

PALISADES NUCLEAR PLANT  
TECHNICAL SPECIFICATION SURVEILLANCE PROCEDURE

TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)

Gary Smyth / 5/20/94  
Procedure Sponsor Date

PJGire / 5/20/94  
Technical Reviewer Date

SROakely / 5/20/94 / 30  
User Reviewer Date Rev #

PALISADES NUCLEAR PLANT  
 TECHNICAL SPECIFICATION SURVEILLANCE TEST PROCEDURE  
 ISSUE AND ROUTING SHEET

Proc No MO-7A-2  
 Revision 30

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

ISSUED TO Operations FREQUENCY 31 Days COLD SHUTDOWN REQUIRED (Y/N) No

SPECIAL REQUIREMENTS Power Operation - Testing interval same during shutdown.

Issue two working copies.

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| <u>EQUIPMENT</u>            | <u>EQUIPMENT</u> | <u>EQUIPMENT</u> | <u>EQUIPMENT</u> | <u>ASSOCIATED EQUIPMENT</u> |
|-----------------------------|------------------|------------------|------------------|-----------------------------|
| Diesel Generator 1-2 (K-6B) |                  |                  |                  |                             |
| Diesel K-6B                 |                  |                  |                  |                             |

SPECIAL INST \_\_\_\_\_

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**ROUTE AFTER COMPLETION (ORDER NO IN BOX)**

|    |                 |  |  |   |                  |  |  |
|----|-----------------|--|--|---|------------------|--|--|
| 1  | 1st LINE SUPV   |  |  | 4 | SURV PROG SCHED  |  |  |
| *2 | SS/SE           |  |  | 5 | SYSTEM ENG       |  |  |
|    | RX ENGINEER     |  |  |   | ISI ENG          |  |  |
| 3  | OPS SE/SUP SUPV |  |  |   | FIRE PROT SUPV   |  |  |
| 6  | SYS ENG SEC HD  |  |  |   | I&C ENG SUPV     |  |  |
|    | HP SUPPORT SUPT |  |  |   | OPS SUPPORT SUPV |  |  |
|    | CHEM SUPT       |  |  | 7 | SURV PROG SCHED  |  |  |
|    | RMC ADMIN       |  |  | 8 | DOC CONTROL      |  |  |
|    |                 |  |  |   |                  |  |  |

\* Required only if inoperable equipment.

PALISADES NUCLEAR PLANT  
TECHNICAL SPECIFICATION SURVEILLANCE TEST PROCEDURE  
ACCEPTANCE CRITERIA AND OPERABILITY SHEET

Proc No MO-7A-2  
Revision 30  
Page 1 of 2

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

1. Does data obtained meet acceptance criteria? If no or yes, with exceptions is checked, provide explanation and/or justification on Page 2.

Yes  No  Yes, with exceptions.

\_\_\_\_\_  
First Line Supervisor / Date

2. Are all Limiting Safety System Settings required by Technical Specification Section(s) \_\_\_\_\_ met? If no or yes, with exceptions is checked, provide explanation and/or justification on Page 2.

Yes  No  Yes, with exceptions.

\_\_\_\_\_  
First Line Supervisor / Date

3. Is all equipment operable and/or do all parameters meet Technical Specification Section(s) Table 4.1.2-11a, 4.7.1a, 4.7.1d, and 4.7.1e? (ie. Do we comply with the tested technical specification requirements?) If no or yes, with exceptions is checked, provide explanation and/or justification for operability and/or continued operation on Page 2.

Yes  No  Yes, with exceptions.

\_\_\_\_\_  
First Line Supervisor / Date / Time

4. If any no or yes, with exceptions box was checked in Item 2 or 3 above, the Limiting Conditions of Operation specified in Technical Specification Section(s) 3.7.2i (3.7.1i, 2t Proposed Standing Order 54) may be applicable.

5. If any no or yes, with exceptions box was checked in Item 1, 2 or 3 above, or technical review not acceptable in Item 7 below, identify corrective action document.

ER  Yes  No # \_\_\_\_\_ WR/WO  Yes  No # \_\_\_\_\_

DR  Yes  No # \_\_\_\_\_ CL  Yes  No # \_\_\_\_\_

6. If no or yes, with exceptions box was checked in Item 3 above, notify SS/SE.

Tags Installed  Yes  No Location \_\_\_\_\_

SS/SE Review: \_\_\_\_\_  
Signature / Date / Time

7. Technical Review Acceptable:  Yes  No

Retest Required  Yes  No  Change Frequency To \_\_\_\_\_

\_\_\_\_\_  
Signature / Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

1. Cont \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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2. Cont \_\_\_\_\_  
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3. Cont \_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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**ATTACHMENTS**

- Attachment 1. "1-2 Diesel Generator Pre and Post Conditions"
- Attachment 2. "1-2 Diesel Generator Operating Conditions"
- Attachment 3. "1-2 Diesel Generator Exhaust Temperatures TI-1479"
- Attachment 4. "1-2 Diesel Generator Firing Pressures and Fuel Injection Pump Control Rack Positions"
- Attachment 5. "1-2 Diesel Generator Start Timer Installation and Removal"

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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1.0 PURPOSE

1.1 This procedure demonstrates operability, per Technical Specifications 4.7. of Emergency Diesel Generator (D/G) 1-2 (K-6B) by:

- a. Verifying that the diesel generator is ready for loading (reaches 2 KV) within 10 seconds from receipt of start signal.
- b. Verifying operability of both the A and B starting circuits by alternating the circuit used on a monthly basis.
- c. Demonstrating that the diesel generator is capable of reaching a load of 2400 KW (2300 - 2500 KW).

1.2 This procedure also verifies normal operation of various components:

- a. Testing mechanical governor control setpoint and verifying the electric governor unit position control setpoint.
- b. Verifying voltage regulator upper and lower limits.
- c. Periodically verifies belly tank level alarm setpoint.
- d. Verifying that engine operating parameters are within normal operating ranges.
- e. Verifying no fluid accumulation in engine cylinders.
- f. Verifying automatic fuel oil transfer to engine belly tank via T-25B and T-10.

1.3 This procedure also exercises the D/G in accordance with the vendor's recommendations.

2.0 REFERENCES

2.1 SOURCE DOCUMENTS

- 2.1.1 Technical Specifications Chapter 4 - Table 4.1.2-11a, 4.7.1a, 4.7.1d, and 4.7.1e
- 2.1.2 Technical Specifications Chapter 3 - Section 3.7.2i (3.7.1i, 2t, proposed Standing Order 54)
- 2.1.3 Technical Specifications Chapter 2 - None
- 2.1.4 FSAR Section 8.4.1

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

2.2 REFERENCE DOCUMENTS

- 2.2.1 IPI Calibration PPAC - EPS006, EPS009, EPS014, EPS016, EPS017, EPS018, EPS019, EPS020, EPS029
- 2.2.2 System Operating Procedure SOP 22, "Emergency Diesel Generators"
- 2.2.3 Unusual Event 75-09, "Diesel Generator Excessive Cylinder Temperature"
- 2.2.4 Nuclear Mutual Limited Standards
- 2.2.5 P&ID M-214 Sheet 1
- 2.2.6 SC-87-078, "Change Setpoints for LS-1467, LS-1468, LS-1470, LS-1471, LS-1472, LS-1473, LS-1474, LS-1475" (C2301385)
- 2.2.7 General Operating Procedure GOP 14, "Shutdown Cooling Operation"
- 2.2.8 Palisades Administrative Procedure 4.02, "Control of Equipment"
- 2.2.9 Checklist CL 22.1, "Emergency Generators Systems Checklist"
- 2.2.10 Checklist CL 22.2, "Fuel Oil System Checklist"
- 2.2.11 D-PAL-92-069, "Parallel EDG Will Trip and Lockout on Loss of Offsite Power Without Fast Transfer"
- 2.2.12 E-PAL-92-016, "Failure to Adequately Test Diesel Generator Ability to Accept Loads Within the Required Time"

3.0 PREREQUISITES

3.1 AUTHORIZATION

Shift Supervisor's permission shall be obtained to perform this test. Shift Supervisor shall read and understand Sections 1.0 through 4.0 of this procedure prior to granting permission.

\_\_\_\_\_  
Shift Supervisor      Date

3.2 SPECIAL NOTIFICATIONS

- 3.2.1 Notify System Engineer if firing pressures will be taken.
- 3.2.2 Notify Electrical Department to install start timing device per Attachment 5. Installation of the device does not make the engine inoperable since spare contacts are used which do not affect the start circuit.



**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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3.3 PLANT CONDITIONS

- 3.3.1 When the reactor is critical, Diesel Generator 1-1 shall:
- a. Be operable BEFORE Diesel Generator 1-2 is made inoperable. AND
  - b. Have controls in automatic mode. AND
  - c. Have all associated engineered safety feature components operable.
- 3.3.2 When PCS temperature is less than 325°F, prior to making Diesel Generator 1-2 inoperable:
- a. The requirements of Palisades Administrative Procedure 4.02, "Control of Equipment," shall be satisfied. AND
  - b. The requirements of General Operating Procedure GOP 14, "Shutdown Cooling Operations," shall be satisfied.
- 3.3.3 When PCS temperature is greater than or equal to 325°F and the reactor is not critical:
- a. DO NOT perform sections of this test (Sections 5.3, 5.5, and Steps 5.4.15, 5.14.5, and 5.15.2) which make Diesel Generator 1-2 inoperable.
- 3.3.4 Ensure that the fuel oil level in T-10 is greater than or equal to the minimum level required for Plant conditions. Refer to Standing Order 54, Section 3.7.

3.4 SYSTEM CONDITIONS

- 3.4.1 Diesel Generator 1-2 (K-6B) shall be in normal standby mode per Checklist (CL) 22.1.
- 3.4.2 Fuel Oil System lined up for automatic fill of day tank from T-10 per Checklist (CL) 22.2.
- 3.4.3 Engine belly tank in its normal operating range (9.25 inches to 14.75 inches).

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

3.5 MINIMUM PERSONNEL SKILL LEVEL

3.5.1 Performance

- a. Auxiliary Operator
- b. Control Operator

3.5.2 Verification

- a. Auxiliary Operator
- b. Control Operator

3.6 SPECIAL TOOLS/EQUIPMENT

Except for the use of test instruments justified in the appropriate Technical Specification Test Basis Documents, only calibrated Measuring and Test Equipment (M&TE) and Installed Plant Instrumentation (IPI) shall be used to measure parameters which are compared to acceptance criteria.

3.6.1 Noncalibrated

- a. Locked valve key
- b. Cylinder test cock wrench
- c. Tank dipstick for T-10

3.6.2 Calibrated

| Description  | CPCo Serial Number | Range                       | Accuracy                        | Calibration Date                 | Calibration Due Date |
|--|--------------------|-----------------------------|---------------------------------|----------------------------------|----------------------|
| Stopwatch  |                    | 0 - 20 Sec<br>Minimum Range | ± 0.05%<br>Reading<br>+ 1 Digit |                                  |                      |
| Thermometer  |                    | 0 - 160 °F<br>Minimum Range | ± 2°F                           |                                  |                      |
| Kiene Cylinder Compression Gauge (used months of January and July) |                    | 0 - 2000 psi                | ± 1.0%<br>Full Scale            | N/A<br>Calibrated Pre & Post Use | N/A                  |
| Wilmar Timer   |                    | 0 - 999.99 seconds          | ± 1<br>millisecond              |                                  |                      |

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- 4.0 PRECAUTIONS AND LIMITATIONS
- 4.1 PERSONNEL SAFETY
- 4.1.1 Standard Plant safety practices shall be observed.
- 4.1.2 Personnel shall stand to the side while installing or removing cylinder compression test equipment.
- 4.2 EQUIPMENT/PLANT SAFETY OR LIMITS
- 4.2.1 This procedure is considered safety-related.
- 4.2.2 Do not exceed 750 amps at 2400 volts.
- 4.2.3 Do not load the diesel generator above 2500 KW.
- 4.2.4 Operation of the diesel generator with no load should be minimized.
- 4.2.5 With the diesel generator parallel to bus 1D and station power feeding bus 1D, avoid reactive power changes with the main generator. Main generator underexcitation causes diesel generator overexcitation and possible overcurrent.
- 4.3 LIMITING CONDITIONS OF OPERATION ENTERED DURING PERFORMANCE OF THIS PROCEDURE
- 4.3.1 Diesel Generator 1-2 is inoperable when:
- The overspeed trip device is tripped for the cylinder leak test. (Section 5.3)
  - MV-DE126 (fuel oil supply to belly tank) is closed to verify low level alarm. (Section 5.5)
  - Operating loaded in parallel with offsite power.
  - Voltage regulator switch in "MANUAL."
  - Voltage droop "UNIT"/"PARALLEL" selector switch in "PARALLEL."
  - The "A" air start motor is isolated. (Section 5.4)
- 4.3.2 When Diesel Generator 1-2 is inoperable during performance of this test, Technical Specifications 3.7.2(i) applies EXCEPT Diesel Generator 1-1 need not be started to verify operability.
- 4.3.3 When Diesel Generator 1-2 is determined to be inoperable, the requirements of Technical Specifications 3.7.2(i) shall apply INCLUDING the requirement to start Diesel Generator 1-1 to verify its operability.

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- 4.3.4 All out of tolerance data shall meet the following conditions.
- a. Circled in red by person recording data.
  - b. Reported immediately to the supervisor in charge of the test.
  - c. Evaluated by the supervisor before proceeding to the next step.

5.0 PROCEDURE

5.1 INITIAL CONDITION

- 5.1.1 Verify that all prerequisites of Section 3.0 are met.

\_\_\_\_\_  
Shift Supervisor / Date

NOTE: The following step ensures that T-10 contains sufficient fuel oil to perform this test without violating minimum required fuel level. The engine generally consumes 1500 - 1750 gallons of fuel during the test.

- 5.1.2 Verify the T-10 level is  $\geq 117$  inches (25,900 useable gallons) if PCS temperature is  $\geq 325^\circ\text{F}$  or  $\geq 77$  inches (16,000 useable gallons) if PCS temperature is  $< 325^\circ\text{F}$ .

- a. Record T-10 level.

T-10 level \_\_\_\_\_ inches

Performed By: \_\_\_\_\_  
Auxiliary Operator / Date

| ENGINE LOAD | FUEL CONSUMPTION |
|-------------|------------------|
| 0 KW        | ~ 30 gal/hr      |
| 1500 KW     | ~ 100 gal/hr     |
| 2350 KW     | ~ 170 gal/hr     |

5.2 PRETEST CONDITIONS

Record and sign "Prior to Run Conditions" on Attachment 1.

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.3 CYLINDER LEAKAGE TEST

NOTE: Performance of cylinder leakage test will render the diesel generator inoperable, placing the Plant in a Limiting Condition of Operation (LCO). The requirements of Technical Specifications 3.7.2(i) apply. EXCEPT it is not necessary to start Diesel Generator 1-1 to verify operability.

**WARNING**

Physical injury may result by attempting to physically restrain the overspeed trip device.

5.3.1 Manually trip overspeed trip device.

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Time Date

5.3.2 Open cylinder test cocks.

5.3.3 Crank engine briefly (minimum of five seconds) by manually pressing starting air solenoid manual override and observe test cocks on both sides of the engine for expulsion of water or oil.

- a. If moisture accumulation is greater than a fine visible mist, record cylinder numbers, approximate amount, and type of fluid (ie, water or oil) below. Suspend test at this point and contact System Engineer.

Results: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.3.4 Close cylinder test cocks.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

5.3.5 Crank engine for approximately five seconds by manually pressing starting air solenoid override and listen to check that all petcocks are closed.

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.3.6 Reset overspeed trip device.

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
 Auxiliary Operator      Time      Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
 Auxiliary Operator      Date

5.3.7 Wait 20 minutes from the time the OST device is reset before starting the engine.

5.4 DIESEL GENERATOR STARTING TIME TEST

5.4.1 Utilize air start motor arrangement as specified in the table below:

| MONTH                                  | AIR START MOTOR(S) TESTED | ACTION  |
|--|---------------------------|---|
| January<br>April<br>July<br>October    | "A"                       | Valve out air to "B" air start motor.<br>Unlock and CLOSE MV-DE120. |
| February<br>May<br>August<br>November  | "B"                       | Valve out air to "A" air start motor.<br>Unlock and CLOSE MV-DE118. |
| March<br>June<br>September<br>December | "A" & "B"                 | No Action Required.   |

Performed By \*: \_\_\_\_\_ / \_\_\_\_\_  
 Auxiliary Operator      Date

Verified By \*: \_\_\_\_\_ / \_\_\_\_\_  
 Auxiliary Operator      Date

\* "N/A if both motors tested simultaneously.

**NOTE:** Placing the voltage droop selector switch in "PARALLEL" renders the diesel generator inoperable, placing the Plant in a Limiting Condition of Operation (LCO). The requirements of Technical Specifications 3.7.2(i) apply. EXCEPT it is not necessary to start Diesel Generator 1-1 to verify operability.

5.4.2 Place voltage regulator unit parallel switch located in C-04, to "PARALLEL" position.

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
 Control Operator      Time      Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
 Control Operator      Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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- 5.4.3 Check reset/reset flags for D/G output voltage relays (127D-21, 127D-22, 127D-23 on EC-26).
- 5.4.4 Read entire step below before proceeding:
- a. Select engine control switch from table below.

| MONTH  | SWITCH                        |
|--|-------------------------------|
| January, February<br>May, June<br>September, October | Control Room C-04<br>(Remote) |
| March, April<br>July, August,<br>November, December  | Local EG-30                   |

- NOTES:
1. All relay position flags may not be fully visible when the D/G breaker close permissive relays engage. Consider a 1/8" motion of the flag to be indication of relay actuation.
  2. The engine timing device results will be obtained for several months and eventually become the test start timing method.
- b. Simultaneously start Diesel Generator 1-2 and use stop watch to time the period from energization of air start solenoid valve until all three (3) flags (silver colored) on the D/G output voltage relays (on EC-26) drop into view.
- c. Record elapsed time for all permissive relays to actuate per the stop watch. (Less than or equal to 9.5 seconds.)
- Elapsed time \_\_\_\_\_ seconds
- d. Record elapsed time at which the engine started per engine timing device. (Information only.)
- Elapsed time \_\_\_\_\_ seconds
- e. Record time D/G started: \_\_\_\_\_

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator                      Date

- 5.4.5 If elapsed time was 9.5 seconds or less, go to Step 5.4.21 of this procedure.
- 5.4.6 If elapsed time was greater than 9.5 seconds using both air start motors or using only the "A" air start motor, then the D/G must be considered inoperable and a Condition Report initiated. Go to Step 5.4.8 and contact System Engineer.

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5.4.7 If the elapsed time was greater than 9.5 seconds using only the "B" air start motor, then a second start test will be required using only the "A" air start motor to ensure a generic problem has not also caused slow starts with the "A" air start circuit and motor. Go to Step 5.4.8. If the diesel generator does not start using the "B" air start motor, it shall be considered inoperable. Go to Step 5.4.8.

5.4.8 Stop the engine by placing either local or remote control switch to "STOP." Record time engine was stopped below:

Time engine stopped: \_\_\_\_\_

\_\_\_\_\_  
Auxiliary/Control Operator / Date

NOTE: The following step exits the LCO entered in Step 5.4.2

5.4.9 Place the voltage droop "UNIT"/"PARALLEL" selector switch in "UNIT."

Performed By: \_\_\_\_\_  
Control Operator / Time / Date

Verified By: \_\_\_\_\_  
Control Operator / Date

5.4.10 Verify remote engine control switch (C-04) is in normal position (Green Target).

Verified By: \_\_\_\_\_  
Control Operator / Date

5.4.11 Verify local engine control switch (EG-30) in normal position ("NORM").

Verified By: \_\_\_\_\_  
Auxiliary Operator / Date

5.4.12 Reset D/G output voltage relays on EC-26: 127D-21, 127D-22, and 127D-23.

5.4.13 If the elapsed time was greater than 9.5 seconds using the "A" air start motor or both air start motors, then go to Step 5.4.19. If the elapsed time was greater than 9.5 seconds using only the "B" air start motor, then perform Step 5.4.14. If the engine did not start using the "B" air start motor, then go to Step 5.4.19.



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5.4.14 Valve out the "B" air start motor and valve in the "A" air start motor.

a. For "B" motor, ensure Closed MV-DE120.

b. For "A" motor, ensure Open MV-DE118.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

5.4.15 Wait at least two hours before attempting to restart the engine with the "A" air start motor.

**NOTE:** Placing the voltage droop selector switch in "PARALLEL" renders the diesel generator inoperable, placing the Plant in a Limiting Condition of Operation (LCO). The requirements of Technical Specifications 3.7.2(i) apply, EXCEPT it is not necessary to start Diesel Generator 1-1 to verify operability.

5.4.16 Prior to attempting a start with the "A" air start motor, place the voltage droop "UNIT"/"PARALLEL" selector switch in "PARALLEL."

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator / Time / Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator / Date

5.4.17 Simultaneously start Diesel Generator 1-2 and use stopwatch to time the period from energization of air start solenoid valves until all three (3) flags (silver colored) on the D/G output voltage relays (on EC-26) drop into view.

Elapsed time: \_\_\_\_\_ seconds

Time D/G started: \_\_\_\_\_

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

5.4.18 If an attempt to start the D/G in  $\leq 9.5$  seconds with only the "B" air start motor failed but a subsequent start utilizing the "A" air start motor started the D/G in  $\leq 9.5$  seconds, the Shift Supervisor shall initiate a Condition Report.

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- 5.4.19 Any one of the following conditions will render the diesel generator inoperable and require a Condition Report:
- a. Start time greater than 9.5 seconds with only the "A" air start motor.  
or,
  - b. Start time greater than 9.5 seconds with both air start motors.  
or,
  - c. Failure to start the engine with only the "B" air start motor. (No start time criteria.) Notify the Shift Supervisor immediately.

Shift Supervisor Notified: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Notified By Time Date

5.4.20 If notification is made in Step 5.4.19 above, Shift Supervisor shall initiate a Condition Report.

5.4.21 Ensure locked open MV-DE120 and MV-DE118.

MV-DE120 and MV-DE118 Locked Open

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

5.4.22 Operator shall periodically monitor fuel oil sight glass and notify Shift Supervisor if oil level falls below alarm actuation level without alarm annunciation.

**5.5 BELLY TANK LOW LEVEL ALARM TEST INITIATION**

5.5.1 Perform Step 5.5.2 and Section 5.10 during the month of May ONLY.

**NOTE:** Isolating fuel oil to the belly tank is performed to cause a low level alarm to be brought in (reference Section 5.10). The alarm should occur within two hours of MV-DE126 closure.

5.5.2 Unlock and close MV-DE126, fuel oil to belly tank.

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.6 PRIOR TO LOADING OPERATING CONDITIONS

Take readings and record data in column marked "Prior to Loading" in Attachment 2, and exhaust temperatures in column marked "Unloaded Condition" in Attachment 3.

NOTE: "Prior to Loading" conditions are not subject to acceptance criteria constraints.

5.7 VOLTAGE REGULATOR TEST

5.7.1 Ensure the voltage regulator mode select switch is in the "AUTO" position.

5.7.2 Perform the following steps using the field rheostat raise-lower switch selected from table below.

| IF THE MONTH IS:                                       | THEN USE SWITCH                        |
|--|--|
| January, March, May<br>July, September,<br>November    | Control Room C-04<br>(Remote)          |
| February, April,<br>June, August,<br>October, December | Diesel Generator Room EC-26<br>(Local) |

a. Raise generator voltage as high as possible. Record field and generator voltage (locally at EC-26).

Generator Voltage \_\_\_\_\_

Field Voltage \_\_\_\_\_

b. Lower generator voltage as low as possible. Record field and generator voltage (locally at EC-26).

Generator Voltage \_\_\_\_\_

Field Voltage \_\_\_\_\_

5.8 SYNCHRONIZE GENERATOR

5.8.1 Turn on synchroscope and adjust the generator speed with the governor control switch located on C-04 until the synchroscope turns slowly in the fast direction.

5.8.2 Adjust generator voltage to match incoming bus voltage ( $\pm 1$  volt on synchronizing voltmeter) using the field rheostat raise-lower switch located on C-04.

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

- 5.8.3 Close diesel generator output breaker 152-213 when correct synchronization is indicated.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

5.9 GENERATOR LOAD TEST

- 5.9.1 Load generator in 500 KW increments per instructions below:

- a. Using governor control switch located in C-04, increase load 500 KW.
- b. Allow engine to run approximately five minutes.
- c. At each of the specified load increments, maintain generator output current below the maximum allowable current value specified in the Table below. To limit reactive loading, maintain if possible, output current within the "Suggested Current Reading" band.

| Actual Load (KW) | Suggested Current Reading (AMPS) | Maximum Allowable Current (AMPS) |
|------------------|----------------------------------|----------------------------------|
| 500              | 120 - 150                        | 619                              |
| 1000             | 240 - 275                        | 638                              |
| 1500             | 360 - 395                        | 667                              |
| 2000             | 480 - 520                        | 705                              |
| 2500             | 600 - 650                        | 750                              |

- d. At any specified load, maintain the generator output current at the proper value by:
  1. Adjusting voltage using the field rheostat switch,  
and/or
  2. Decreasing load with the governor control switch.
- e. If current cannot be maintained below maximum allowable current values, then secure the diesel generator and notify the Shift Supervisor.
- f. Repeat Steps a through e until generator reaches full load or 2400 KW (2300 - 2500).
- g. Do not allow generator to exceed 2500 KW.

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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h. Record below and in Step 5.13.1 time generator reached full load.

Time generator reached full load: \_\_\_\_\_

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

5.9.2 Maintain 2400 Kw (2300 - 2500) load for at least six hours. Slight power excursions outside of the band will not invalidate the test. Take readings off of EWI-1213 located on the C-04 Panel.

5.9.3 Record full load data on Attachments 2 and 3 one hour after achieving full load (Step 5.9.1h). Take additional sets of data every hour thereafter until load test is concluded.

5.10 CONCLUDE BELLY TANK LOW LEVEL ALARM TEST

5.10.1 Perform Steps 5.10.2 through 5.10.3 during the month of May ONLY.

5.10.2 Run diesel until local "High/Low Fuel Oil Level" alarm for the diesel engine belly tank annunciates. Alarm should annunciate at a fuel oil level of 10.25" from the bottom of the tank as displayed in the sight glass (9.25 - 11.25). Record alarm level below.

Local "High/Low Fuel Oil Level" alarm received at \_\_\_\_\_ inches

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

Control Room alarm received \_\_\_\_\_  
YES / NO

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

5.10.3 Open and lock fuel oil supply valve MV-DE126.

MV-DE126 Locked Open

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Time Date

Verified By: \_\_\_\_\_  
Auxiliary Operator

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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5.11 BELLY TANK HIGH LEVEL ALARM TEST

5.11.1 Perform Steps 5.11.2 through 5.11.3 during the month of May ONLY.

5.11.2 Open bypass valve MV-DE132 and verify high level alarm annunciates at a fuel oil level of 13.75"  $\pm$  1" from bottom of reservoir as displayed in sight glass (12.75 - 14.75). Record alarm level below.

Local "High/Low Fuel Oil Level" alarm received at \_\_\_\_\_ inches

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

Control Room alarm received \_\_\_\_\_  
YES / NO

\_\_\_\_\_  
Control Operator Date

5.11.3 Close bypass valve MV-DE132.

MV-DE132 Closed

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

- 5.12 DETERMINING CYLINDER FIRING PRESSURES AND FUEL RACK POSITIONS AT FULL LOAD
- 5.12.1 During the months of January and July, record engine firing pressures and fuel injection pump control rack positions as specified in Section 5.12, for all 18 cylinders.

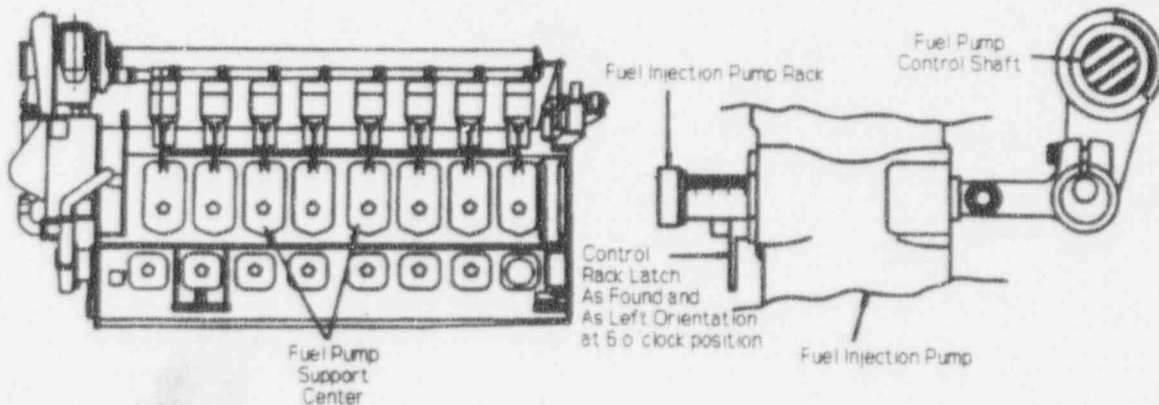
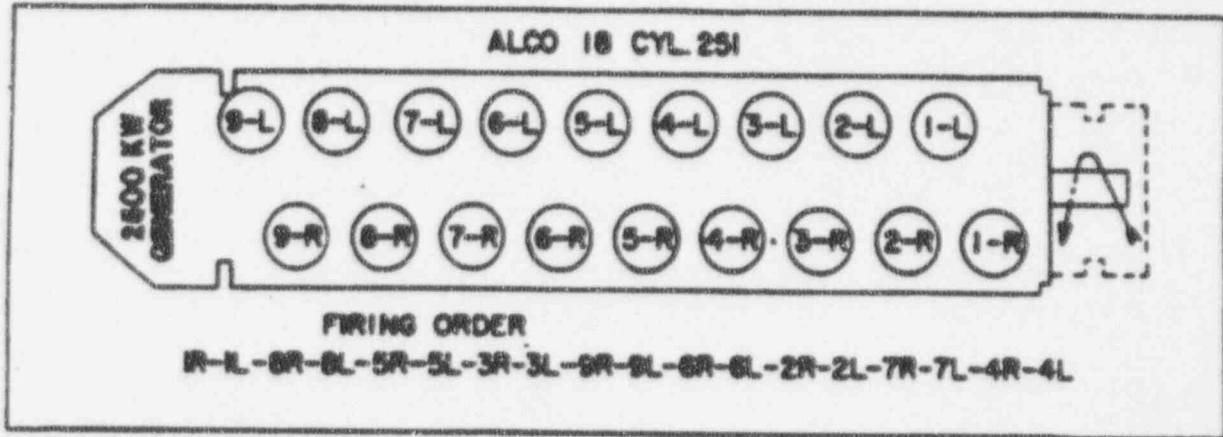


FIGURE 1  
ALCO MODEL 251F DIESEL  
GENERATOR (TYPICAL)

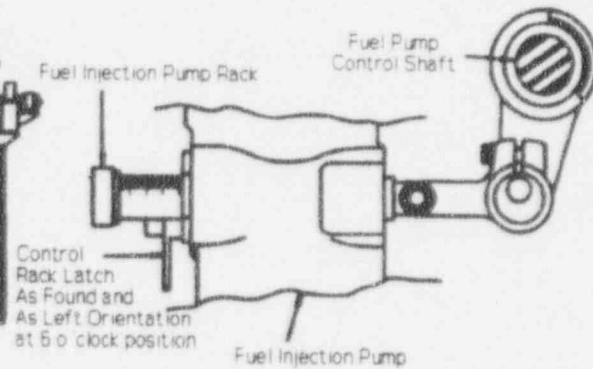


FIGURE 2  
FUEL INJECTION PUMP  
CONTROL RACK ASSEMBLY

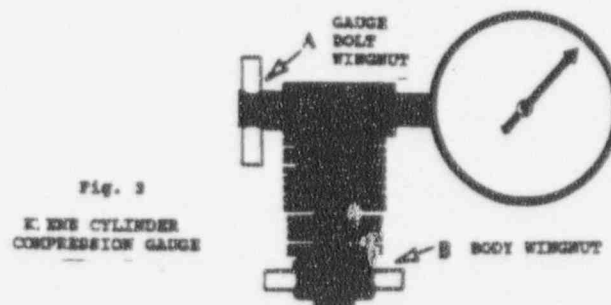
- 5.12.2 Remove fuel pump support covers (refer to Figure 1 above) on the left and right sides of the engine.
- 5.12.3 Fuel injection pump rack settings.

Record "Full Fuel" reading, as indicated on the fuel injection pump rack, for all 18 cylinders in Attachment 4.

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.12.4 Diesel generator firing pressures.

- a. The System Engineer or his designee shall be present while obtaining cylinder firing pressures.
- b. Reference Figures 2 and 3 when performing the following steps.
- c. Cut out fuel to the cylinder by pulling out the fuel injection pump rack until the backstop is reached and engage the rack latch into the machined slot.
- d. Install cylinder pressure gauge by threading the body wingnut (B) onto the cylinder petcock.
- e. Loosen gauge bolt wingnut (A) and position gauge to a readable position, then retighten wingnut.



**NOTE:** It is imperative that both wingnuts (A) and (B) be securely tightened to obtain an accurate reading.

- f. Tighten body and gauge bolt wingnuts.
- g. While holding the fuel injection pump rack, disengage the control rack latch, then release the fuel rack.
- h. Fully open cylinder petcock until valve is on its backseat.
- i. Record cylinder firing pressure in Attachment 4.
- j. Close cylinder petcock.
- k. Cut out fuel to the cylinder by pulling out the fuel injection pump rack until the backstop is reached and engage the rack latch into the machined slot.
- l. Break loose gauge bolt wingnut to bleed off gauge pressure, then hand tighten.
- m. Remove compression gauge from cylinder petcock (body wingnut can be used to break loose gauge assembly).



**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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- n. While holding the fuel injection pump rack, disengage the control rack latch, then release the fuel rack. Note the orientation of the disengaged control rack latch is the 6 o'clock position. (Refer to Figure 2)
- o. Repeat Steps c through n for all 18 cylinders.
- p. Verify that all control rack latches are in the 6 o'clock position. A control rack latch may engage when the engine is shutdown if the latch is left on top of the fuel injection pump rack when the latch is disengaged. (Refer to Figure 2)

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

- q. Verify that all fuel injection pump racks are free to operate by checking that all cylinder temperatures are normal for full load conditions.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

Witnessed By: \_\_\_\_\_ / \_\_\_\_\_  
System Engineer/Designee / Date

- r. Replace the fuel pump support covers.

5.13 CONCLUDE GENERATOR LOAD TEST

- 5.13.1 After the diesel generator has been run fully loaded for at least six hours, reduce generator load to approximately 250 KW and maintain for approximately five minutes. Record time below:

Time generator was fully loaded (from Step 5.9.1h): \_\_\_\_\_

Time generator was reduced in load: \_\_\_\_\_

- 5.13.2 Reduce generator load to approximately 50 KW then open diesel generator breaker 152-213.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator / Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator / Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.14 FREQUENCY CONTROL TESTING

- 5.14.1 Raise the frequency of the diesel as high as possible and verify frequency between 62 and 64 Hz using the governor control at the local panel (EC-26). Record frequency from SPI-1213L (EC-26) below.

Frequency (Hz) \_\_\_\_\_

NOTE: The following step exits the LCO entered in Step 5.4.2.

- 5.14.2 Place voltage droop "UNIT"/"PARALLEL" selector switch (C-04) in "UNIT." Frequency should decrease to 60 Hz (59.5 - 60.5).

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

- 5.14.3 Record frequency from local indicator SPI-1213L (EC-26) below.

Frequency (Hz) \_\_\_\_\_

NOTE: Placing the voltage droop selector switch in "PARALLEL" renders the diesel generator inoperable, placing the Plant in a Limiting Condition of Operation (LCO). The requirements of Technical Specifications 3.7.2(i) apply. EXCEPT it is not necessary to start Diesel Generator 1-1 to verify operability.

- 5.14.4 Place voltage droop "UNIT"/"PARALLEL" selector switch in "PARALLEL."

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

- 5.14.5 Lower the frequency of the diesel generator to 58.0 Hz (57.4 - 58.6) using the governor control switch at local control panel (EC-26).

- 5.14.6 Record frequency as indicated on SPI-1213L (EC-26) below.

Frequency (Hz) \_\_\_\_\_

NOTE: The following step exits the LCO entered in Step 5.14.4.

- 5.14.7 Place voltage droop "UNIT"/"PARALLEL" selector switch (C-04) in "UNIT." Frequency should increase to 60 Hz (59.5 - 60.5).

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.14.8 Record final frequency from local indicator SPI-1213L (EC-26) below.

Frequency (Hz) \_\_\_\_\_

5.15 VOLTAGE REGULATOR ADJUSTMENT

5.15.1 Using field rheostat raise-lower switch, adjust/check generator voltage to be 2390 V to 2410 V as indicated by D/G voltmeter on C-04.

NOTE: Placing the voltage regulator switch in "MANUAL" renders the diesel generator inoperable, placing the Plant in a Limiting Condition of Operation (LCO). The requirements of Technical Specifications 3.7.2(i) apply, EXCEPT it is not necessary to start Diesel Generator 1-1 to verify operability.

5.15.2 Place the voltage regulator switch to "MANUAL."

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

5.15.3 Using field rheostat raise-lower switch, adjust/check generator voltage to be 2390 V to 2410 V as indicated by D/G voltmeter on C-04.

NOTE: The following step exits the LCO entered in Step 5.15.2.

5.15.4 Place voltage regulator switch in "AUTO."

Performed By: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Time Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

5.16 ENGINE SHUTDOWN

5.16.1 Stop engine by placing either local or remote control switch to "STOP." Record time engine was stopped below.

Time engine stopped: \_\_\_\_\_

\_\_\_\_\_  
Auxiliary/Control Operator Date

5.16.2 Verify remote engine control switch (C-04) is in normal position (Green Target).

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control Operator Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

5.16.3 Verify local engine control switch (EG-30) in normal position ("NORM").

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Auxiliary Operator / Date

5.16.4 Reset D/G output voltage relays on EC-26: 127D-21, 127D-22, 127D-23.

5.16.5 Contact Electrical or I&C Department to remove the engine start timing device per Attachment 5. Note, the engine can be declared operable with the device installed. Spare contacts are used that do not affect the engine start circuit.

5.17 POST TEST CONDITIONS

5.17.1 Record "After Run Condition" in Attachment 1.

5.18 All data transferred and verified correct. Working Copy Number Two (2) destroyed.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Control/Auxiliary Operator / Date

Verified By: \_\_\_\_\_ / \_\_\_\_\_  
Control/Auxiliary Operator / Date

5.19 Shift Supervisor shall document length of time of diesel generator inoperability during Steps (5.3.1 to 5.3.6); (5.4.2 to 5.14.2) or (5.4.2 to 5.4.9 and 5.4.15 to 5.14.2); (5.14.4 to 5.14.7) and (5.15.2 to 5.15.4).

\_\_\_\_\_  
Shift Supervisor / Date

5.20 Shift Supervisor shall review test data against acceptance criteria and complete Technical Specification Surveillance Procedure Acceptance Criteria and Operability Sheet.

\_\_\_\_\_  
Shift Supervisor / Date

5.21 As an aid in evaluating equipment performance, the System Engineer shall trend test results to aid in the determination of equipment degradation.

REMARKS: (Include actions required and reference applicable Work Orders, Deviation Reports, etc.) \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
System Engineer / Date

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

6.0 ACCEPTANCE CRITERIA

6.1 All out of tolerance data shall be circled in red.

6.2 In Sections 5.10 and 5.11 if the fuel oil belly tank low and high level alarms are not found to be within the stated limits of 10.25" (9.25 - 11.25) and 13.75" (12.75 - 14.75) respectively, a Work Request shall be initiated. The diesel is not to be considered inoperable.

6.3 Automatic fuel oil transfer capability is considered acceptable provided:

- a. Day tank level is  $\geq 79\%$  (on LIA-1417) with no alarms in upon completion of the test.
- b. Engine belly tank level is within the indicating range of LG-1470, with no level alarms in, upon completion of test. (9.25 to 14.75 inches)

6.4 The diesel generator shall still be considered operable if the maximum cylinder firing pressure minus the minimum cylinder firing pressure is greater than 150 psi. The System Engineer shall evaluate that data per Step 5.21.

6.5

| PARAMETER          | PROCEDURE REFERENCE                        | ACCEPTABLE LIMITS                                      | ALERT RANGE<br>-EQUIPMENT OPERABLE<br>-CONDITION REPORT                 | REQUIRED ACTION RANGE<br>-EQUIPMENT INOPERABLE<br>-CONDITION REPORT   |
|--------------------|--|--|---|---|
| Start Time         | Section 5.4 and Step 5.14.16 if applicable | $\leq 9.5$ secs for "A" air start motor or both motors | $> 9.5$ sec with "B" motor but $\leq 9.5$ sec with "A" motor            | $> 9.5$ secs with two motors or "A" motor   |
| Load               | Attachment 2                               | +100 KW<br>2400 KW<br>-100 KW                          | 2500 KW $<$ KW $\leq$ 3125 KW<br>(750 amps at 2400 V)                   | KW $<$ 2300 KW or KW $>$ 3125 KW<br>(750 amps at 2400 V)<br>Low Limit applies only if unable to achieve 2300 KW |
| Fuel Oil Press     | Attachment 2                               | 40 psig $\leq$ Press $\leq$ 60 psig                    | 20 psig $\leq$ Press $<$ 40 psig or<br>60 psig $<$ Press $\leq$ 65 psig | Press $<$ 20 psig or<br>Press $>$ 65 psig   |
| Manifold Pressure  | Attachment 2                               | 15 psig $\leq$ Press $\leq$ 24 psig                    | 0 psig $\leq$ Press $<$ 15 psig or<br>24 psig $<$ Press $\leq$ 35 psig  | Press $>$ 35 psig   |
| Tube Oil Press     | Attachment 2                               | 80 psig $\leq$ Press $\leq$ 90 psig                    | 90 psig $<$ Press $\leq$ 130 psig<br>40 psig $\leq$ Press $<$ 80 psig   | Press $>$ 130 psig or<br>Press $<$ 40 psig  |
| Jacket Water Press | Attachment 2                               | 10 psig $\leq$ Press $<$ 50 psig                       | 8 psig $\leq$ Press $<$ 10 psig   | Press $<$ 8 psig or<br>Press $\geq$ 50 psig   |

PALISADES NUCLEAR PLANT  
TECHNICAL SPECIFICATION SURVEILLANCE PROCEDURE

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 Revision 30  
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**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

| PARAMETER  | PROCEDURE REFERENCE        | ACCEPTABLE LIMITS   | ALERT RANGE<br>-EQUIPMENT OPERABLE<br>-CONDITION REPORT  | REQUIRED ACTION<br>RANGE<br>-EQUIPMENT<br>INOPERABLE<br>-CONDITION<br>REPORT |
|--|----------------------------|---|--|--|
| Starting Air Press   | Attachment 2               | $130 \text{ psig} \leq \text{Press} \leq 160 \text{ psig}$                            | $160 \text{ psig} < \text{Press} \leq 250 \text{ psig}$<br>$90 \text{ psig} \leq \text{Press} < 130 \text{ psig}$                                    | Press < 90 psig or<br>> 250 psig   |
| Field Current  | Attachment 2               | $30 \leq \text{AMP} \leq 75$  | —————  | Amps < 30 or<br>Amps > 75  |
| Field Voltage  | Attachment 2               | $60 \leq \text{volts} \leq 190$   | —————  | Volts < 60 or<br>Volts > 190   |
| Phase Currents   | Attachment 2               | Amps $\leq 670$   | $670 < \text{Amps} \leq 750$   | Amps > 750   |
| Fuel Oil Filter<br>D/P (Primary and<br>Secondary)                                      | Attachment 2               | D/P $\leq 8 \text{ psid}$   | $8 \text{ psid} < \text{D/P} \leq 10 \text{ psid}$   | D/P > 10 psid  |
| Lube Oil Filter<br>D/P   | Attachment 2               | D/P $\leq 15 \text{ psid}$  | $15 \text{ psid} < \text{D/P} \leq 20 \text{ psi}$   | D/P > 20 psid  |
| Hot Lube Oil<br>Temp   | Attachment 2               | $175^\circ \leq \text{Temp} \leq 190^\circ\text{F}$                                   | $90^\circ\text{F} \leq \text{Temp} < 175^\circ\text{F}$<br>$190^\circ\text{F} < \text{Temp} \leq 205^\circ\text{F}$                                  | Temp > 205°F<br>Temp < 90°F  |
| Hot Jacket Water<br>Temp   | Attachment 2               | $160^\circ\text{F} \leq \text{Temp} \leq 185^\circ\text{F}$                           | $40^\circ\text{F} \leq \text{Temp} < 160^\circ\text{F}$<br>$185^\circ\text{F} < \text{temp} \leq 195^\circ\text{F}$                                  | Temp < 40°F<br>Temp > 195°F  |
| Exhaust Temps<br>(Unloaded)  | Attachment 3               | $195^\circ\text{F} \leq \text{Temp} \leq 500^\circ\text{F}$                           | $150^\circ\text{F} \leq \text{Temp} < 195^\circ\text{F}$<br>$500^\circ\text{F} \leq \text{Temp} \leq 750^\circ\text{F}$                              | Temp < 150°F or<br>Temp > 750°F  |
| Exhaust Temps<br>(Full Load)   | Attachment 3               | $600^\circ\text{F} \leq \text{Temp} \leq \{1000^\circ\text{F} +$<br>outside air Temp} | $500^\circ\text{F} \leq \text{Temp} < 600^\circ\text{F}$ or<br>$\{1000^\circ\text{F} + \text{Outside Air}$<br>Temp} < Temp $\leq 1100^\circ\text{F}$ | Temp < 500°F or<br>Temp > 1100°F   |
| Exhaust Temp<br>Differential<br>between any two<br>or<br>more cylinders<br>(full Load) | Attachment 3               | $\Delta T \leq 150^\circ\text{F}$   | $150^\circ\text{F} < \Delta T \leq 300^\circ\text{F}$  | $\Delta T > 300^\circ\text{F}$   |
| Mechanical<br>Governor<br>(Frequency<br>Control)                                       | Step 5.14.1                | $62.0 \leq \text{Freq} \leq 64.0 \text{ Hz}$  | Freq > 64.0 Hz<br>< 62.0 Hz  | Engine Trips on<br>overspeed   |
| Electric Governor<br>(Frequency<br>Control)  | Steps 5.14.3<br>and 5.14.8 | $59.5 \leq \text{Freq} \leq 60.5$   | $60.6 < \text{Freq} < 62.0 \text{ Hz}$<br>Freq < 59.5 Hz   | Freq $\leq 62.0 \text{ Hz}$  |
| Firing Pressure<br>Differential<br>between any<br>two cylinders                        | Attachment 4               | $\leq 150 \text{ psig}$   | N/A  | N/A  |

**TITLE: EMERGENCY DIESEL GENERATOR 1-2 (K-6B)**

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7.0 ATTACHMENTS AND RECORDS

7.1 ATTACHMENTS

7.1.1 Attachment 1. "1-2 Diesel Generator Pre and Post Conditions"

7.1.2 Attachment 2. "1-2 Diesel Generator Operating Conditions"

7.1.3 Attachment 3. "1-2 Diesel Generator Exhaust Temperatures TI-1479"

7.1.4 Attachment 4. "1-2 Diesel Generator Firing Pressures and Fuel Injection Pump Control Rack Positions"

7.1.5 Attachment 5. "1-2 Diesel Generator Start Timer Installation and Removal"

7.2 RECORDS

The completed procedure and all attached documents shall be forwarded to the Document Control Center for permanent retention in UFI System.

1-2 DIESEL GENERATOR PRE AND POST CONDITIONS

Prior to Run Condition (Step 5.2.1)

After Run Conditions (Step 5.17.1)

\*Combustion Air Temperature \_\_\_\_\_ °F

\*Combustion Air Temperature \_\_\_\_\_ °F

**\*NOTE:** This air temperature should be taken outside the Diesel Generator Room at or near combustion air intake filter using the calibrated M&TE thermometer and not the noncalibrated temperature indication of the meteorological tower.

Engine Hour From Running Time Meter  
(Local Engine Gauge Panel EG-30) \_\_\_\_\_

Engine Hour From Running Time Meter  
(Local Engine Gauge Panel EG-30) \_\_\_\_\_

Governor Oil Level  
(Normal, Low, etc) \_\_\_\_\_

Governor Oil Level  
(Normal, Low, etc) \_\_\_\_\_

Mechanical Governor Control Setting  
Speed Control  
(Outer Dial, Inner Dial) \_\_\_\_\_

Mechanical Governor Control Setting  
Speed Control  
(Outer Dial, Inner Dial) \_\_\_\_\_

Speed Droop  
(0 to 10) \_\_\_\_\_

Speed Droop  
(0 to 10) \_\_\_\_\_

Load Control  
(Min Fuel to Max Fuel) \_\_\_\_\_

Load Control  
(Min Fuel to Max Fuel) \_\_\_\_\_

Lube Oil Dipstick Indication  
(Normal, Low, etc) \_\_\_\_\_

Lube Oil Dipstick Indication  
(Normal, Low, etc) \_\_\_\_\_

Engine Base Fuel Oil Reservoir Level  
(LG-1470) (Normal [9.25 to 14.75 inches]) \_\_\_\_\_

Engine Base Fuel Oil Reservoir Level  
(LG-1470) (Normal [9.25 to 14.75 inches]) \_\_\_\_\_

Jacket Water Expansion Tank Level  
(LG-1482) (Normal, Low, etc) \_\_\_\_\_

Jacket Water Expansion Tank Level  
(LG-1482) (Normal, Low, etc) \_\_\_\_\_

Day Tank (T-25B) Level (LIA-1417)  
(Normal [ $\geq 80\%$  and  $\leq 93\%$ ]) \_\_\_\_\_

Day Tank (T-25B) Level (LIA-1417)  
(Normal [ $\geq 80\%$  and  $\leq 93\%$ ]) \_\_\_\_\_

Taken By: \_\_\_\_\_  
Auxiliary Operator

Taken By: \_\_\_\_\_  
Auxiliary Operator



1-2 DIESEL GENERATOR OPERATING CONDITIONS

| <u>PARAMETER</u>  | <u>Prior to Loading<br/>Step 5.6.1<br/>(Note 1)</u> | <u>1-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>2-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>Normal Operating Range</u> |
|---|---|---|---|-------------------------------|
| Load  | N/A   |   |   | 2300 KW to 2500 KW            |
| Fuel Oil Press PI-1485  |   |   |   | 40 psig to 60 psig            |
| Manifold Press  | N/A   |   |   | 15 psig to 24 psig            |
| Lube Oil Pressure PI-1488   | N/A   |   |   | 80 psig to 90 psig            |
| Jacket Water Pressure PI-1492   |   |   |   | 10 psig to 50 psig            |
| Starting Air Press A (Red Pen) PI-1489  |   |   |   | 130 psig to 160 psig          |
| Starting Air Press B (Black Pen) PI-1490  |   |   |   | 130 psig to 160 psig          |
| RPM   |   |   |   | 880 to 960                    |
| Field Current   |   |   |   | 30 to 75 amps                 |
| Field Voltage   |   |   |   | 60 to 190 volts               |
| Phase Current 1 (x)   | N/A   |   |   | Less than 670 amps            |
| Phase Current 2 (y)   | N/A   |   |   | Less than 670 amps            |
| Phase Current 3 (z)   | N/A   |   |   | Less than 670 amps            |
| Terminal Voltage  |   |   |   | Approximately 2400 volts      |
| Fuel Oil Primary Filter D/P DPI-1485  |   |   |   | Less than or = to 8 psid      |
| Fuel Oil Secondary Filter D/P DPI-1486  |   |   |   | Less than or = to 8 psid      |
| Lube Oil Filter D/P DPI-1487  |   |   |   | Less than 15 psid             |
| Lube Oil Temp, Hot TI-1488  | N/A   |   |   | 175° to 190°F                 |
| Engine Fuel Oil Belly Tank Level LG-1411  |   |   |   | 9.25 in to 14.75              |
| Jacket Water Surge Tank Level LG-1492   |   |   |   | Visible in sightglass         |
| Jacket Water Temp, Hot TI-1492  | N/A   |   |   | 160°F to 185°F                |
| Lube Oil Temp, Cold TI-1487   | N/A   |   |   | 90°F to 190°F                 |
| Jacket Water Temp, Cold TI-1491   | N/A   |   |   | 90°F to 185°F                 |
| Lube Oil Strainer D/P DPI-1488  |   |   |   | To Be Determined              |
| Exhaust Color Clarity (Black, Gray, Blue, White, Clear, or variation thereof; eg: light, dark, etc) |   |   |   | Clear                         |
| Time  |   |   |   |                               |
| Data Taken By   |   |   |   |                               |

NOTE 1: "Prior to Loading" data is not subject to acceptance criteria.

1-2 DIESEL GENERATOR OPERATING CONDITIONS

| <u>PARAMETER</u>  | <u>3-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>4-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>5-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>6-Hour<br/>Readings<br/>Step 5.9.3</u> | <u>Normal Operating Range</u> |
|---|---|---|---|---|-------------------------------|
| Load  | _____                                     | _____                                     | _____                                     | _____                                     | 2300 KW to 2500 KW            |
| Fuel Oil Press PI-1485  | _____                                     | _____                                     | _____                                     | _____                                     | 40 psig to 60 psig            |
| Manifold Press  | _____                                     | _____                                     | _____                                     | _____                                     | 15 psig to 24 psig            |
| Lube Oil Pressure PI-1488   | _____                                     | _____                                     | _____                                     | _____                                     | 80 psig to 90 psig            |
| Jacket Water Pressure PI-1492   | _____                                     | _____                                     | _____                                     | _____                                     | 10 psig to 50 psig            |
| Starting Air Press A (Red Pen) PI-1489  | _____                                     | _____                                     | _____                                     | _____                                     | 130 psig to 160 psig          |
| Starting Air Press B (Black Pen) PI-1490  | _____                                     | _____                                     | _____                                     | _____                                     | 130 psig to 160 psig          |
| RPM   | _____                                     | _____                                     | _____                                     | _____                                     | 880 to 960                    |
| Field Current   | _____                                     | _____                                     | _____                                     | _____                                     | 30 to 75 amps                 |
| Field Voltage   | _____                                     | _____                                     | _____                                     | _____                                     | 60 to 190 volts               |
| Phase Current 1 (x)   | _____                                     | _____                                     | _____                                     | _____                                     | Less than 670 amps            |
| Phase Current 2 (y)   | _____                                     | _____                                     | _____                                     | _____                                     | Less than 670 amps            |
| Phase Current 3 (z)   | _____                                     | _____                                     | _____                                     | _____                                     | Less than 670 amps            |
| Terminal Voltage  | _____                                     | _____                                     | _____                                     | _____                                     | Approximately 2400 volts      |
| Fuel Oil Primary Filter D/P DPI-1485  | _____                                     | _____                                     | _____                                     | _____                                     | Less than or = to 8 psid      |
| Fuel Oil Secondary Filter D/P DPI-1486  | _____                                     | _____                                     | _____                                     | _____                                     | Less than or = to 8 psid      |
| Lube Oil Filter D/P DPI-1487  | _____                                     | _____                                     | _____                                     | _____                                     | Less than 15 psid             |
| Lube Oil Temp, Hot TI-1488  | _____                                     | _____                                     | _____                                     | _____                                     | 175°F to 190°F                |
| Engine Fuel Oil Belly Level LG-1471   | _____                                     | _____                                     | _____                                     | _____                                     | 9.25 in to 14.75 in           |
| Jacket Water Surge Tank Level LG-1492   | _____                                     | _____                                     | _____                                     | _____                                     | Visible in sightglass         |
| Jacket Water Temp, Hot TI-1492  | _____                                     | _____                                     | _____                                     | _____                                     | 160°F to 185°F                |
| Lube Oil Temp, Cold TI-1487   | _____                                     | _____                                     | _____                                     | _____                                     | 90°F to 190°F                 |
| Jacket Water Temp, Cold TI-1491   | _____                                     | _____                                     | _____                                     | _____                                     | 90°F to 185°F                 |
| Lube Oil Strainer D/P DPI-1488  | _____                                     | _____                                     | _____                                     | _____                                     | To Be Determined              |
| Exhaust Color Clarity (Black, Gray,<br>Blue, White, Clear, or variation<br>thereof; eg: light, dark, etc) | _____                                     | _____                                     | _____                                     | _____                                     | Clear                         |
| Time  | _____                                     | _____                                     | _____                                     | _____                                     |                               |
| Data Taken By   | _____                                     | _____                                     | _____                                     | _____                                     |                               |

1-2 DIESEL GENERATOR EXHAUST TEMPERATURES TI-1479

Proc No MO-7A-2  
Attachment 3  
Revision 30  
Page 1 of 1

| <u>CYLINDER</u> | <u>UNLOADED<br/>CONDITION<br/>Step 5.6.1</u> | <u>1-HOUR<br/>READINGS<br/>Step 5.9.3</u> | <u>2-HOUR<br/>READINGS<br/>Step 5.9.3</u> | <u>3-HOUR<br/>READINGS<br/>Step 5.9.3</u> | <u>4-HOUR<br/>READINGS<br/>Step 5.9.3</u> | <u>5-HOUR<br/>READINGS<br/>Step 5.9.3</u> | <u>6-HOUR<br/>READINGS<br/>Step 5.9.3</u> |
|-----------------|--|---|---|---|---|---|---|
| 1L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 2L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 3L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 4L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 5L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 6L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 7L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 8L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 9L              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 1R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 2R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 3R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 4R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 5R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 6R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 7R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 8R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| 9R              | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| *UR             | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| *LR             | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| *UL             | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| *LL             | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| Time Data Taken | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |
| Data Taken By   | _____  | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     | _____                                     |

NORMAL OPERATING RANGES

Unloaded: 195°F - 500°F

Loaded (~2500 KW): 600°F - (1000°F + Outside Air Temperature)  
ΔT Between any 2 cylinders ≤ 150°F

NOTE: Right Cylinder Bank is East Side of Engine  
Left Cylinder Bank is West Side of Engine

\* Data recorded for information only, do not compare to acceptance criteria.

1-2 DIESEL GENERATOR FIRING PRESSURES AND  
FUEL INJECTION PUMP CONTROL RACK POSITIONS  
Section 5.12

| CYLINDER | FIRING PRESSURE, psig | CONTROL RACK POSITION, mm |
|----------|-----------------------|---------------------------|
| 1R       |                       |                           |
| 2R       |                       |                           |
| 3R       |                       |                           |
| 4R       |                       |                           |
| 5R       |                       |                           |
| 6R       |                       |                           |
| 7R       |                       |                           |
| 8R       |                       |                           |
| 9R       |                       |                           |
| 1L       |                       |                           |
| 2L       |                       |                           |
| 3L       |                       |                           |
| 4L       |                       |                           |
| 5L       |                       |                           |
| 6L       |                       |                           |
| 7L       |                       |                           |
| 8L       |                       |                           |
| 9L       |                       |                           |

Data Taken By: Auxiliary Operator /            Date

1-2 DIESEL GENERATOR START TIMER  
INSTALLATION AND REMOVAL

TIMER INSTALLATION

NOTE: The following steps will connect test equipment to verify the 9.5-second start time of the diesel generator. The test circuit schematic is shown in Fig 1. Only spare contacts are used for each relay to avoid interfering with the circuit.

INDEPENDENT VERIFICATION

The Repairperson shall notify the Responsible Supervisor of inspection in Steps 5.1 through 5.6. Do not proceed with Step 5.8 until Independent Verification is complete.

- 5.1 Connect one side of start timer to contact 19 on relay ESR2 inside Engine Gauge Panel G-30.
- 5.2 Connect other side of start timer to contact 20 on relay ESR2 inside Engine Gauge Panel G-30.
- 5.3 Connect jumper between TB1-81 to TB1-84 in Exciter Cubicle C-26.
- 5.4 Connect jumper between TB1-85 to TB1-88 in Exciter Cubicle C-26.
- 5.5 Connect one side of stop timer lead to TB1-89 in Exciter Cubicle C-26.
- 5.6 Connect other side of stop timer lead to TB1-89 in Exciter Cubicle C-26.
- 5.7 Steps 5.1 through 5.6 verified complete as specified.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Repairperson / Date

Independent Verification: \_\_\_\_\_ / \_\_\_\_\_  
Verifier / Date

- 5.8 Ensure timer switches are in the following positions:
  - a. Start mode and stop mode in "OFF to OFF"
  - b. Display in "Seconds"
  - c. Lock in "ON"
- 5.9 Plug unit in, turn power on, and push reset.

1-2 DIESEL GENERATOR START TIMER  
INSTALLATION AND REMOVAL

TIMER REMOVAL

NOTE: The following steps will remove test equipment used to verify the 9.5-second start time of the diesel generator. The test circuit schematic is shown in Fig 1. Only spare contacts are used for each relay to avoid interfering with the circuit.

INDEPENDENT VERIFICATION

The Repairperson shall notify the Responsible Supervisor of inspection in Steps 5.10 through 5.16. Do not proceed until Independent Verification is complete.

- 5.10 Remove other side of stop timer lead to TB1-89 in Exciter Cubicle C-26.
- 5.11 Remove one side of stop timer lead to TB1-80 in Exciter Cubicle C-26.
- 5.12 Remove jumper between TB1-85 to TB1-88 in Exciter Cubicle C-26.
- 5.13 Remove jumper between TB1-81 to TB1-84 in Exciter Cubicle C-26.
- 5.14 Remove other side of start timer to contact 20 on relay ESR2 inside Engine Gauge Panel G-30.
- 5.15 Remove one side of start timer to contact 19 on relay ESR2 inside Engine Gauge Panel G-30.
- 5.16 Steps 5.10 through 5.16 verified complete as specified.

Performed By: \_\_\_\_\_ / \_\_\_\_\_  
Repairperson Date

Independent Verification: \_\_\_\_\_ / \_\_\_\_\_  
Verifier Date

1-2 DIESEL GENERATOR START TIMER  
INSTALLATION AND REMOVAL

FIG 1  
DIESEL GENERATOR 1-2  
START CIRCUIT RELAYS

