Alabama Power Company
600 North 18th Street
Post Office Box 2641
Birmingham, Alabama 35291
Telephone 205 250-1000

**F. L. CLAYTON, JR.**
Senior Vice President

Alabama Power
*the southern electric system*

September 24, 1980

Docket No. 50-364

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulator Commission
Washington, D. C. 20555

Attention: Mr. R. L. Tedesco

JOSEPH M. FARLEY NUCLEAR PLANT - UNIT 2
REQUEST FOR ADDITIONAL INFORMATION

Gentlemen:

Enclosed is Alabama Power Company's response to NRC Power Systems Branch questions 040.1 through 040.14.

If there are any questions, please advise.

Yours very truly,

for F. L. Clayton, Jr.

KK:bs

cc: Mr. R. A. Thomas
Mr. G. F. Trowbridge
Mr. L. L. Kintner
Mr. W. H. Bradford

B001 S 1/1

A 8009290391

QUESTIONS CONCERNING DIESEL GENERATORS

040.1 (9.5.6) Provide a discussion of the measures that have been taken in the design of the standby diesel generator air starting system to preclude the fouling of the air start valve or filter with moisture and contaminants such as oil carryover and rust. (SRP 9.5.6, Part III, item 1).

040.2 (9.5.8) Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deliterious material on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches - etc.). Describe the provisions that have been made in your diesel generator building design, electrical starting system, and combustion air and ventilation air intake design(s) to preclude this condition to assure availability of the diesel generator on demand.

Also describe under normal plant operation what procedure(s) will be used to minimize accumulation of dust in the diesel generator room, specifically address concrete dust control. In your responses also consider the condition when Unit 1 is in operation and Unit 2 is under construction (abnormal generation of dust).

Q40.3 (9.5.3) 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 PSAR/FSAR to include and explicitly define the capability of your design with regard to this requirement. (SRP 9.5.5, Part III, Item 7).

Q40.4 (9.5.4) Section 9.5.4.1 emergency diesel engine fuel oil storage and transfer system (EDEFSS) does not specifically reference ANSI Standard N195 "Fuel Oil Systems for Standby Diesel Generators". Indicate if you intend to comply with this standard in your design of the EDEFSS; otherwise provide justification for non-compliance. (SRP 9.5.4, Rev. 1, Part II, item 12).

Q40.5 (9.5.4) Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision will be made in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of the storage tank. Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator.

040.6
(9.5.4)

Discuss the precautionary measures that will be taken to assure the quality and reliability of the fuel oil supply for emergency diesel generator operation. Include the type of fuel oil, impurity and quality limitations as well as diesel index number or its equivalent, cloud point, entrained moisture, sulfur, particulates and other deliterious insoluble substances; procedure for testing newly delivered fuel, periodic sampling and testing of on-site fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks and periodic system inspection. In your discussion include reference to industry (or other) standard which will be followed to assure a reliable fuel oil supply to the emergency generators. (SRP 9.5.4, Part III, items 3 and 4).

040.7
(9.5.6)
RSP

A study of the University of Dayton has shown that accumulation of water in the starting air system has been one of the most frequent causes of diesel engine failure to start on demand. Condensation of entrained moisture in compressed air lines leading to control and starting air valves, air start motors, and condensation of moisture on the working surfaces of these components has caused rust, scale and water itself to build up and score and jam the internal working parts of these vital components thereby preventing starting of the diesel generators.

In the event of loss of offsite power the diesel generators must function since they are vital to the safe shutdown of the reactor(s). Failure of the diesel engines to start from the effects of moisture condensation in air starting systems and from other causes have lowered their operational reliability to substantially less than the desired reliability of 0.99 as

specified in Branch Technical Position ICSB (PSB) 2 "Diesel Generator Reliability Testing" and Regulatory Guide 1.108 "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants."

In an effort toward improving diesel engine starting reliability we require that compressed air starting system designs include air dryers for the removal of entrained moisture. The two air dryers most commonly used are the dessicant and refrigerant types. Of these two types, the refrigerant type is the one most suited for this application and therefore is preferred. Starting air should be dried to a dew point of not more than 50°F when installed in a normally controlled 70°F environment, otherwise the starting air dew point should be controlled to at least 10°F less than the lowest expected ambient temperature.

Revise your design of the diesel engine air starting system accordingly, describe this feature of your design.

040.8
(8.3)
RSP

Operating experience at certain nuclear power plants which have two cycle turbocharged diesel engines manufactured by the Electromotive Division (EMD) of General Motors driving emergency generators have experienced a significant number of turbocharger mechanical gear drive failures. The failures have occurred as the result of running the emergency diesel generators at no load or light load conditions for extended periods. No load or light load operation could occur during

periodic equipment testing or during accident conditions with availability of offsite power. When this equipment is operated under no load conditions insufficient exhaust gas volume is generated to operate the turbocharger. As a result the turbocharger is driven mechanically from a gear drive in order to supply enough combusion air to the engine to maintain rated speed. The turbocharger and mechanical drive gear normally supplied with these engines are not designed for standby service encountered in nuclear power plant application where the equipment may be called upon to operate at no load or light load condition and full rated speed for a prolonged period. The EMD equipment was originally designed for locomotive service where no load speeds for the engine and generator are much lower than full load speeds. The locomotive turbocharged diesel hardly ever runs at full speed except at full load. The EMD has strongly recommended to users of this diesel engine design against operation at no load or light load conditions at full rated speed for extended periods because of the short life expectancy of the turbocharger mechanical gear drive unit normally furnished. No load or light load operation also causes general deterioration in any diesel engine.

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

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

040.9 (8.3) Provide a detail discussion (or plan) of the level of training proposed for your operators, maintenance crew, quality assurance, and supervisory personnel responsible for the operation and maintenance of the emergency diesel generators. Identify the number and type of personnel that will be dedicated to the operations and maintenance of the emergency diesel generators and the number and type that will be assigned from your general plant operations and maintenance groups to assist when needed.

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

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

040.10
(9.5.7)
RSP

Several fires have occurred at some operating plants in the area of the diesel engine exhaust manifold and inside the turbocharger housing which have resulted in equipment unavailability. The fires were started from lube oil leaking and accumulating on the engine exhaust manifold and accumulating and igniting inside the turbocharger housing. Accumulation of lube oil in these areas, on some engines, is apparently caused from an excessively long prelube period, generally longer than five minutes, prior to manual starting of a diesel generator. This condition does not occur on an emergency start since the prelube period is minimal.

When manually starting the diesel generators for any reason, to minimize the potential fire hazard and to improve equipment availability, the prelube period should be limited to a maximum of three to five minutes unless otherwise recommended by the diesel engine manufacturer. Confirm your compliance with this requirement or provide your justification for requiring a longer prelube time interval perior to manual starting of the diesel generators. Provide the prelube time interval your diesel engine will be exposed to prior to manual start.

040.11
(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 intregal 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.

040.12
(8.3)
RSP

Periodic testing and test loading of 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.

040.13
(8.3)
RSP

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 senstive instrumentation under this environment rapidly deteriorates calibration, accuracy and control signal output.

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring

instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area or equipped with vibration mounts.

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

040.14 (8.3) Provide the design characteristics for the diesel engine (engine horsepower, number of cylinders, manufacturer, model number] and any other pertinent information.

## RESPONSES TO DIESEL GENERATOR QUESTIONS

040.1
(9.5.6)

RESPONSE

Each standby diesel generator is equipped with two independent air starting systems. Each air start system is piped to six of the twelve cylinders of the engine and will start the engine should the other system fail to function.

Each air start system is equipped with the following components that remove contaminants from the air to preclude fouling of the air start valve:

1. Compressor Air Inlet Filter
2. Compressed Air Cooler
3. Air Dryer (Dessicant)
4. Air Dryer Automatic Drain Valve
5. Air Receiver Drain Valve (Manual)
6. Air Start Valve Inlet Air Filter (Equipped with manual blow-down valve)

The manual drain and blow-down valves listed above are periodically operated to remove contaminants from the air system.

In addition, the filters, compressors, and dryer are on a preventive maintenance program to ensure the reliability of the system.

040.2
(9.5.8)

RESPONSE

The Diesel Generator Building houses five diesel units in five separate rooms. Each diesel has a dedicated combustion air inlet system which is independent of the diesel room ventilation system. Combustion air is drawn directly from outside the building through an inlet structure equipped with louvered doors, screens, and filters to the engine.

Engine exhaust is piped to the building exterior through an exhaust ventilator.

Each diesel room is provided with an independent ventilation system. Temperature controlled motor operated louvers are provided on ventilation air inlet and exhaust openings. Two screens, separated by $90^{o}$ turns in the inlet path are provided. Exhaust fans discharge through roof ventilators and are sequenced "on" between 75-$105^{o}$ F to control diesel room temperature.

Each engine is equipped with two parallel electrical start circuits. The components of these circuits are housed in three electrical panels two of which are equipped with door seals and no ventilation louvers. The local engine controls and local generator monitoring instrumentation are housed in the third panel which is not ventilated. Access door seals will be added to this panel.

The diesel building is cleaned on a routine basis. A sealant has been applied to the diesel generator building floors to preclude the generation of concrete dust by personnel traffic.

The FNP diesel generator building is located on the Unit 1 side of the plant which is complete except for backfit work. The grounds are landscaped, grassed, and roads are paved. Unit 2 construction is essentially complete; however, unpaved access roads necessary for construction are wetted to limit dust generation by construction traffic.

In addition to the above measures, routinely scheduled preventive maintenance is accomplished on electrical panels (eg. includes cleaning of components) and ventilation components.

040.3
(9.5.5) RESPONSE:

FNP diesel generators have no mechanical limit on the length of time operated unloaded at rated speed; this

has been reverified with Colt as a result of this question. However, following extended periods of no load operation, the diesel specifications require load be applied in order to clear the exhaust system of lubricating oil that may have accumulated. The requirements is implemented in our standard operating practices by loading the diesels every fifth start. This is in response to formal and informal questions addressed to Colt concerning oil accumulation in exhaust manifolds.

An emergency start of the diesel engines with offsite power available will cause the engines to operate unloaded until the emergency start signal has been cleared. Should a loss of offsite power occur while in this condition, loads will be automatically sequenced onto each operating diesel generator.

Alabama Power feels that diesel generator operation is adequately addressed in Volume IX, Chapter 8.0 of our FSAR. No additional amendment is deemed necessary at this time.

040.4
(9.5.4) RESPONSE:

FNP diesel fuel oil storage and transfer system has been compared to the requirements of ANSI Standard N195 "Fuel Oil Systems for Standby Diesel Generators" and meets its requirements except:

1. N195 Paragraph 6.3 requires a duplex fuel oil strainer be provided in the fuel transfer pump suction.

Our design provides a single element strainer in the discharge line of each of two pumps that transfer fuel oil from each engine's supply tank to the day tank.

One pump is sequenced "on" and "off" automatically while the other pump must be started manually in the event of a day tank low-low level alarm. Should this occur, there is at least a one hour's supply of fuel remaining in the day tank.

2. N195 Paragraph 7.5 requires a strainer in the supply tank fill line.

No fill line strainer is provided; however filters are installed as discussed in Item 1 above and a duplex filter is installed in the fuel header for each engine.

FNP has experienced no problems with fuel oil quality which is maintained within the requirements of Federal Specification VV-F-800b and ASTM D-975-78 by FNP surveillance and procurement requirements as discussed in the response to 040.5 and 040.6 respectively.

Based on the above, Alabama Power feels that the requirements of N195 have been met by the design and operation of our system.

040.5
(9.5.4) RESPONSE:

A sample from each fuel oil storage tank is taken every three months and analyzed for water and sediment in accordance with ASTM D-270-65. Before sampling, the contents of each tank is recirculated for a period of at least two hours. In the event that sample analyses do not meet ASTM D-975-78, the contents of the tank is discharged and fuel oil meeting the requirements of Federal Specification VV-F-800b and ASTM D-975-78 is loaded into the tank.

Since our sampling procedure ensures that any sediment is mixed with the fuel oil prior to sampling, the mixing of sediment by tank fill operations should not cause degradation of the fuel oil quality.

In addition, each fuel transfer pump is equipped with a discharge filter and each engine fuel header is equipped with a duplex filter.

040.6
(9.5.4) RESPONSE:

Diesel fuel oil No. 2 is used in the FNP emergency diesels. This fuel oil is procured as a safety related item (QA Review Code A) from Chevron, USA, under blanket P. O. #2101 and must meet Federal Specification VV-F-800b dated April 2, 1975, and ASTM Specification D-975-78. A statement of conformance certifying compliance with the above specifications is required at the time of delivery in lieu of testing the new delivered oil onsite.

Each diesel fuel oil tank is sampled at least once per 92 days in accordance with ASTM-D270-65 to ensure the oil is within the specifications of Table 1 of ASTM-D975-74 when checked for viscosity, water and sediment. No problems due to condensation in these tanks have been experienced since they were placed in operation. The diesel generators and diesel fuel oil day tanks are checked by operations personnel once per four hours as part of their routine inspections. Part of this inspection involves checking the water-in-fuel-oil monitor for each day tank. Operability of the diesel fuel oil transfer system is checked at least once per 31 days as a prerequisite of running each diesel.

040.7
(9.5.6) RESPONSE:

The diesel generator starting air system as described in the response to 040.1 is the results of several modifications intended to eliminate moisture problems encountered in the original system. This modified system has been in operation for over one year and no problems associated with entrained moisture have occured.

However, we have evaluated our present system and determined that it is designed to provide compressed air at a dew point of $64^{o}$ F at 100 PSA with a $90^{o}$ F service water inlet to the compressed air cooler and compressor inlet air at saturation. The actual dew point provided by the system will depend on operating space ambient temperature (maintained by design above a minimum of $40^{o}$ F - actual operating experience has shown that the temperature does not fall nearly this low), service water temperature and inlet air moisture content.

Entrained mositure has not been a problem since placing our current system in operation. Therefore, we believe the system is adequate based on our operating experience.

040.8
(8.3) RESPONSE:

This paragraph is not applicable to our diesel engines which are manufactured by Colt Industries.

040.9
(8.3) RESPONSE:

All plant operators, assistant plant operators, equipment operators and operations supervisory personnel receive training in the theory of diesel operation, auxiliary systems to support diesel operation, and on-the-job-training in diesel operating procedures and practices. Plant operators and operations supervisory personnel receive training and periodic retraining on diesel sequencing, Surveillance Test Procedures for ensuring diesel generator operability and Technical Specifications dealing with the diesels.

Plant operators, assistant plant operators, and equipment operators receive a "walk through" of plant systems (including diesel systems) under their cognizance by shift supervision as part of their qualification process.

Additionally, maintenance personnel receive basic instructions in diesel operations.

Two maintenance supervisory foremen and two plant instructors have attended diesel maintenance courses at the Fairbanks Morse Diesel Training Center. Also, one additional maintenance foreman has over 20 years of previous experience in diesel maintenance and operations including one year as a Colt Industries technical representative.

FNP does not generally dedicate specific operations and maintenance personnel to operate and maintain a particular system or piece of equipment. Personnel recieve applicable training as discussed above and are qualified as discussed in the next paragraph. On each shift, an equipment operator is responsible for the physical condition of the diesel and making diesel log entries. Operations supervisory personnel routinely review the logs during each shift and make routine tours of the diesel. Maintenance personnel are assigned to perform diesel corrective maintenance on as "as needed" basis and to perform preventative maintenance when scheduled or indicated by diesel performance.

All maintenance and operations personnel assigned to FNP are required to meet the minimum qualifications of ANSI N18.1 concerning level of education and experience requirements.

040.10
(9.5.7) RESPONSE:

On the two 2850 KW opposed piston diesels, the vendor manual requires a prelube of not less than two minutes or more than three minutes. FNP procedures require a prelube of no less than 2-1/2 minutes or more than three minutes on the 2850 KW diesels. On the three 4075 KW "V" type diesels, the vendor manual requires a prelube of 10 minutes duration. FNP procedures require a 10 minute prelube on the 4075 KW diesels.

040.11
(9.5.7) RESPONSE:

This section requires the addition of an electric driven lube oil pump which would start upon receipt of the diesel emergency start signal. The intent of this proposed addition is to get lubrication to the dry bearings within the first few seconds of an emergency start.

Three of the five diesels at FNP are Pielstick engines that have a keep warm oil circulation system that keeps the bearings lubricated at all times.

The other two diesels are opposed piston Colt Industries 3800 TD 8-1/8 engines. Due to their design the keep warm circulation system does not prelube the bearings, such design is not feasible on these engines. Experience to date with these engines has shown no deleterious effects due to the operation of the lube oil system as designed.

040.12.1
(8.3) RESPONSE:

Each diesel generator is tested at a load greater than or equal to its continuous rating and operated for greater than or equal 60 minutes in accordance with the frequency specified in applicable NRC Guidelines (R. G. 1.108). These test frequencies are implemented by our Technical Specification surveillance requirements.

040.12.2
(8.3) RESPONSE:

Diesel engine surveillance testing is performed in accordance with the applicable NRC Guidelines (R.G. 1.108).

The diesel engine manufacturer recommends that the engines be exercised once per week for about one hour. This recommended test frequency would at least quadruple the testing required by R. G. 1.108.

Alabama Power believes that weekly testing would cause undue wear on the engines and not contribute to the engine reliability.

Therefore, we will continue to perform diesel surveillance testing in accordance with R. G. 1.108 and technical specification requirements.

040.12.3
(8.3) RESPONSE:

The Maintenance Group and other plant groups, through the review of Work Requests, Licensee Event Reports and Surveillance Test Reports, maintain awareness of problems associated with the diesels and other plant equipment. Repeated problems with any equipment or component immediately becomes a subject for a plant investigation to determine if the cause of the problem is related to improper maintenance, improper operation, poor design, or manufacturing deficiencies. If the problem is determined to be caused by improper maintenance or operation, proper training or procedure changes are implemented. If the problem is determined to be caused by design or manufacture, a request is made to engineering for an evaluation and/or solution. Task forces have previously been constituted to address problems with the diesel generators. These task forces are typically composed of personnel from Colt, plant operations and maintenance, design and engineering and offsite management.

040.12.4
(8.3) RESPONSE:

Administrative Procedures, FNP-0-AP-16 (Conduct of Operations - Operations Group) and FNP-0-AP-52 (Equipment Status Control & Maintenance Authorization), specify for listed systems (diesel included) that shift supervision shall "require a checklist to be performed on the affected system and on portions of other systems located in the areas in which significant maintenance was performed." Based on the activities performed, this checklist includes such items as valve, electrical and instrument alignments, tests, etc.

Furthermore, for the diesels, a second individual will perform an independent verification of the valve and electrical/instrument alignments listed on this checklist.

040.13
(8.3) RESPONSE:

Each skid mounted diesel engine gauge panel is equipped with vibration mounts. This panel houses the crankcase manometer, starting air, lube oil, fuel oil, service water and jacket coolant pressure gauges, jacket coolant and lube oil temperature instruments, engine tachometer and pyrometer.

The generator control and monitoring instrumentation is housed in the local control panel which is mounted off skid.

The manufacturer has stated that skid mounted control and instrumentation equipment is not subject to mis-operating due to engine vibration and the equipment that is sensitive to vibration is mounted in remote panels. In addition no vibration induced problems with engine mounted components have been experienced on Farley Unit 1 diesel generators.

In view of the above, vibration should not effect performance of diesel control and instrumentation equipment.

040.14
(8.3)

| | 1C & 2C | | 1A, 1B & 2B |
|---|---|---|---|
| Manufacturer | Fairbanks Morse | | Colt-Pielstiek |
| Model | 3800 TD 8-1/8 | | PC - 2V |
| Type of Engine | In line Opposed Piston | | V |
| | Supercharged by Exhaust Driven Centrifugal Compressor | | Supercharged by Exhaust Driven Centrifugal Compressor |
| | Engine-Driven Scavenging Air Blower | | |
| Size of Engine | | | |
| Cylinder | 12 | | 12 |
| Bore, inch | 8-1/8 | | 15.75 |
| Stroke, inch | 10 | | 18.11 |
| Rated Speed, RPM | 900 | | 514 |
| Piston Speed, ft. P. M. | 1500 | | 1550 |
| bhp @ 2850 KW (Sea Level) | 3950 | bhp (Sea Level) | 6000 |
| Unit Rating, KW | | | |
| Continuous | (8,760 hrs/yr) | 2850 | 4075 |
| Extended | (2,000 hrs/yr) | 3100 | 4353 |
| Overload | ( 300 hrs/yr) | 3250 | 4474 |
| Overload | (30 Minutes in 24 hour period) | 3500 | 4881 |