the above response.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 118

A more detailed discussion is required than that provided in the NRC Question 430.36 response regarding component safety class. This information should also be identified on Figure 9.5.5-2.

Response

Each emergency diesel engine generator set is provided with a separate fuel oil system.

The fuel oil from the main fuel oil storage tank is supplied to each day tank by the fuel oil transfer pump as shown in Figure 9.5.4-1 (see FSAR Section 9.5.4).

The diesel engine mounted piping and components consisting of an engine driven fuel oil pump, a duplex filter, a duplex strainer, an ejector system, an injector system, manifolds and valves (check, shut-off and relief valves), is shown in detail on the attached Figure 9.5.4-2. Pressure and level switches and gauges are provided for alarm, control, and indication.

Upon receipt of a signal initiating diesel start, the diesel engine shaft driven fuel pump takes suction from its associated day tank through a duplex strainer and discharges fuel oil to the diesel engine through a check valve and duplex filter. A relief valve is provided to protect the system.

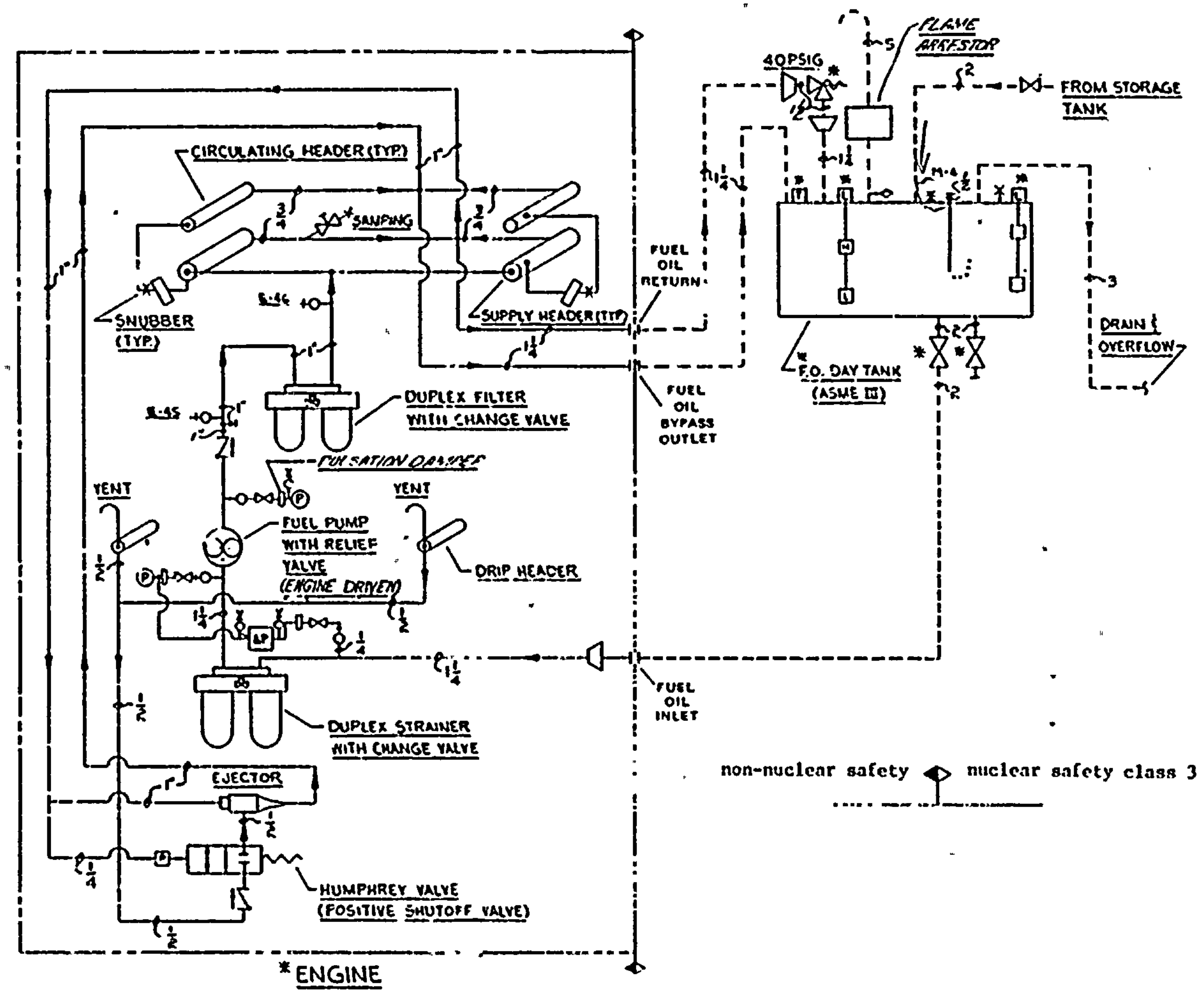
Leaving the duplex filter, fuel oil flows to the supply header and circulating header. Fuel oil is then fed to each cylinder fuel injector. The governor controls the fuel racks which in turn regulates the amount of fuel oil injected to the cylinders, thus controlling the engine speed. Since the fuel oil pump is sized (26 GPM) to pump more than the engine needs, fuel oil not used by the injectors is returned to the day tank by means of an ejector system. The ejector system regulation is controlled by a pressure regulator which is mounted on the day tank. Also mounted on the day tank are level indicators to annunciate low and high level in the tank. A flame arrestor is incorporated on the tank vent to protect the tank from fire.

The Diesel Generator Fuel Oil System (excluding the engine mounted piping and components) is designed in accordance with Seismic Category I and ASME Boiler and Pressure Vessel Section III Code Class 3, as indicated in FSAR Table 3.2.1-1. The engine and fuel oil system piping and components on the engine meet the guidelines as stated by the DEMA standards. The design stresses which include mechanical, pressure and thermal, and seimic induced loads for the engine mounted piping have been determined by the Diesel Generator manufacturer, Transamerica DeLaval Incorporated (TDI), to be well within the allowable stresses as permitted by ANSI B31.1.

The TDI approved QA/QC program used in conjunction with the manufacture of diesel engines, engine mounted components, and piping comply with the requirements of Appendix B of 10 CFR 50.

The design standards for all the engine mounted piping and components are those developed by TDI on a very conservative design basis. Supporting this design are over 250 units in this model series (DSRV) which have been used at other nuclear projects.

FSAR Section 9.5 will be revised in a future amendment to reflect this response.



REF DWG: EMDRAC DWG NO. 1364-7818 (REV 6)

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

FUEL OIL PIPING SCHEMATIC
FIGURE 9.5.4-2

Shearon Harris Nuclear Power Plant
Draft SER Open Item 119
(FSAR Section 9.5.5, NRC Question 430.42)

Diesel Generator starting under adverse ambient conditions.

Question 430.42

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

Response

The diesel generators are Transamerica-DeLaval, Inc. Model DSRV-16-4. The design provision of the engine takes into consideration the prolonged period of no-load operation at synchronous speed.

A factory no-load endurance test has been conducted by the manufacturer to verify that the engine could operate at zero load for at least 7 days (168 hours) without detrimental effects on the engine's performance or its capability to accept a significant step load.

The specific procedure utilized for this test is to start and run the engine at no-load, rated speed for 168 hours. At the end of this time, a 1000 KW resistive load is applied, and one-half second later a 3000 KW resistive load is applied (4000 KW total).

The test results indicated that the engine-generator set performed without developing abnormal engine responses, noise or vibration. The exhaust was clear from the start of the unit until the moment the load was applied. After the application of the step loads, the exhaust smoke was heavy for about 20 seconds. Within 35 seconds the exhaust was normal. This indicates that during no-load operation, the combustion process was good with no fuel carry over to the exhaust stack. There were also no indications of lube oil being pumped into the intake or exhaust manifolds.

During the factory no-load endurance test, the ambient temperature was maintained at 50°F. The minimum temperature recommended by DeLaval if the auxiliary lube oil heaters are not in service is 50°F in the room and 0°F at the remote intake (air).

SHNPP procedures will reflect the periodic need for no-load operating conditions. There are recognized situations that will require the standby diesel to start and to continue operation in the no-load conditions, and these situations are as follows:

1) No-load run-in for overhaul (major maintenance) of cylinders, piston rings, crank shaft bearings in accordance with IEEE-387-1977.

2) Upon receiving a Safety Injection Signal, with offsite power available, the diesel will start and operate unloaded until the Emergency Operating Procedures are used to evaluate the events and a determination is made whether the diesels should be running or secured.

After the no-load situations cited in item (1) above, the diesel generators will be demonstrated operable by performing surveillance requirements on the required independent circuits between the offsite transmission network and the onsite Class 1E distribution system. These requirements are covered in a one-hour run-time operational surveillance test.

Shearon Harris Nuclear Power Plant
Draft SER Open Item 123
(FSAR Section 9.5.7, NRC Question 430.57)

Question 430.57

Under certain conditions, it may be necessary to operate the diesel generators continuously for periods of 7 days, or more. In your FSAR describe the provisions which have been made in your lube oil system to monitor lube oil level in the diesel engine sump during extended operations. If such provisions have not been made, show by analysis that the lube oil sump has adequate reserve capacity to allow for 7 days of diesel generator operation at full load with associated lube oil consumption while retaining sufficient lube oil inventory to ensure proper lube oil pump suction and adequate lube oil cooling. Also, show how lube oil can be safely added during diesel generator operation.

Response

The Diesel Generator Lubrication System is described in FSAR Section 9.5.7. As discussed in this section, the lubrication system is capable of supporting continuous diesel operation.

An adequate supply of lubricating oil is assured by several means: the integrity of the lubrication system's piping and components (refer to FSAR Section 9.5.7.2); the lubrication oil sump capacity (1500 gallons); a low level alarm on the oil sump; routine manual monitoring of the sump oil level; and the ability to add oil to the oil sump. Based on technical data from the diesel manufacturer, the diesel will consume 0.6 gallons of lube oil per hour during loaded operation. During a seven day run (168 hours), the consumption is 101 gallons, which represents a small fraction of the oil sump capacity (1500 gallons). The sump level alarm is shown on FSAR Figure 9.5.7-1, and it is listed in FSAR Section 9.5.7.5. The level alarm setpoint will be set at a level of 1100 gallons. In the absence of a level alarm, manual monitoring of the oil sump level will be used to determine if oil addition is necessary. A qualified individual running the diesel will perform manual monitoring with a dipstick.

Oil addition is performed manually via the fill line as shown on FSAR Figure 9.5.7-1. Oil will be obtained from storage containers kept on-site; these containers will not be stored in the diesel generator building due to fire protection considerations. Lubricating oil can be transferred from storage containers by a manual pump or by a portable, electrically operated pump. Lubricating oil can be added when the diesel is operating or shutdown. Oil addition will be covered in the appropriate CP&L training (refer to the response for Open Item 102). However, the addition of diesel lube oil is an elementary activity; therefore, it will not be subject to specific procedures.

Based on the oil consumption rate identified above, the oil sump capacity, the low level alarm, the capability to add oil to the oil sump during operation or shutdown, and the ability to monitor oil sump level, SHNPP finds that an adequate lube oil level can be maintained.

(7148NLUccc)

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 149
(FSAR Section 10.2, NRC Question 430.69)

ISI program for extraction steam valves.

Question 430.69

Provide a discussion of the in-service inspection program for the extraction steam valves. Also, provide the time interval between periodic valve exercising to ensure the extraction steam valves will close on turbine trip.

Response

As discussed in FSAR Section 10.2.3.6, the extraction steam valves are exercised at least once per month by closing each valve and observing the valve position indicator. Direct observation of the valve motion is to be made at least once per quarter as part of the in-service inspection.

Disassembly of the extraction steam valves is not considered necessary for the following reasons:

1) Their importance to safety does not justify the risks inherent to reassembling a disassembled extraction steam valve after inspection;

2) Mechanical defects affecting the function of the valve are readily identified by exercising the valve; and

3) The frequency of exercising the valve is sufficient to provide confidence that the reliability of the valve to perform its isolation function is satisfactory.

Shearon Harris Nuclear Power Plant
Draft SER Open Item No. 153
(FSAR Section 10.4.4, NRC Question 430.85)

Safety significance of the Turbine Bypass System.

Question 430.85

In section 10.4.4.4, you have discussed tests and initial field inspection, but not the frequency and extent of in-service testing and inspection of the Turbine Bypass System. Provide this information in the FSAR.

Response

The Turbine Bypass System (Steam Dump System) shall be exercised at least once in a six-month period by remotely stroking the eight atmospheric and six bypass valves described in FSAR Section 10.4.4.2 and by observing the valve position indicator. Direct observation of valve motion will be made at least once every two years.

FSAR Section 10.4.4.4 will be revised in a future amendment to add the above information.