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SUBJECT: LTR 1 ENCL 1
COMPLETED DIESEL QUESTIONAIRE REQUESTED BY THE NRC LTR OF 12/15/77.

PLANT NAME: DUANE ARNOLD REVIEWER INITIAL: XBT
DISTRIBUTOR INITIAL:

********** DISTRIBUTION OF THIS MATERIAL IS AS FOLLOWS **********

RELIABILITY OF STANDBY DIESEL GENERATOR UNITS.
(DISTRIBUTION CODE A014)

FOR ACTION: BRANCH CHIEF LEAR**W/7 ENCL

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EXTERNAL:
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CEDAR RAPIDS, IA**W/ENCL
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DISTRIBUTION: LTR 40 ENCL 40 CONTROL NBR: 780260092
SIZE: 1P+7OP

GD

********** THE END **********

MA 4

#18 B 26625

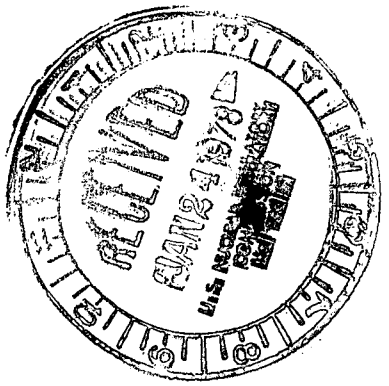
REGULATORY DOCKET FILE COPY

IOWA ELECTRIC LIGHT AND POWER COMPANY

General Office
CEDAR RAPIDS, IOWA

LEE LIU
VICE PRESIDENT – ENGINEERING

50-331



January 20, 1978
IE-78-112

Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Case:

Enclosed herewith is the completed diesel questionnaire requested by the NRC letter of December 15, 1977.

Very truly yours,

Lee Liu
Vice President, Engineering

LL/KAM/gan

Attachment

cc: K. Meyer w/a
D. Arnold w/o
R. Lowenstein w/a
R. Clark (NRC) w/a
L. Root w/a
File: A-107

780260092

A014/S
1/1
HEAD TO HEAD

Questionnaire

for

NUCLEAR REGULATORY COMMISSION
RELIABILITY STUDY

of

Standby Diesel Generator Units

Date Questionnaire Completed: January, 1978

Plant Name: Duane Arnold Energy Center Unit No. 1

Diesel Manufacturer: Fairbanks Morse (Colt Ind) Model: 38OOTD8-1/8

Number of Units: 2

Size Kw/Unit: 3250 Rated Speed: 900 RPM

Average Operating Hours Per Unit to Date: 455.65 hours

DIESEL GENERATOR STATUS

A. Engine:

1. Problems are caused chiefly by (give estimated number)

   a. Defective parts 1
   b. Installation errors: 1
   c. Failure of system to respond properly in function or sequence: 0
   d. Faulty adjustment: 0

2. Would more stringent inspection and testing requirements during acceptance or preoperational tests significantly improve the diesel-generator power plant performance?
   Yes _____ No X

B. Starting Systems (indicate which):

1. Air-to-cylinder cranking. X
   Air cranking motor _____ Mfr. _____ Model No. _____
   Electric cranking motor ____ Mfr. _____ Model No. _____

2. If air cranking, then:

Give size of starting air tank: Length 103" Diameter 30"

Normal standby air tank pressure 240 psi.

Is pressure reducer used? Yes _____ No XX
Reducer pipe size? _____ inches.

Starting air control admission valve pipe size in air piping system, 2.0 inches.

Minimum air tank pressure for engine cranking 150 psi.

Number of five-second cranking periods between above pressures with no tank recharging 5/tank.

Number of air tanks per engine 3.

Can starting air tanks serve more than one engine?
Yes _____ No XX

Is air pipe to engine from top of air tank? Yes X No ____

Does starting air tank have water condensate drain?
Yes X No ___

Does starting air pipe have water condensate trap and drain near engine? Yes ____ No XX

Is starting air piping horizontal? Yes ____ No XX at the engine

Does it slant toward drain? Yes ____ No ____ not applicable

If water condensate drains are provided, then is draining:

a. Automatic through float valve? Yes ___ No XX
b. Manual by hand valve? Yes X No ____ from air tank
c. If manual, then is draining water condensate done:

daily? x once each shift
weekly? ___
monthly? ___
before each start if manual? ___
no procedure? ___

Is dirt and rust filter provided in starting air pipe?
Yes x No ___

If provided, where installed? between air tank and starting valve

How is it cleaned? replaceable element

How often and when? yearly during maintenance inspection

Give pipe size of filter: 2 inches.

How is it known whether filter is plugged or has high pressure drop? reduction in air flow to engine or visual inspection of element

Is starting air pipe to engine positioned:

a. Below floor? ___
b. On the floor? xxxx
c. Overhead? ___

What is air pressure drop from air tank to engine during cranking _____ psi Data not available

Give approximate length (nearest ten feet) of starting air pipe for individual engine or all engines from air tank to:

a. Nearest engine 40 feet
b. Furthest engine 55 feet

Diameter of starting air pipe from:

a. Air tank to starting valve 2.0 inches
b. At air starting valve 1.5 inches
c. At engine 1.5 inches

What is the primary source of power for the starting air system? Primary Source: AC Motor driven compressor
Secondary Source: Diesel engine driven compressor
Is there a duplicate and redundant motor and air compressor set? Yes XX No ___

What is the time required to recharge one air tank?
10-15 minutes

Does starting air supply system have independent secondary power supply for compressor? Yes XX No ___

If yes, then by:

a. Gasoline engine? ___
b. Motor driven? ___
c. Other? (Specify) Diesel Driven

3. If electric (Battery powered) cranking, then: NOT APPLICABLE

a. Battery charging: Continuous trickle charger _____
Intermittent charging _____

If so, how is charging requirement determined?

Time cycle _____
Test _____
Other _____

b. Battery used: Common Plant _____
Individual Unit _____
Other _____

Starting cable size ____ ; Length: Battery to engine (longest) _____

C. Fuel Oil System: Bulk Tank to Day Tank

1. Does the bulk tank to day tank fuel supply system (viz: pump, motor, etc.) have redundant independent power supplies? Yes XX No ____

   Does this system have a hand-operated emergency fuel pump? Yes ____ No XX

   If yes, is this hand-operated pump and piping in immediate operating condition? Yes ____ No ___

2. Is there a water and sediment drain from the very bottom of the:

   a. Bulk tank? Yes ____ No XX Water removal is provided however
   b. Day tank? Yes XX No ____ not from bottom of bulk tank

3. Is the regular functional fuel oil outlet slightly above (two to three inches) the bottom of the:

   a. Bulk tank? Yes XX No ____ Pump suction approximately 8" from bottom
   b. Day or integral tank? Yes XX No ____

4. Is bottom of day tank and/or integral tank above all parts and piping of the engine fuel injection systems? Yes ____ No XX

   If yes,

   Give approximate amount inches ____ feet ____

5. Does the engine fuel system have a fuel bleed return line to the fuel day tank and/or integral tank? Yes XX No ____

   During extended operation, such as more than two to three hours, does the fuel in the day tank become: (yes or no)

   a. Warm? ____
   b. Hot? ____ (above 130°F) Data not available

What is fuel oil return line size (nominal)?

a. Pipe size .75 inches
b. Tubing size ____ inches no tubing used

6. Do engine fuel oil filters have air bleed or vent valves readily accessible? Yes XX No ____

7. How is fuel transferred from day tank to engine fuel system?

a. By gravity ____
b. Engine driven pump XX
c. Electric motor driven pump ____
d. Is a manual pump also provided for injection system filling and/or air venting after servicing or replacement of parts in the fuel injection system? Yes XX No ____

If yes, is the manual pump in immediate operating condition? Yes XX No ____

8. Type of fuel (e.g., #1, #2, #3, JP-4, etc.) #1.

9. Approximate bulk tank capacity, 40,000 gallons.

10. Typical frequency of refilling (weekly, monthly, etc.) 2 months.

11. Typical refill (gallons), 4000.

D. Lube Oil System

1. Lube oil

a. Type Amoco Alkalube #1540
b. Viscosity SAE 40
c. Specification number API Service CD
d. Oil change determined by:

Time interval: Yes ___ No ____
Give interval _____ monthly, yearly
By oil analysis: Yes XX No ____

Analysis every 4 months

2. Lube oil filters are:

   a. Full flow XX with internal bypass valves
   b. Bypass _____
   c. Combination _____

3. Interval and/or basis for changing filter cartridge:

   a. Monthly _____
   b. Yearly _____
   c. By running time _____ hours
   d. By oil analysis. Yes ____ No ____
   e. By pressure drop. Yes X No ____ Checked monthly
   f. Does provisions exist for changing cartridges during engine operation? Yes ___ No XX

4. Oil Pressure Monitoring

   a. Normal operating pressure 30-35 psi
   b. Alarm 20 psi
   c. Shutdown 18 psi

5. Oil temperature control:

   a. By standby heater in engine sump 130-135 °F.
   b. Heating means for maintaining standby temperature:

      Direct in oil _____
      Oil-to-water heat exchanger _____
      Other (Specify) System functions by taking oil from the rear of the engine and circulating it thru the tubes of an electric heater

E. Cooling System - Engine Water

1. Temperature control by:

   a. By thermostat in water? Yes XX No ____

      If yes, then:

      Bypass thermostat? Yes XX No ____
      Throttle thermostat? Yes ____ No XX

b. By radiator shutter: Not applicable

Automatic ____
Manual ____
Other (give type) _____

2. Corrosion control (water additive)? Yes XX No ____

If yes, give chemical additive or name of compound.

Nalco 39-1

Proportion or concentration control:

a. By additive measurement? Yes X No ___
b. By water coolant analysis? Yes X No ___

3. Engine cooling water cooled by:

a. Radiator? _____
b. Heat exchanger from sea, river or other water? X
c. Other? (give type) _____

4. Engine cooling water temperature-monitoring

a. Standby temperature 100-110°F
b. Normal operating temperature 170-185 °F
c. Alarm temperature 195 °F
d. Shutdown temperature 200 °F
e. Water circulation during standby:

Thermo-syphon _____
Pump XX

5. Water Pressure Monitoring: Yes XX No ____

a. Alarm _____
b. Shutdown _____
c. Both XX

6. Water temperature Sensor Position:

   a. In piping from engine XX Between engine and heat exchanger
   b. In engine piping _____
   c. In engine direct _____

7. Water surge or supply tank in system. Yes XX No ____

   If yes, then bottom connected to:

   a. Water pump suction? Yes XX No ____
   b. Top of system? Yes ____ No XX
   c. Both of above? Yes ____ No XX
   d. Is bottom of surge tank above top of engine system? Yes XX No ____
   e. Does engine have constant air bleed from top of engine water piping to surge or supply tank? Yes XX No ____
   f. Give size of bleed or vent line, .375 inches.
   g. Manual air bleed only? Yes ____ No XX Continuous vent to Atm.

F. Governor - Speed Control

Manufacturer Woodward
Electric (speed sensing) Yes
Hydraulic Yes
Type or code (such as EGB-35, LSG-10, etc.) EG-B10
Automatic load sharing? Yes ____ No X

1. Is compensation or stability control and/or speed of response manually adjustable? Yes ____ No XX

   If yes, adjusted by:

   a. Eye and ear?
   b. Test and specification? _____
   c. Other? (Specify) _____.

2. Engine - generator normal shutdown or stopping means and method.

Is the engine stopped:

a. Manually? Yes XX No ____

If yes, then:

Directly at engine? Yes XX No ____
Through local control panel? Yes ___ No XX

b. Automatically through the controls in the control room? Yes XX No ___

c. By setting governor to "fuel-off" position? Yes ____ No XX

d. By over-ride of governor settings and control position directly to fuel injection pumps? Yes XX No ____

e. Other means. Describe briefly. _____

_____

3. When engine is stopped, is fuel control in:

a. Full fuel or maximum fuel position? ____
b. Full off or no fuel position? XX
c. Intermediate? _____
d. Random? _____

(If not consistent and typical in above, then give the usual.)

4. When starting from the standby condition after shutdown for at least 24 hours, give number of seconds from start-to-crank to full fuel or maximum fuel position of governor and fuel control, _____ seconds.

Data not available

G. Governor - Overspeed (shutdown)

1. Speed sensing?

   a. Electrical _____
   b. Flyball ____
   c. Other (Specify) Centrifugal force on a weight opposed by a spring

2. Fuel shutoff force generated by:

   a. Spring? XX
   b. Air? ____
   c. Hydraulic? ____
   d. Electrical? ____
   e. Other? (Specify) _____

3. Overspeed sensing setting? (in terms of full speed)

   a. 115% ____
   b. 110% XX
   c. Other (Specify) _____

4. Is overspeed tripping set point tested periodically?
   Yes ____ No XX

   If yes, then how often? _____ (yearly, monthly, etc.)

H. 1. Generator Mfr. Fairbanks Morse Colt Ind. Model No. TGZJ
   Single bearing or two bearings? single bearing (spherical roller oil lubricated)
   Does generator have damper windings? Yes XX No ____

2. Does generator have any obvious fault or difficulty?
   Yes ____ No XX

   Is problem repetitive? Yes ____ No ____

   If yes, then describe briefly. _____

I. Exciter and Voltage Regulator

1. Exciter Manufacturer: Basler Elect. Co. Model SBHV

   Type: Rotating _____ Static X

   If rotating drive? Direct _____
   Belt or Chain _____
   DC with field control _____
   Brushless with rectifier _____

2. Voltage Regulator: Manufacturer Basler Elect. Co Model SBHV

   Type: Mechanical _____ Static XX

3. Are paralleled units of automatic load sharing control of fully automatic type? Yes ____ No ____ Not applicable. Generators not operated in parallel

   If yes, has any obvious influence or interrelationship been noted between the stability and response time of the engine governor and the stability and voltage control of the generators? Yes ___ No ___

4. Have engine governor and voltage regulator/exciter adjustments been made on the site or under any conditions since any of the units have been placed in service? Yes ___ No XX

   If yes, by means of what tests and what standards? Give name or very brief description. _____

   _____

5. If any difficulties have occurred, give approximate number of problems.

   a. Components 0
   b. Wiring 0
   c. Other (damage in service or dropping of miscellaneous hardware into switchboard, etc.) 0.

J. Paralleling: Engine-Generator Units — Not applicable. Diesels will never be operated in parallel.

1. Do all units consistently have the proper voltage output? Yes ____ No ____

2. Do all units automatically share both the "real" or in-phase load and also the reactive load reasonably well? Yes ____ No ___

3. At the same Kw load, are both the field and the armature line currents of the several units consistently close to the same value? Yes ____ No ____

   If no, approximate percent difference. _____

4. Synchronizing

   a. In automatic synchronizing do circuit breakers close immediately after reaching full synchronous speed? Yes _____ No _____

   b. If "no" above then, does speed of some units drift slowly while failing to synchronize and close circuit breakers?

      How many seconds? _____

      Occasionally _____
      Always _____
      Never _____

K. Switch Gear and Electrical Con (other than exciter/ voltage regulator)

1. If any difficulties have occurred, then give approximate number of problems.

   a. Components 1
   b. Wiring 0
   c. Other (damage in service or dropping of miscellaneous hardware into switchboard, etc.) 0
   d. Design concept faults. That is, does the switch gear and its controls perform the proper functions and in proper sequence and timing. 0

2. a. Do the on-site diesel generator units and related support equipment have any storage battery power systems for any service whatsoever? Yes X No ___

b. Identify each storage battery power system associated with the on-site diesel generator unit and its function. 125 V DC (2) Control Power
12 V DC Starts diesel driven air compressor on starting air system (back-up)

c. Does each system identified above adequately fulfill the service requirements for which it is intended? Yes XX No ___

If no, briefly describe. ___

d. Is there a DG battery maintenance program? Yes XX No ___

L. Safety Shut downs

Give safety shut down settings compared to equilibrium operating conditions.

1. Engine and generator speed. Give rpm or hertz:

a. Synchronous and usual 900 rpm or 60 Hz
b. Overspeed shutdown setting 990-1010 rpm or ___ Hz
not used

2. Engine cooling water (see E.4)

a. Equilibrium 170-185 °F
b. Alarm 195 °F
c. Shut down 200 °F

3. Lube oil pressure (see D.4)

a. Equilibrium 30-35 psi
b. Alarm 20 psi
c. Shut down 18 psi

4. Lube oil temperature

   a. Equilibrium 195-215 °F
   b. Alarm 230 °F High 105° Low
   c. Shutdown _____ °F Not used

5. Indicate all other protective interlocks (give name and;)

   a. Usual or proper condition Crankcase Vacuum .5 - 2.0" H_2O ; Cooling Water Pressure > 18 psi

   b. Shutdown condition Crankcase vacuum < .5" H_2O' Cooling Water Pressure 12 psi

6. a. What source of power is provided to operate alarms and shutdown controls? (See G.2) 125 VDC from batteries

   b. Do the generator units automatically shutdown in case of the electrical power loss to its control system? Yes ____ No X

M. Emergency or Alert Conditions

1. Are all safety shutdown and safety interlocks bypassed during emergency conditions? Yes ____ No XX

2. If "no" above, then which are not bypassed. Name items.

   Mechanical Overspeed Trip

3. For each interlock not bypassed is coincident logic used? Yes _____ No XX

   If yes, is it testable? Yes_____ No ____

N. Maintenance

1. Does plant have regularly scheduled maintenance procedures? Yes

   If so, return copy of these procedures with questionnaire.

2. When need for minor adjustments obviously exists, then:

   a. Is remedial action taken immediately or at earliest practical opportunity? Yes XX No ____

   b. Is remedial action taken only at periodic prescheduled or programmed times and conditions? Yes ____ No XX

   c. For best performance record which of above appears better:

      immediate or early action? XX
      as scheduled only? ____

   d. Must permission for minor maintenace be obtained from some higher out-of-plant authority? Yes ____ No XX

   e. Is maintenance referred to above allowed and encouraged? Yes X No ____

   f. In periodic surveillance tests, simulated alert standby tests, etc., is the criteria "pass/not pass" the test used? Yes X No ____

   g. Is there a conscious continuing policy to detect and remedy marginal conditions or imminent trouble: for examples: lube oil pressure shutdown only two to five psi below operating pressure or, perhaps overspeed governor setting only one or two percent above starting speed surge or etc.? Yes X No ____

   h. Are efforts to remedy marginal or questionable conditions as mentioned above encouraged by plant management? ____

      Yes XX No ____

   i. Are remedial steps on items similar to the above taken or allowed when the unit has started and operated satisfactorily within specified limits or conditions? Yes XX No ____

O. Starting Conditions

1. Give starting or necessary cranking time as experienced.

   a. Starting time per specification ≤ 10 seconds
   b. Usual starting time 7-8 seconds
   c. Maximum starting time observed 9 9 seconds

2. Give usual time intervals as follows:

   a. Time from start-to-crank to first firing of any cylinder. _____ seconds — Data not available

   b. Time from start-to-crank to approximate full firing of all cylinders. _____ seconds — Data not available

3. Give maximum speed surge when starting; use both tachometer and frequency meter if possible.

   a. Usual conditions _____ rpm
      _____ Hz — Data not available
   b. Maximum observed _____ rpm
      _____ Hz

4. During a surveillance test, give time from start-to-crank to when steady synchronous speed is attained and maintained.

   a. Usual 7-8 seconds
   b. Maximum 9.9 seconds
   c. As specified ≤10 seconds.

5. Give briefly the most troublesome problems in starting.

   a. Most troublesome We have experienced no starting problems

   b. Next to most troublesome _____.

P. Air Cleaner or Air Filter - Combustion Air

1. Combustion air source: taken from engine room or inside the building, or from outdoors?

   a. Indoors _____
   b. Outdoors xx

2. Give type and make of air cleaners or air filters:

   a. Oil bath _____ Make _____
   b. Oil wetted screen _____ Make _____
   c. Paper X _____ Make Farr Dynacell DH-68
   d. Other _____ Make _____
   e. Precleaner: Yes ____ No XX

3. Excessive air flow restriction and servicing need determined by?

   a. Instrument such as:

      manometer _____
      If other give type Differential Pressure Switch and alarm
   b. Personal judgement by appearance, etc. _____
   c. By smoking exhaust _____
   d. Time schedule _____
   e. Other (Specify) _____

4. Are climatic extremes normally experienced such as:

   a. Air heavily loaded with water mist, high humidity and low temperature? Yes X No ____
   b. Blowing sand and dust? Yes X No _____
   c. Blowing snow (blizzards)? Yes X No ____
   d. Other-Name Thunderstorms

5. Are climatic extremes potentially possible such as:

   a. Air heavily loaded with water mist, high humidity and low temperature? Yes X No _____
   b. Blowing sand and dust? Yes X No _____
   c. Blowing snow (blizzards)? Yes X No ____
   d. Other-Name Thunderstorms

Q. Temperature Conditions

1. Ambient outside hottest 109 °F.

2. Ambient outside coldest -25 °F.

3. Engine-generator room hottest 140 °F.

4. Engine-generator room coldest 68 °F.

5. Inside switch gear hottest 104°F design maximum

6. Inside voltage regulator or ambient near voltage regulator hottest 104° F design maximum

7. Ambient at exciter hottest 104° F design maximum

R. Operator Qualifications (as presently exists, and suggested minimums if different) Control Room Personnel

1. Minimum education required (check)

	Existing	Suggested
a. High School	XX	
b. Trade School		
c. Technical School		
d. No minimum		

2. Minimum Years of operating experience (diesel electric generator)

	Existing	Suggested
a. 0-3		
b. 3-6	XX	
c. 6-10		
d. 10-15		

3. Operator training

	Existing	Suggested
a. Military		
b. Industrial		
c. On-the-job		
d. Combination of a, b, and c (indicate which)	a,b,c	

4. Licensing required

	Existing	Suggested
a. State		
b. Federal		
c. Utility or self		
d. None	X for operation of diesels	

S. Are any foreign gases such as propane, freon, halon, carbon dioxide, etc. stored in the: Diesel Engine room? Yes _____ No XX or adjacent buildings? Yes XX No ____

If yes, (other than hand portable fire extinguishers), then identify gases and give approximate tank size.

Gases	Volume (ft^3)
CO_2-Cardox	10 tons-liquid

T. Does control system automatically bypass, in emergency starting, any engine temporarily out of service for maintenance? Yes XX No _____

If yes, then how many failures to bypass have occured? None

U. Does the control system automatically override the test mode under emergency conditions? Yes XX No _____

V. Have repetitive mechanical failures occurred in any component part or subsystem of the engine, generator, or switch gear, etc.? Yes XX No ____

If yes, then which part or subsystem? Journal Bearings

How many failures? 2

Give nature of failure. Possible oil problems causing bearing failure

W. Would periodic (yearly or other) evaluation and/or testing by "outside experts" contribute significantly to the diesel-generator reliability? Yes XX No _____

Give brief reasons for the answer. Colt Industries currently participates in our annual maintenance inspection. We feel that this contributes to the reliability of the diesels.

X. 1. Give the accumulated time-load operating record for each diesel-generator unit from installation to the present (Running Hours):

Preoperational test Date August, 1973

Engine Serial No.	Surv. Testing & Maintenance Hrs. No Load	Loaded	Emergency and Other Service Hrs.	Total Hours
38D871077 TDSM12	~ 14.8	~ 81.5	~ 402.2	498.5
38D871078 TDSM12	~ 12.7	~ 80	~ 320.1	412.8

2. Surveillance test load (percent of continuous rating) 100%

3. Give the projected or planned time-load operation for each diesel-generator unit during the next 12 months.

Surveillance & Maintenance Hrs.	Emergency and other Service Hrs.	Total Hours	
30 hours each	none	30 hours	

4. Provide the following summary of the periodic surveillance testing experience:

a. Starting date of surveillance testing (OL date) 3/2/74
b. Periodic test interval monthly
c. Total number of surveillance tests performed Unit A-105;Unit B-112
d. Total number of test failures 5

failure to start 0 failure to accept load 0
failure to carry load 0 failures due to operator error 0
failure due to equipment not being operative during emergency conditions 0

e. Supply a copy of the surveillance test procedures with this completed questionnaire.

Additional Comments

_____

_____

_____

_____

_____

_____

Y. General Suggestions

Briefly give constructive criticism or suggestions as to improvement in reliability of the diesel generators. These remarks may cover tests, maintenance, practices, orders, policy, adjustments, etc.

2.8 Personnel required for this procedure:

Group	Number
Operations	2

2.9 At the completion of testing, Test Completion Criteria Section 5, the completed Test Data Sheets and any Deviation Report(s) should be submitted to the Operations Supervisor for review and approval.

2.10 Refer to Operating Instructions 3C and 23/24 before proceeding with this procedure.

2.11 Inspection Procedure IP-24 should be performed concurrently with this test.

2.12 A copy of the Data Sheets, Section 6, shall be provided to the Mechanical Maintenance Supervisor for Inspection Procedure records.

2.13 The Mechanical Maintenance Supervisor should be advised at the start of the test to allow for proper maintenance interface coordination.

3.0 Special Precautions

3.1 There are no Special Precautions to be observed for this test.

4.0 Procedure

The Test Data Sheets must be completed as each step and/or substep is completed.

NOTE: All steps are performed at Panel 1C08 and verified by indicating lights, unless otherwise stated.

4.1 Complete Steps 2 through 16 in Table 1.0 of Inspection Procedure IP-24.

4.2 Place the UNIT/PARRELLEL switch to the PARALLEL position on Panel **.

4.3 Under the platform near the air start solenoid valves, unlock and close the air supply valve from the diesel driven air supply **.

4.4 Start and run the Prelube Pump for two (2) minutes.

4.5 Start Standby Diesel Generator ** and start the stop watch.

4.6 Verify that rated frequency and voltage is reached at $\leq$ 10 seconds.

4.7 Verify that annunciator D GEN ** RUNNING, window ** is activated.

4.8 Verify Diesel Gen ** Frequency Meter indicates 60 Hz. Adjust the frequency as necessary.

4.9 Verify Diesel Gen ** Voltmeter indicates 4160 volts. Adjust the voltage as necessary.

4.10 Verify, at Panel 1C23, that the diesel generator room vent fan, for the diesel generator under test, is running.

4.11 Verify, at Panel 1C06, that the emergency service water pump, for the diesel generator under test, is running.

4.12 Stop the diesel generator under test and record the run time.

4.13 Under the platform near the air start solenoid valves;

a. Open and lock the air supply valve from the diesel driven air supply.

b. Unlock and close the air supply valve from the AC driven air supply **.

4.14 Run the Prelube Pump for two (2) minutes.

4.15 Restart the Standby Diesel Generator under test and start the stop watch.

4.16 Verify that rated frequency and voltage is reached at $\leq$ 10 seconds. Record the starting time.

4.17 Verify Diesel Gen ** Frequency Meter indicated 60 Hz. Adjust the frequency as necessary.

4.18 Verify Diesel Gen ** Voltmeter indicates 4160 volts. Adjust the voltage as necessary.

4.19 Verify, at Panel 1C23, that the diesel generator room vent fan, for the diesel generator under test, is running.

4.20 Verify, at Panel 1C06, that the emergency service water pump, for the diesel generator under test, is running.

4.21 Place the 4KV Bus ** Auto -Manual transfer switch in the MAN position.

4.22 Synchronize the diesel generator under test to the essential bus and close the circuit breaker.

4.23 Increase the diesel generator load to 2850 KW and run the diesel generator under test for one hour.

4.24 Complete the remaining items in TAble 1.0 of Inspection Procedure IP-24.

NOTE: To ensure the diesel will not motorize do not trip the engine before tripping the associated generator breaker.

4.25 Decrease the diesel generator load to approximately 50 KW, trip the diesel generator circuit breaker, and allow the engine to run unloaded for 5 minutes.

4.26 Place the 4KV Bus ** Auto-Manual transfer switch in the AUTO position.

4.27 Stop the diesel generator under test and record the run time.

4.28 Verify the annunciator DIESEL GEN ** RUNNING, window **, is reset.

4.29 Verify that the diesel generator voltage decreases to zero, and the frequency meter goes to mechanical zero.

4.30 Trip the injection pump control racks on the engine under test by depressing the Emergency Stop Pushbutton (overspeed trip) at the engine.

4.31 Utilizing the manual override of the normal air start solenoid, admit starting air to the engine under test for 10 seconds.

4.32 Return the diesel generator under test to a standby status as follows:

a. Place the UNIT/PARRALLEL switch in the UNIT position on Panel **.

b. Verify that all fluid inventories are at the proper levle i.e.; engine lube oil, jacket water and governor oil.

c. Verify that all diesel generator subsystem annunciators at Panel 1C08 and local Panel ** are reset.

d. Under the platform near the air start solenoid valves, open and lock the air supply valve from the AC driven air supply.

e. Reset the overspeed trip.

4.33 Open the diesel Starting Air Receiver ** & ** valves slightly, and reduce the air receiver pressure to < 200 psig as indicated on the receiver mounted pressure gages PI ** and PI **.

4.34 Close the air receiver drain valves and verify that the Starting Air Compressor ** has started.

4.35 When the air receiver pressure rises to > 240 psig, verify that air compressor under test has stopped. Record the run time and compressor oil pressure.

4.36 Open the Diesel Starting Air Receiver ** drain valve, slightly, and reduce the air receiver pressure to 220 psig as indicated on the receiver mounted pressure gage PI ** and close the air receiver drain valve.

4.37 Start the diesel-driven starting air compressor with the local handswitch.

4.38 When the air receiver under test pressure is > 240 psig, verify that the diesel-driven air compressor has stopped. Record the run time, compressor oil pressure and diesel oil pressure.

4.39 Start the Diesel Oil Transfer Pump ** locally at panel ** by turning HS ** to START. After the pump starts, turn HS ** back to STOP. The pump should remain running.

4.40 Verify that the Diesel oil transfer pump stops automatically when the day tank level reaches 850 gallons as indicated on LI **.

4.41 Verify that the fuel oil level of the diesel oil storage tank is >36,000 gallons. Record the as found value.

** Identified on the Test Data Sheets for the subsystem under test.

5.0 Test Completion Criteria

The surveillance requirements will have been satisfied when the following items have been completed and signed off.

5.1 This Surveillance Test Procedure was performed for the following reason:

a. Standby Diesel Generator Operability Test _____
b. Other (define) _____

5.2 The Test Data Sheets have been completed, reviewed, signed and attached for each instrument channel.

a. Diesel Generator Subsystem A _____
b. Diesel Generator Subsystem B _____

5.3 The Surveillance test results, as documented by the Test Data Sheets, are as follows:

	Unacceptable	Acceptable
a. Diesel Generator Subsystem A	_____	_____
b. Diesel Generator Subsystem B	_____	_____

5.4 Were any problems encountered during the test? _____

a. Procedural (Related Document Change Form(s) attached)? DCF# _____

b. Equipment (Apply of related Deviation Report(s) attached)? DR# _____

5.5 If Item 5.3 indicates any unacceptable surveillance results or problems were encountered, has General Instruction 2.4 been implemented? _____

5.6 Test Comments:

_____ _____
Operations Supervisor Date

_____ _____
Surveillance Program Coordinator Date

6.0 Test Data Sheets

6.1 Subsystem Under Test A_____ B_____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.1	Steps 2 through 16 of Inspection Procedure IP-24 completed.	
4.2	UNIT/PARALLEL switch in the Parallel Position on Panel **. Subsystem A: ** = 1C93 Subsystem B: ** = 1C94	
4.3	Air supply valve from the diesel driven air supply ** closed. Subsystem A: ** = 1T-117A Subsystem B: ** = 1T-117B	
4.4	Prelube pump run for two (2) minutes.	
4.5	Diesel Generator ** started. Subsystem A: ** = 1G-31 Subsystem B: ** = 1G-21	
4.6	Rated frequency and voltage is reached at $\leq$ 10 seconds. Starting time _____seconds.	
4.7	Annunciator DIESEL GEN ** RUNNING, window no. ** activated. Subsystem A: ** = 1G-31, window no. A10 Subsystem B: ** = 1G-21, window no. B3	
4.8	Diesel Gen ** Frequency Meter indicated 60 Hz. Subsystem A: ** = Gen 1G31 Subsystem B: ** = Gen 1G21	
4.9	Diesel Gen ** Voltmeter indicates 4160 volts. Subsystem A: ** = Gen 1G31 Subsystem B: ** = Gen 1G21	
4.10	Diesel generator room vent fan running:	
4.11	Emergency service water pump running.	
4.12	Diesel generator under test stopped. Run time _____	

6.0 Test Data Sheets

6.1 Subsystem Under Test A_____ B_____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.13.a	Air supply valve from the diesel driven air supply opened and locked.	
4.13.b	Air supply valve from AC Driven Air Supply ** unlocked and closed. Subsystem A: ** = 1T-115A and 1T-116A Subsystem B: ** = 1T-115B and 1T-116B	
4.14	Prelube pump run for two (2) minutes.	
4.15	Diesel Generator under test started.	
4.16	Rated frequency and voltage is reached at $\leq$ 10 seconds. Starting Time _____seconds. Time of Start _____	
4.17	Diesel Gen ** Frequency Meter indicates 60 Hz. Subsystem A: ** = Gen 1G31 Subsystem B: ** = Gen 1G21	
4.18	Diesel Gen ** Voltmeter indicates 4160 volts. Subsystem A: ** = Gen 1G31 Subsystem B: ** = Gen 1G21	
4.19	Diesel generator room vent fan running.	
4.20	Emergency service water pump running.	
4.21	4KV Bus ** Auto-Manual Transfer switch in the MAN position. Subsystem A: ** = Bus 1A3 Subsystem B: ** = Bus 1A4	
4.22	Diesel generator synchronized.	
4.23	Diesel generator load 2850 KW and one hour load run complete.	
4.24	Remaining steps of Inspection Procedure IP-24 completed.	
4.25	Diesel generator load approximately 50 KW diesel generator circuit breaker tripped, engine run unloaded for 5 minutes.	

6.0 Test Data Sheets

6.1 Subsystem Under Test A_____ B_____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.26	4KV Bus ** Auto-Manual transfer switch in the AUTO position.	
4.27	Diesel generator under test stopped. Time of Stop _____	
4.28	Annunciator DIESEL GEN ** RUNNING, window no. ** reset. Subsystem A: ** = 1G-31, window no. A10 Subsystem B: ** = 1G-21, window no. B3	
4.29	Diesel generator voltage decreases to zero, and frequency meter indicates mechanical zero.	
4.30	Injection pump control racks tripped by depressing the Emergency Stop Pushbutton (overspeed trip) at the engine.	
4.31	Starting air admitted to engine under test for 10 seconds utilizing the manual override of the normal air start solenoid.	
4.32.a	UNIT/PARALLEL switch in UNIT Position on Panel **. Subsystem A: ** = 1C93 Subsystem B: ** = 1C94	
4.32.b	All fluid inventories at the proper level.	
4.32.c	All subsystem annunciators at Panel 1C08 and local Panel ** reset. Subsystem A: ** = Panel 1C93 Subsystem B: ** = Panel 1C94	
4.32.d	Air supply valve from the AC driven air supply opened and locked.	
4.32.e	Overspeed trip reset.	

Reference Only

6.0 Test Data Sheets

6.1 Subsystem Under Test A_____ B_____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.33	Diesel starting air receiver ** and ** drain valves opened slightly and air receiver pressure reduced to <200 psig as indicated on PI ** and PI **.	
	Subsystem A: ** = 1T-115A / PI 3221A; 1T-116A / PI 322A	
	Subsystem B: ** = 1T-115B / PI 3221B; 1T-116B / PI 3222B	
4.34	Air receiver drain valves closed and Starting Air Compressor ** Started.	
	Subsystem A: ** = 1K-10A Subsystem B: ** = 1K-10B	
4.35	Starting Air Compressor stopped, when pressure increased to >240 psig	
	Compressor run time _____ minutes. Compressor oil pressure _____ psig.	
4.36	Diesel starting air receiver ** drain valve open slightly and air receiver pressure reduced to 220 psig as indicated on PI ** and air receiver drain valve closed.	
	Subsystem A: 1T-117A, PI 3223A Subsystem B: 1T-117B, PI 3223B	
4.37	Diesel Driven Starting Air Compressor ** started.	
	Subsystem A: ** = 1K-10C Subsystem B: ** = 1K-10D	
4.38	Diesel air compressor stops at > 240 psig.	
	Run Time _____ Compressor oil pressure _____ Diesel oil pressure _____	

6.0 Test Data Sheets

6.1 Subsystem Under Test A_____ B_____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.39	Diesel oil transfer pump ** started, locally at Panel ** by turning HS ** to START. After the pump starts, turn HS ** back to STOP. The pump remains running. Subsystem A: ** = Pump 1P-44a, 1C91, HS-3203 Subsystem B: ** = Pump 1P-44B, 1C92, HS-3204	
4.40	Diesel oil transfer pump stops automatically at 850 gallons as indicated on LI**. Subsystem A: ** = LI 3208 Subsystem B: ** = LI 3210	
4.41	Fuel oil level verified $\geq$ 35, 000 gallons. As found value _____.	
4.42	Completed Table 1.0 of Inspection Procedure IP-24 attached.	

Performed by _____ Date _____ Time _____

4.42 Inspection Procedure IP-24.

Table 1.0
ENGINE RUN-UP
Unit No. ____
(Reference, Paragraph 1.1)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	ITEMS TO BE CHECKED BEFORE STARTING ENGINE				
2	Engine Coolant Level	____ in.			Ref. 3a, Page Q1
3	Engine Coolant Temperature	100 - 100°F			-
4	Engine Lube Oil Level	Full			Ref. 3e, Page P2
5	Engine Lube Oil Temp.	130 - 135°F			-
6	Lube Oil Circulation Pump	Running ___psi min.			-
7	Coolant Circulation Pump	Running ____ psi min			-
8	Starting Air Pressure	200 - 240 psi			-
9	Auto Lube Oil Make-up Tank Level	Full			-
10	Drain Air Starting Lines	-			Ref. 2
11	Generator Bearings Oil Level	Full			Ref. 3c, Page 6
12	Air Compressor Oil Level* - 1K-10A (or B)	Full			-
13	Air Compressor Oil Level*-1K-10C (or D)	Full			-
14	Air Compressor Diesel Engine Oil Level **	Full			-
15	Governor Oil Lever				
16	Inspect Air Intake Filter				

Reference Only

Unit No. ____
(Reference, Paragraph 1.1) Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
17	ITEMS TO BE CHECKED AFTER TEMPERATURE EQUILIBRIUM				
18	Engine Coolant Temperature	170 - 185°F			Ref. 3a, Section Q
19	Engine Lube Oil Pressure	30 - 35 psi			Ref. 3a, Section P
20	Engine Lube Oil Temperature	195 - 215°F			Ref. 3a Section P
21	Air Cooler Inlet Temperature	Less than 100° F			Ref. 3a Section K
22	Fuel Oil Pressure	12 - 15 psi			Ref. 3a Section L
23	Pressure Drop, Lube Oil Filters	18 psi max.			Ref. 3a Section P
24	Pressure Drop, Fuel Oil Filter	10 psi max.			Ref. 3a, Section L
25	Engine Lube Oil Leakage	-			Ref. 3a Section L
26	Engine Lube Oil Pump Leakage	-			Ref. 3a Section P
27	Exhaust Temperature	850 - 1100°F			Ref. 3a, Section S
28	Crankcase Vacuum	0.4 to 2.0 in. of Water vacuum			
29	Engine Coolant Level	____in.			Ref. 3a, Page 23
30	Pressure Drop, Lube Oil Strainer	12 psi max.			Ref. 3 Page 14
	* If the oil is below the proper level, add oil per LP-14, Paragraph 1.3.				
	** If the oil is below the proper level, add oil per LP-15, Paragraph 1.2.				

IP

INSPECTION PROCEDURE (I.P.)	NO. IP-24
ENGINE (DIESEL) GENERATOR SET	PAGE 1 OF 10
COLT INDUSTRIES MODEL 38TD8 1/8	REV. 0 DATE 1/8/76

APPROVED BY _____
Maintenance Supervisor

APPROVED BY _____
Chairman, Operations Committee

APPROVED BY _____
Chief Engineer

1.0 INSTRUCTIONS

1.1 Engine Run-Up (Complete Table 1.0)

1. With the engine at standstill and before the engine is started per Surveillance Test Procedure 48A001, perform items 2 through 16 in Table 1.0.

2. While STP 48A001 is proceeding and after the diesel and generator reach equilibrium temperature, complete the remaining items in Table 1.0.

1.2 Engine Run-Up, Standby (Complete Table 1.0)

This operation is identical to Paragraph 1.1 except for frequency of test. When one standby diesel generator subsystem is out of service, the operable subsystem must be run-up once every 24 hours.

1.3 Annual Engine Test (Complete Tables 1.0 and 1.1)

1. With the engine shut down and prior to engine start per Surveillance Test Procedure 48A004, perform items 2 through 16 in Table 1.0 and complete items 2 through 21 in Table 1.1.

2. While STP 48A004 is proceeding and after the diesel and generator reach equilibrium temperature, complete the remaining items 18 through 30 in Table 1.0.

1.4 4000 Hour Maintenance (Complete Table 1.2)

1. With the engine shut down, perform the items in Table 1.2, every 4000 hours of engine operation.

2. Complete Table 1.2.

1.5 6000 Hour Maintenance (Complete Table 1.3)

1. With the engine shut down, perform the items in Table 1.3 every 6000 hours of engine operation.

2. Complete Table 1.3.

1.6 8000 Hour Maintenance (Complete Table 1.4)

1. With the engine shut down, perform the items in Table 1.4 every 8000 hours of engine operation.

2. Complete Table 1.4.

1.7 Generator Exciter Inspection

1. With the engine shut down, inspect the exciter - regulator for general condition.

2. Clean the air openings per Reference 3h, Page 5-1.

1.8 Generator Electrical Inspection

1. With the engine shut down, perform insulation resistance testing per Reference 3.C, Page 4, "Insulation Resistance Testing".

1.9 Exhaust Silencer Inspection

1. Inspect the exhaust silencer for general condition.

2.0 REFERENCES

1. IELP Safety Manual.

2. P&ID, Diesel Generator Systems, Bechtel Corp., Dwg. No. 7884-M-132, Revision 9.

3. Diesel Generator Service Manual, Instructions No. 3542, Colt Industries, Bechtel Vendor Print Control No. 7884-M15-73-2.

   a. Instructions 3800TD8 1/8, Colt Industries.

   b. Instruction Manual, Basler Electric Publication No. 90 85100 990.

   c. Electrical Tab, Instructions 3562, Colt Industries Power Systems Division.

   d. Accessories Tab, Part Nos. 11 905 731 and 11 905 732.

   e. Accessories Tab, Part No. 11 906 206.

   f. Bulletin 37708E, Woodward Governor Company.

   g. Instruction Book TC-30E, Elliott Division of Carrier Corporation.

Table 1.0
ENGINE RUN-UP
Unit No. ____
(Reference, Paragraph 1.1)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	ITEMS TO BE CHECKED BEFORE STARTING ENGINE				
2	Engine Coolant Level	____ in.			Ref. 3a, Page Q1
3	Engine Coolant Temperature	100 - 100°F			-
4	Engine Lube Oil Level	Full			Ref. 3a, Page P2
5	Engine Lube Oil Temp.	130 - 135°F			-
6	Lube Oil Circulation Pump	Running ___psi min.			-
7	Coolant Circulation Pump	Running ____ psi min			-
8	Starting Air Pressure	200 - 240 psi			-
9	Auto Lube Oil Make-up Tank Level	Full			-
10	Drain Air Starting Lines	-			Ref. 2
11	Generator Bearings Oil Level	Full			Ref. 3c, Page 6
12	Air Compressor Oil Level* - 1K-10A (orB)	Full			-
13	Air Compressor Oil Level*-1K-10C (orD)	Full			-
14	Air Compressor Diesel Engine Oil Level **	Full			-
15	Governor Oil Lever				
16	Inspect & Clean Air Intake Filter				

Table 1.0 (Cont'd)
ENGINE RUN-UP
Unit No. ____
(Reference, Paragraph 1.1) Name _____ Date ____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
17	ITEMS TO BE CHECKED AFTER TEMPERATURE EQUILIBRIUM				
18	Engine Coolant Temperature	170 - 185°F			Ref. 3a, Section Q
19	Engine Lube Oil Pressure	30 - 35 psi			Ref. 3a, Section P
20	Engine Lube Oil Temperature	195 - 215°F			Ref. 3a Section P
21	Air Cooler Inlet Temperature	Less than 100° F			Ref. 3a Section K
22	Fuel Oil Pressure	12 - 15 psi			Ref. 3a Section L
23	Pressure Drop, Lube Oil Filters	18 psi max.			Ref. 3a Section P
24	Pressure Drop, Fuel Oil Filter	10 psi max.			Ref. 3a, Section L
25	Engine Lube Oil Leakage	-			Ref. 3a Section L
26	Engine Lube Oil Pump Leakage	-			Ref. 3a Section P
27	Exhaust Temperature	850 - 1100°F			Ref. 3a, Section S
28	Crankcase Vacuum	0.4 to 2.0 in. of Water vacuum			
29	Engine Coolant Level	____in.			Ref. 3a, Page 23
30	Pressure Drop, Lube Oil Strainer	12 psi max.			Ref. 3 Page 14

* If the oil is below the proper level, add oil per LP-14, Paragraph 1.3.
** If the oil is below the proper level, add oil per LP-15, Paragraph 1.2.

Table 1.1
ANNUAL ENGINE TEST
Unit No. ____
(Reference, Paragraph 1.3)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Complete Table 1.0, Items 1-16				Para. 1.1
2	Check Injection Pump Rack Settings				Ref. 3a. Page L15
3	Check Injection Pump Rack for freedom of motion				Ref. 3a, Page L15
4	Inspect, Clean Lube Oil Strainer				Ref. 3e
5	Inspect Governor, Check Oil				Ref. 3f Page 10
6	Inspect Air Start Distributor				Ref. 3a, Section R
7	Inspect Pump Drives				Ref. 3a, Page N1
8	Check Governor Linkage				Ref. 3f.
9	Inspect Generator Brush Wear				Ref. 3c Page 10-11
10	Check Generator Brush Holder Tension				Ref. 3c Page 11-12
11	Check Engine Oil Quality*				
12	Inspect Vertical Drive Coupling				Ref. 3a Section F
13	Inspect Blower Drive				Ref. 3a Page K-b3
14	Inspect Timing Gears				Ref. 3a, Section H
15	Check Injection Nozzle operation & opening pressure				
16	Check Crankcase Oil Separator Drain Tube				Ref. 3a, Page K-b1
17	Check Timing Chain, Tension				Ref. 3a, Page H3

ANNUAL ENGINE TEST
Unit No. _____
(Reference, Paragraph 1.3)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
18	Inspect Pump Drives	-			Ref. 3a, Page N1
19	Check Fuel Injection Timing				Ref. 3a Page L13
20	Check Air Inlet, Exhaust Ports				
21	Fuel Oil Pump Seal				
22	Complete Table 1.0, Items 18-30				
	* Have a sample of engine oil checked for dilution & general detergent quality. If necessary, change oil per LP-16, Paragraph 1.1.				

Table 1.2
4000 HOUR MAINTENANCE
Unit No. ____
(Reference, Paragraph 1.4)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Inspect Cylinder Adapters for Water Leakage				Ref. 3a, Page D1
2	Inspect Pistons, Pumps, Cylinder Liners through the Ports				Ref. 3a, Section D
3	Inspect Air Receivers for Oil Accumulation				
4	Turbochargers - Clean Impeller and Diffuser				Ref. 3g, Page 8

Table 1.5

6000 HOUR MAINTENANCE

Unit No. ____

(Reference, Paragraph 1.5)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Drain & Change Governor Oil				Ref. 3f, Page 10
2	Blower - Inspect Impellers and Check Clearances				Ref. 3a, Page K-b3
3	Check Fuel Oil Relief Valve				Ref. 3a, Page L1

Table 1.4
8000 HOUR MAINTENANCE
Unit No. ____
(Reference, Paragraph 1.6)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Check Main, Connecting Rod Bearings for Wear	See Ref. 3a Page B2			Ref. 3a, Page E14
2	Clean Crankcase Oil Separator				Ref. 3a, Page K-11
3	Check Engine Generator Alignment				Ref. 3f, Page 7
4	Disassemble, Clean, & Check the Air Start Check Valves				Ref. 3a, Page B4
5	Check Camshaft Bearings for Wear	See Ref. 3a, Page B2			Ref. 3a, Page H1
6	Disassemble, Inspect Fuel Pumps				Ref. 3a, Page L2
7	Disassemble, Inspect Lube Pumps				Ref. 3a, Page P2
8	Check Torsional Damper Pins, Bushings for Wear	See Ref. 3a, Page B3			Ref. 3a, Page E11
9	Disassemble, Inspect Water Pump				Ref. 3a, Page Q4
10	Check Piston Wear	See Ref. 3a, Page B3			Ref. 3a, Section G
11	Turbochargers - Clean Turbine Disc, Nozzle Ring				Ref. 3g, Page 8

IP

MOTOR & DIESEL DRIVEN AIR COMPRESSOR QUINCY MODEL D3 AIR COMPRESSOR

ONAN MODEL DJA DIESEL ENGINE

NO. IP-25

PAGE 1 OF 3

REV. 0 DATE 1/8/76

APPROVED BY _____ Maintenance Supervisor

APPROVED BY _____ Chairman, Operations Committee

APPROVED BY _____ Chief Engineer 1-29-76

1.0 INSTRUCTIONS

1.1 Compressor Inspection (Complete Table 1.0)

1. With the compressor shutdown, perform the items in Table 1.0.
2. Complete Table 1.0.

This maintenance may be coordinated with surveillance testing.

1.2 Compressor Diesel Driver Inspection (Complete Table 1.1)

1. With the compressor shutdown, perform the items in Table 1.1.
2. Complete Table 1.1.

2.0 REFERENCES

1. Diesel Generator Service Manual, Instructions No. 3542, Colt Industries (7884-M15-73-2).
   a. Instructions 3800TD8 1/8, Colt Industries.
   b. Sundry Equipment Tab, Instruction Manual - Quincy Compressor Division, Colt Industries.
   c. Sundry Equip. Tab, Service and Parts Catalog, Onan Company.

Table 1.0
COMPRESSOR INSPECTION
Unit No. ____
(Reference, Paragraph 1.1)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Visually Inspect Compressor				Ref. 1b
2	Drain Air Receiver Moisture				Ref. 1b
3	Check for Air Leakage				Ref. 1b
4	Operate Safety Valves				Ref. 1b
5	Clean (or Replace) Intake Filter				Ref. 1b
6	Check Belt Tension				Ref. 1b
7	Check Pulley Clamp Bolts				Ref. 1b
8	Inspect VD Pilot Filter Felt				Ref. 1b
9	Check VD Pilot				Ref. 1b
10	Inspect Valves				Ref. 1b

Table 1.1
COMPRESSOR DIESEL DRIVER INSPECTION
Unit No. ____
(Reference, Paragraph 1.2)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	Check Oil Level *				Ref. 1c
2	Clean Vent Openings				Ref. 1c
3	Check Starter Cables				Ref. 1c
4	Check Governor Linkage				Ref. 1c
5	Check Battery Level				Ref. 1c
6	Check Battery Charger				Ref. 1c
7	Change Fuel Filter				Ref. 1c
8	Clean Crankcase Breather				Ref. 1c
9	Drain Condensate Traps				Ref. 1c

* If the oil is below the proper level, add oil per LP-15, Paragraph 1.2.

IP

INSPECTION PROCEDURE (I.P.)

Diesel Generator 1G-31, 1G-21

IP-225

PAGE 1 OF 4

REV. 0 DATE 8-4-76

APPROVED BY Richard D Burdick
Maintenance Supervisor

APPROVED BY E E Essy Hammond 8/6/76
Chairman, Operations Committee

APPROVED BY G G Hunt 8-6-76
Chief Engineer

1.0 INSTRUCTIONS

1.1 External Inspection

1. Visually inspect the diesel and associated equipment for evidence of oil leakage or seepage.
2. Report all discrepencies to the Mechanical Maintenance Supervisor immediately.

1.2 Flange Torque

1. Review system file for discrepencies (MARs) discovered in 1.1. Check bolt torques on the flanges on those discrepencies and record the as found and as left (if applicable) data on the appropriate data sheet (data sheet I or data sheet II). Data sheet to be filed in Maintenance History file.

2.0 REFERENCES

1. IELP Safety Manual
2. Instructions 3800TD8 1/8, Colt Industries.

TABLE #1

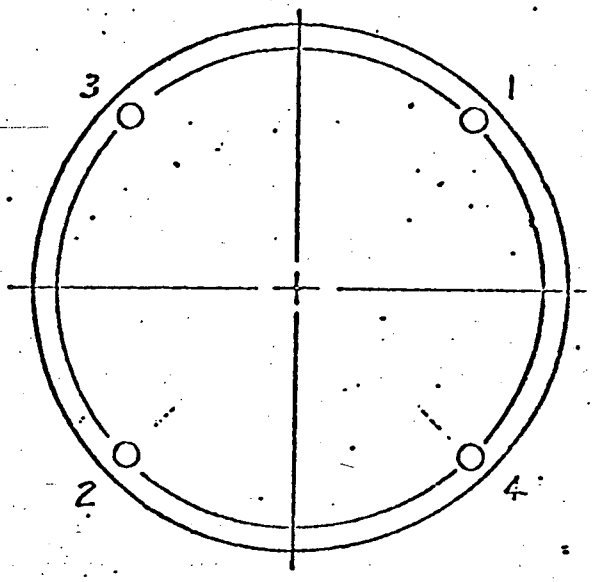
TORQUE LIMITS

Part	Torque Limit Ft. Lbs.
Adapter Collar Stud Nuts	20-25
Blower Flexible Drive Stud Nuts	110-120
Blower to Block Stud Nuts	110-130
Blower Bearing Plate Nuts	80-90
Camshaft Coupling Bolt Nuts	60-80
Camshaft Sprocket Nuts	80-90
Camshaft Thrust Bearing Clamp Ring Capscrews	35-40
Connecting Rod Bolt Nuts	175-200
Crankshaft Coupling Bolt Nuts (Long)	500-700
Crankshaft Coupling Bolt Nuts (Short)	500-700
Crankshaft Flexible Drive Nuts	290-300
Cylinder Liner Holddown Capscrews	125
Cylinder Block to Base Rail Bolts	300-350
Cylinder Liner Adapters 1-1/4"	135-140
Cylinder Liner Adapters 1-1/2"	165-180
Exhaust Manifold and Extension Pipes	
3/8" Thread - Bolts and Capscrews	30-35
1/2" and 9/16" Thread - Bolts and Capscrews	50-55
By-pass Fitting Gland Nuts	See Sec.S.
Exhaust Belt to Cylinder Block Capscrews	60
Flexible Pump Drive Stud Nuts	110-120
Injection Pump and Tappet Housing Bolt Nuts	80-100
Injection Pump Cage Yoke Stud Nuts	40
Lube Oil Pump Bearing Plate to Housing Nut	60-80
Lube Oil Pump Housing to Cylinder Block	100-120
Lube Oil Header Capscrews	35-40
Lube Oil Header Locknut	45-60
Main Bearing Bolt Nuts	700-1000
Piston Retainer Plate Capscrews (Rotating Pistons)	25-30
Piston Insert Capscrews (Fixed Pistons)	60-65
Top Cover to Block Capscrews	40-55
Top Cover to Blower Capscrews	40-55
Turbocharger Nozzle Ring (59p) to Inlet Casing (50p) Bolt (62). (Numbers refer to Part Nos. in Elliott Inst. Book TC-30F)	25

INSPECTION PROCEDURE (I.P.)	NO. IP-225
Diesel Generator 1G-31, 1G-21	PAGE 3 OF 4
	REV. 0 DATE 8-4-76

DATA SHEET #1

FLANGE BOLTING INSPECTION SHEET



4 BOLT SEQUENCE

BOLT TIGHTENING SEQUENCE

TITLE (SYSTEM) - _____

ISO. DWG. NO. - _____

FLANGE LOCATION - _____

BOLT SIZE - _____

TORQUE REQUIREMENT - _____

TORQUE WRENCH SERIAL NO. - _____

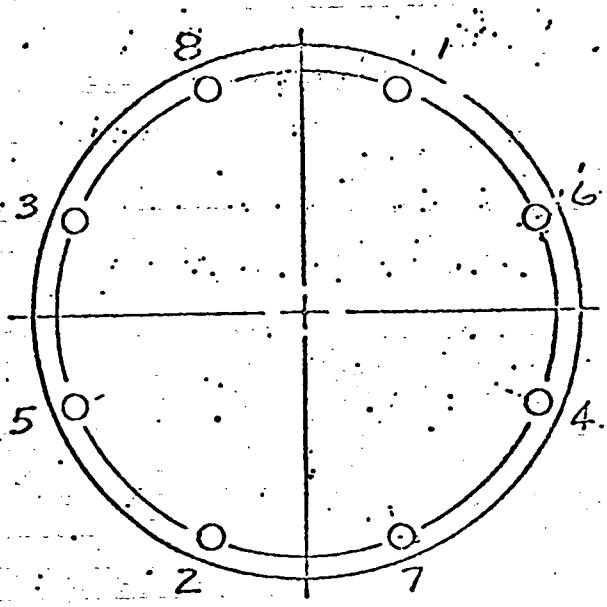
WRENCH CALIBRATION DATE - _____

DATE: _____ WITNESSED BY: _____

INSPECTION PROCEDURE (I.P.)	No. IP-225
Diesel Generator 1G-31, 1G-21	PAGE 4 OF 4
	REV. 0 DATE 8-4-76

DATA SHEET #2

FLANGE BOLTING INSPECTION SHEET



8 BOLT SEQUENCE

BOLT TIGHTENING SEQUENCE

TITLE (SYSTEM) - _____

ISO. DWG. NO. - _____

FLANGE LOCATION - _____

BOLT. SIZE - _____

TORQUE REQUIREMENT - _____

TORQUE WRENCH SERIAL NO. - _____

WRENCH CALIBRATION DATE - _____

DATE: _____ WITNESSED BY: _____

IP

INSTRUCTION PROCEDURE (IP)

ENGINE (DIESEL) GENERATOR SET FOR MODEL 38TD8-1/8 STANDBY UNITS

NO. IP-229

PAGE 1 OF 2

REV. 0 DATE 9-16-77

APPROVED BY _____ Maintenance Supervisor

APPROVED BY _____ Chairman, Operations Committee

APPROVED BY _____ Chief Engineer

1.0 INSTRUCTIONS

1.1 Monthly Inspections and Maintenance (Electrical)

1.1.1 Check the DC control supply - service the batteries, etc. as required.

1.2 Every 4 Months (Chemist) Water and Oil Samples

1.2.1 Obtain a sample of jacket water and have it analized by plant chemist, for required treatment.

1.2.2 Obtain a sample of lube oil and have it analized by plant chemist for its condition.

1.3 Every 4 Months (Electrical)

1.3.1 Check the safety and shutdown controls to determine if all are set properly and all are working so that the engine will fail safe. Refer to page 22 of Tech Manual.

1.4 Every 4 Months (Mechanical)

1.4.1 Check air and exhaust ports for carbon deposits. Clean as necessary.

1.5 Yearly Maintenance

1.5.1 Inspect all the upper and lower pistons for the condition of rings and liners through the exhaust and air ports, if the visual inspection show suspicious liner wear patterns. Remove all the pistons and repair as necessary.

1.5.2 If the wear is such that pistons are not removed from the engine the engine should be water tested and inspected for any internal water leakage.

1.5.3 Inspect the torsional damper and all bearings.

1.5.4 Check the crank alignmnet and the crankshaft end float.

1.5.5 Check the condition of the blower through the inspection cover.

1.5.6 Check the heat exchangers and coolers for scale or plugging.

1.5.7 Check main and connecting rod bearings for wear.

2.0 REFERENCES

2.1 Maintenance Program for Model 38TD8-I/8 Standby Units

2.2 Suggested Maintenance from Colt Industries, Colt Industries Instructions 3542.

DUANE ARNOLD ENERGY CENTER

UNIT NO. 1

IOWA ELECTRIC LIGHT AND POWER COMPANY

Reference Only

REV. 4 APPROVAL

SURVEILLANCE TEST PROCEDURE NO. 48A004

STANDBY DIESEL GENERATOR ANNUAL INSPECTION

Prepared by: Larry Nelson Date: 10/10/77
Larry Nelson

Approved by: for D. ROCKHILL Date: 10/13/77
Mechanical Maintenance Supervisor

Approved by: Date: 10-13-77
Reactor & Plant Performance Engineer

Reviewed by David L. Minnick Date: 10-13-77
Chairman, Operations Committee

Approved by: Cleese Hammond Date: 10-14-77
Chief Engineer

Implementation Date 10/18/77

STANDBY DIESEL GENERATOR ANNUAL INSPECTION

1.0 Purpose

1.1 The purpose of this test is to demonstrate, by inspection, the operability of the Standby Diesel Generator System. In accordance with the surveillance requirements of the DAEC Technical Specifications, Section 4.8.A, this inspection will be performed annually.

2.0 General Instructions

2.1 There are two subsystems to be tested as part of this procedure. The instructions of Section 4 are to be performed for each subsystem.

2.2 This procedure contains data sheet (page 5) which is to be used to document the instructions of Section 4 and data obtained. The "master" data sheet is to be reproduced and completed for each subsystem.

2.3 All steps of this procedure are to be performed in sequence. Only one subsystem is to be tested at a time.

2.4 The Mechanical Maintenance Supervisor (or designated alternate) must be notified immediately whenever a procedural step cannot be completed as stated or if any other problem develops during the test. No maintenance, adjustment, or replacement is permitted without his authorization.

2.5 The Shift Supervising Engineer should be notified and Section 3.8.A of the DAEC Technical Specifications (LCO) immediately referred to whenever problems that are not resolvable are encountered during the test.

2.6 A Deviation Report should be completed for any problems encountered during the test.

2.7 Test equipment required for this procedure:

a. Test equipment as indicated in the Diesel Service Manual, Bechtel Vendor Print Control No. 7884-M15-73-2.

2.8 All test equipment required for this procedure should be functional and properly maintained; e.g., calibration date should not have expired for test instruments.

2.9 Personnel required for this procedure:

Group	Number

2.10 At the completion of testing, Test Completion Criteria Section 5, the completed Test Data Sheets and Deviation Report(s) should be submitted to the Mechanical Maintenance Supervisor for review and approval.

2.11 This test is to be coordinated with Inspection Procedure IP-24 and the results of IP-24 will be included with Section 6 Data Sheets.

3.0 Special Precautions

3.1 Insure that the starting air receiver outlet isolation valves are closed and engine control switches are in LOCKOUT before starting any mechanical inspection of the diesel.

4.0 Procedure

The Test Data Sheets must be completed as each step and/or substep is completed.

4.1 The Standby Diesel Generator is run monthly in a loaded condition (STP 48A001) and maintenance data is recorded on Inspection Procedure No. IP-24. Review this data for the previous 12 months and verify that no trends toward degradation of components or accessories is indicated. Record the review results.

4.2 Complete Steps 2 through 16 of Table 1.0 and Steps 2 through 21 of Table 1.1 of Inspection Procedure IP-24.

5.0 Test Completion Criteria

The surveillance requirements will have been satisfied when the following items have been completed and signed off.

5.1 This Surveillance Test Procedure was performed for the following reason:

a. Standby Diesel Generator Annual Inspection _____
b. Other (define) _____

5.2 The Test Data Sheets have been completed, reviewed signed and attached for each subsystem.

a. Subsystem A _____
b. Subsystem B _____

5.3 The surveillance test results, as documented by the Test Data Sheets, are as follows:

	Unacceptable	Acceptable
a. Subsystem A	_____	_____
b. Subsystem B	_____	_____

5.4 Were any problems encountered during the Test? _____

a. Procedural (Related Document Change Form(s) attached)? DCF# _____
b. Equipment (A ply of related Deviation Report(s) attached)? DR# _____

5.5 If Item 5.3 indicates any unacceptable surveillance results or unresolvable problems were encountered, has General Instruction 2.5 been implemented? _____

5.6 Test Comments:

_____ _____
Mechanical Maintenance Supervisor Date

_____ _____
Surveillance Program Coordinator Date

6.0 Test Data Sheets

6.1 Subsystem A _____ B _____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.1	Previous 12 months data from IP-24 reviewed and the results are: RESULTS	
4.2	Steps 2 through 16 of Table 1.0 and Steps 2 through 21 of Table 1.1 of Inspection Procedure IP-24 completed.	

Performed by _____ Date _____ Time _____

DUANE ARNOLD ENERGY CENTER

UNIT NO. 1

Reference Only

IOWA ELECTRIC LIGHT AND POWER COMPANY

REV. 6 APPROVAL

SURVEILLANCE TEST PROCEDURE NO. 45G002

STANDBY DIESEL GENERATOR DAILY OPERABILITY TEST

Prepared by: Larry Nelson Date: 10/10/77
Larry Nelson

Approved by: B R York Date: 10/13/77
Operations Supervisor

Approved by: A E West Date: 10-13-77
Reactor & Plant Performance Engineer

Reviewed by: David L Mineck Date: 10-13-77
Chairman, Operations Committee

Approved by: Ellery Hammond Date: 10-14-77
Chief Engineer

Implementation Date 10/14/77

STANDBY DIESEL GENERATOR DAILY OPERABILITY TEST

1.0 Purpose

The purpose of this test is to demonstrate operability of the operable standby diesel generators on a daily basis (when required). In accordance with the surveillance requirements of the DAEC Technical Specifications Sections 4.5.A, 4.5.C, 4.5.G and 4.5.J, this includes an operability demonstration of the diesel generator.

2.0 General Instructions

2.1 There are two standby diesel generators to be tested as part of this procedure. The instructions of Section 4 are to be performed for each operable diesel generator.

2.2 This procedure contains Test Data Sheets(Pages 6 and 7) which are to document the instructions of Section 4 and data obtained. The "master" Test Data Sheet is to be reproduced and completed for each subsystem.

2.3 All steps of this procedure are to be performed in sequence. Only one subsystem is to be tested at a time.

2.4 The Operations Supervisor (or designated alternate) must be notified immediately whenever a procedural step cannot be completed as stated or if any other problem develops during the test. No maintenance, trip setting adjustment, or instrument replacement is permitted without his authorization.

2.6 A Deviation Report should be completed for any problems encountered during the test.

2.7 Personnel required for this procedure:

Group	Number
Operations	2

2.8 At the completion of testing, Test Completion Criteria Section 5, the completed Test Data Sheets and any Deviation Report(s) should be submitted to the Operations Supervisor for review and approval.

2.9 Inspection Procedure IP-24 should be performed concurrently with this procedure.

2.10 This test was written for SBDG 1G31. The information in parentheses refers to SBDG 1G21.

3.0 Special Precautions

3.1 There are no special precautions to be observed for this test.

4.0 Procedure

The Test Data Sheets must be completed as each step and/or substep is completed.

NOTE: All steps are performed at Panel 1C08 and verified by indicating lights, unless otherwise stated.

4.1 Complete Steps 2 through 16 of Table 1.0 of Inspection Procedure IP-24.

4.2 Place the UNIT/PARALLEL switch to the PARALLEL position on Panel 1C93 (1C94)

4.3 Start Emergency Service Water Pump 1P-99A (1P-99B).

4.4 Start and run the Prelube Pump for two (2) minutes.

4.5 Start Standby Diesel Generator 1G31 (1G21). Record the time.

4.6 Verify that annunciator D GEN 1G31 (1G21)RUNNING, window A10 (B3) is activated.

4.7 Verify Diesel Gen 1G31 (1G21) Frequency Meter indicates 60Hz. Adjust the frequency as necessary.

4.8 Verify Diesel Gen 1G31 (1G21) Voltmeter indicates 4160 volts. Adjust the voltage as necessary.

4.9 Verify that Supply Fan 1V-SF-20 (1V-SF-21) is running.

4.10 Place the 4KV Bus 1A3 (1A4) Auto-Manual transfer switch in the MAN position.

4.11 Synchronize the diesel generator under test to the essential bus and close the circuit breaker.

4.12 Increase the diesel generator load to 2850 KW, run the diesel generator under test for 30 minutes, and complete the remaining Steps of Table 1.0 of Inspection Procedure IP-24.

NOTE: To ensure the diesel will not motorize do not trip the engine before tripping the associated generator breaker.

4.13 Decrease the diesel generator load to approximately 50 KW, trip the diesel generator circuit breaker, and allow the engine to run unloaded for 5 minutes.

4.14 Place the 4KV Bus 1A3 (1A4) Auto-Manual transfer switch in the AUTO position.

4.15 Stop the diesel generator under test and record the time.

4.16 Verify the annunciator DIESEL GEN 1G31 (1G21) RUNNING, window no. A10 (B3) is reset.

4.17 Verify that the diesel generator voltage decreases to zero, and the frequency meter goes to mechanical zero.

4.18 Trip the injection pump control racks on the engine under test by depressing the Emergency Stop Pushbutton (overspeed trip) at the engine.

4.19 Utilizing the manual override of the normal air start solenoid admit starting air to the engine under test for 10 seconds.

4.20 Return the diesel generator under test to a standby status as follows:

a. Verify fuel oil level of diesel oil storage tank is ≥ 36,000 gallons. Record the as found value.

b. Verify that all fluid inventories are at the proper level, e.g., engine luge oil, jacket water and governor oil.

c. Verify that all diesel generator subsystem annumciators at Panel 1C08 and local Panel 1C93 (1C94) are reset.

d. Reset the overspeed trip.

4.21 Place the UNIT/PARALLEL switch in the UNIT position on Panel 1C93 (1C94).

4.22 Stop the Emergency Service Water Pump of Step 4.3.

4.23 Attach completed Table 1.0 of Inspection Procedure IP-24.

Reference Only

5.0 Test Completion Criteria

The surveillance requirements will have been satisfied when the following items have been completed and signed off.

5.1 This Surveillance Test Procedure was performed for the following reason:

a. Standby Diesel Generator Daily Operability Test as required by STP # _____ _____

b. Other (define) _____

5.2 The Test Data Sheets have been completed, reviewed signed and attached for each instrument channel.

a. Diesel Generator 1G31 _____

b. Diesel Generator 1G21 _____

5.3 The Surveillance test results, as documented by the the Test Data Sheets, are as follows:

	Unacceptable	Acceptable
a. Diesel Generator 1C31	_____	_____
b. Diesel Generator 1G21	_____	_____

5.4 Were any problems encountered during the test? _____

a. Procedural (Related Document Change Form(s) attached? DCF# _____

b. Equipment (A ply of Related Deviation Report(s) attached)? DR# _____

5.5 If Item 5.3 indicates any unacceptable surveillance results or unresolvable problems were encountered, has General Instruction 2.5 been implemented? _____

5.6 Test Comments:

_____ _____

Operations Supervisor Date

_____ _____

Surveillance Program Coordinator Date

6.0 Test Data Sheets

6.1 Diesel Generator Under Test 1G31 _____ 1G21 _____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.1	Steps 2 through 16 of Table 1.0 of Inspection Procedure IP-24 completed.	
4.2	UNIT/PARALLEL switch in the PARALLEL position.	
4.3	Emergency Service Water Pump 1P-99A (1P-99B) started.	
4.4	Prelube pump run for two (2) minutes.	
4.5	Diesel Generator 1G31 (1G21) started.	
	Time of Start _____	
4.6	Annunciator DIESEL GEN 1G31 (1G21) RUNNING, window no. A10 (B3) is activated.	
4.7	Diesel Gen 1G31 (1G21) Frequency Meter indicates 60 Hz.	
4.8	Diesel Gen 1G31 (1G21) Voltmeter indicates 4160 volts.	
4.9	Supply Fan 1V-SF-20 (1V-SF-21) running.	
4.10	4KV Bus 1A3 (1A4) Auto-Manual Transfer switch in the MAN position.	
4.11	Diesel generator synchronized, breaker closed.	
4.12	Diesel generator load 2850 KW, 30 minute load run complete, remaining Steps of Inspection Procedure IP-24 completed.	
4.13	Diesel generator load approximately 50 KW, diesel generator circuit breaker tripped, engine run unloaded for 5 minutes.	
4.14	4KV Bus 1A3 (1A4) Auto-Manual transfer switch in the AUTO position.	
4.15	Diesel generator under test stopped.	
	Time of Stop _____	
4.16	Annunciator DIESEL GEN 1G31 (1G21) RUNNING, window no. A10 (B3) reset.	
4.17	Diesel generator voltage decreased to zero, and frequency meter indicates mechanical zero.	
4.18	Injection pump control racks tripped by depressing Emergency Stop Pushbutton (overspeed trip).	

6.0 Test Data Sheets

6.1 Diesel Generator Under Test 1G31 _____ 1G21 _____

6.2 Test Date _____

Procedure Step	Required Action	Initials
4.19	Starting air admitted to engine under test for 10 seconds utilizing manual override of normal air start solenoid.	
4.20.a	Fuel oil level verified $\geq$ 36,000 gallons. As found value _____.	
4.20.b	All fluid inventories at the proper level.	
4.20.c	All subsystem annunciators at Panel 1C08 and local Panel 1C93 (1C94) reset.	
4.20.d	Overspeed trip reset.	
4.21	UNIT/PARALLEL switch in the UNIT Position on Panel 1C93 (1C94).	
4.22	Emergency Service Water Pump of Step 4.3 stopped.	
4.23	Completed Table 1.0 of Inspection Procedure IP-24 attached.	

Reference Only

Table 1.0
ENGINE RUN-UP
Unit No. ____
(Reference; Paragraph 1.1)

Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
1	ITEMS TO BE CHECKED BEFORE STARTING ENGINE				
2	Engine Coolant Level	____ in.			Ref. 3a, Page Q1
3	Engine Coolant Temperature	100 - 100°F			-
4	Engine Lube Oil Level	Full			Ref. 3a, Page P2
5	Engine Lube Oil Temp.	130 - 135°F			-
6	Lube Oil Circulation Pump	Running ___psi min.			-
7	Coolent Circulation Pump	Running ___psi min			-
8	Starting Air Pressure	200 - 240 psi			-
9	Auto Lube Oil Make-up Tank Level	Full			-
10	Drain Air Starting Lines	-			Ref. 2
11	Generator Bearings Oil Level	Full			Ref. 3a, Page 6
12	Air Compressor Oil Level* - 1K-10A (or B)	Full			-
13	Air Compressor Oil Level*-1K-10C (or D)	Full			-
14	Air Compressor Diesel Engine Oil Level **	Full			-
15	Governor Oil Lever				
16	Inspect Air Intake Filter				

Reference Only

Unit No. ____
(Reference, Paragraph 1.1) Name _____ Date _____

Line No.	Item	Normal Condition	Actual Condition	Remarks	Reference
17	ITEMS TO BE CHECKED AFTER TEMPERATURE EQUILIBRIUM				
18	Engine Coolant Temperature	170 - 185°F			Ref. 3a, Section Q
19	Engine Lube Oil Pressure	30 - 35 psi			Ref. 3a, Section P
20	Engine Lube Oil Temperature	195 - 215°F			Ref. 3a Section P
21	Air Cooler Inlet Temperature	Less than 100° F			Ref. 3a Section K
22	Fuel Oil Pressure	12 - 15 psi			Ref. 3a Section L
23	Pressure Drop, Lube Oil Filters	18 psi max.			Ref. 3a Section P
24	Pressure Drop, Fuel Oil Filter	10 psi max.			Ref. 3a, Section L
25	Engine Lube Oil Leakage	-			Ref. 3a Section L
26	Engine Lube Oil Pump Leakage	-			Ref. 3a Section P
27	Exhaust Temperature	850 - 1100°F			Ref. 3a, Section S
28	Crankcase Vacuum	0.4 to 2.0 in. of Water Vacuum			
29	Engine Coolant Level	____in.			Ref. 3a, Page 23
30	Pressure Drop, Lube Oil Strainer	12 psi max.			Ref. 3 Page 14

* If the oil is below the proper level, add oil per LP-14, Paragraph 1.3.
** If the oil is below the proper level, add oil per LP-15, Paragraph 1.3.

DUANE ARNOLD ENERGY CENTER

UNIT NO. 1

IOWA ELECTRIC LIGHT AND POWER COMPANY

Reference Only

REV. 9 APPROVAL

SURVEILLANCE TEST PROCEDURE NO. 48A001

STANDBY DIESEL GENERATOR OPERABILITY TEST

Prepared by: T. Bresaw Date: Mar 31, 1977
T. Bresaw

Approved by: B R York Date: 4/1/77
Operations Supervisor

Approved by: Dick Hansen Date: 4/1/77
Reactor & Plant Performance Engineer

Approved by: David L Hammond Date: 4-1-77
Chairman, Operations Committee

Approved by: Elroy Hammond Date: 4-1-77
Chief Engineer

Implementation Date 4/1/77

Rev. 9
3/24/77

STANDBY DIESEL GENERATOR OPERABILITY TEST

1.0 Purpose

1.1 The purpose of this test is to demonstrate operability of the standby diesel generators, including the diesel generator starting air compressor and the diesel fuel oil transfer pump subsystems. In accordance with the surveillance requirements of the DAEC Technical Specifications, Section 4.8.A, this includes a manual start and a one-hour full load operation of the standby diesel generator monthly. The diesel starting time to reach rated voltage and frequency shall be logged.

1.2 To demonstrate the capability of each standby diesel generator to be started by either of its air start solenoids by direction of the Operating Committee on April 13, 1974.

2.0 General Instructions

2.1 There are two standby diesel generator subsystems to be tested as part of this procedure. The instructions of Section 4 are to be performed for each subsystem.

2.2 This procedure contains data sheets (pages 7, 8, 9, and 10) which are to be used to document the instructions of Section 4 and data obtained. The "master" data sheets are to be reproduced and completed for each subsystem.

2.3 All steps of this procedure are to be performed in sequence. Only one subsystem is to be tested at a time.

2.4 The Shift Supervising Engineer must be notified immediately and Section 3.8.A of the DAEC Technical Specifications (LCO) referred to whenever problems are encountered during the test.

2.5 The Operations Supervisor (or designated alternate) should be notified whenever a procedural step cannot be completed as stated or if any other problem develops during the test. No maintenance, trip setting adjustment, or instrument replacement is permitted without his authorization.

2.6 A Deviation Report should be completed for any problems encountered during the test.

2.7 Test equipment required for this procedure:

a. Stopwatch

b. Keys for air supply valves