J-1502000-14 Emergency Generator Maintenance Data at the National Naval Medical Center (NNMC) TABLE OF CONTENTS

J-1502000-14 Electric Generators - Inventory
at the National Naval Medical Center (NNMC)

Generator Location	Area	PM I.D.No.
001	Hospital	MOO767
001	Hospital	MO3040
007	Hospital	MO3837
011	IT	MO15829
045	AFRRI	MO3655
047	AFRRI	MO2919
052	Lodge	MO15828
053	Call Center	M01664
054	Parking Garage	MOO841
055	Parking Garage	MOO458
055	Parking Garage	MOO455
055	Parking Garage	MOO456
055	Parking Garage	MOO457
070	USUHS	MO2901
071	USUHS	MO2904
072	USUHS	MO2902
139	NMRI	MO15830
202	Fire House	MO5827
202	Substation	MOO 778

J-1502000-14 Electric Generators - Maintenance Check List at the National Naval Medical Center (NNMC)

Generators shall be load tested by transferring the load from normal power to emergency power and letting the generator carry the load. This procedure shall test the automatic operation of transfer switches if applicable. Items needing servicing shall be corrected and a record of date and description of trouble, maintenance performed, test run, etc. recorded in a log book that will be maintained at each site. Fuel tanks of the generators shall be checked and filled weekly. Drain water or sediment while visually checking for fuel contamination. Check for evidence of fuel leaks at fuel tank/fuel tank lines and repair as necessary. Test operation of control panel lamps. Inspect for and correct loose components, terminal screws or soldered connections.

(See Form Following Two Pages)

Maintenance Schedule Generator #:_____ **Inspection Date:**_____

Component (as applicable)	Freq-uency	Action	Certification (initials required)	Comments
1. Fuel				
(a) Main supply tank level	W	Check		
	W	Check		
(c)Day tank float switch	W	Check and Test		
(d) Supply or transfer pump operation	W	Check and Test		
(e) Solenoid valve operation	W	Check and Test		
(f) Strainer, filter, dirt leg, or combination	m	Clean		
(g) Water in system	W	Check and Clean		
(h) Flexible hose and connectors	W	Check and Replace (if necessary)		
(I) Tank vents and overflow piping obstructed	A	Check and Test		
(j) Piping	A	Check		
(k) Gasoline in main tank (when used)	A	Replace (if necessary)		
2. Lubrication System				
(a) Oil level	W	Check		
(b) Oil change	A	Replace (if necessary)		
(c)Oil filter(s)	A	Change		
(d) Lube oil heater	W	Check		
(e) Crankcase breather	m	Check, Clean, Replace (if necessary)		
3. Cooling System				
(a) Level	W	Check		
(b) Antifreeze protection level	S	Test		
(c)Antifreeze	A	Change		
(d) Adequate cooling water to heat exchanger	W	Check		
(e) Rod out heat exchanger	A	Clean		
(f) Adequate fresh air through radiator	W	Check		
(g) Clean exterior of radiator	A	Clean		
(h) Fan and alternator belt	M	Check		
(I) Water pump(s)	W	Check		
(j) Condition of flexible hoses and connection	W	Check		
(k) Jacket water heater	W	Check		
(l) Inspect duct work, clean louvers	A	Check and Change		
(m) Louver motors and controls	A	Check, Clean and Test		
4. Exhaust System				
(a) Leakage	W	Check		
(b) Drain condensate trap	W	Check		
(c) Insulation and fire hazards	m	Check		
(d) Excessive backpressure	A	Test		
(e) Exhaust system hangers and supports	A	Check		
(f) Flexible exhaust section	m	Check		
5. Battery System				
(a) Electrolyte level	W	Check		
(b) Terminals clean and tight	m	Check		

(c) Remove corrosion, case exterior clean and dry	M	Check and Clean		
(d) Specific gravity or state of charge	M	Test		
(e) Charger and charge rate	M	Check		
(f) Equalize Charge	M	Check		
6. Electrical System				
(a) General inspection	W	Check		
(b) Tighten control and power wiring connections	A	Check		
(c) Wire chafing where subject to movement	m	Check		
(d) Operation of safeties and alarms	m	Check and Test		
(e) Boxes, panels, and cabinets	m	Clean		
(f) Circuit breakers, fuses	M	Check, Clean, Test, and Replace (if necessary)		
(g) Transfer switch main contacts	A	Check and Clean		
(h) Calibration of voltage-sensing relays/devices	A	Check and Test		
(I) Wire insulation breakdown	A	Test (See note A)		
7. Prime Mover				
(a) General inspection	W	Check		
(b) Service air cleaner	m	Clean and Change		
(c) Governor oil level and linkage	M	Check		
(d) Governor oil	A	Change		
(e) Ignition system-plugs, points, coil, cap, rotor, secondary wire insulation	A	Check, Clean, Test, and Replace (if necessary)		
(f) Choke setting and carburetor adjustment	m	Check		
(g) Injector pump and injectors for flow rate pressure, and/or spray pattern	A	Test		
(h) EPS at minimum of 80% nameplate rating	A	Test (See note C)		
(I) Valve clearance	A	Test (See note B)		
(j) Torque bolts	A	Test (See note B)		
8. Generator				
(a) Electrolyte level	W	Check		
(b) Brush length, appearance, free to move in holder	m	Check and Change		
(c) Commutator and slip rings	A	Check and Change		
(d) Rotor and stator	A	Check and Change		
(e) Bearing(s)	A	Check and Replace (if necessary)		
(f) Bearing grease	A	Check and Replace (if necessary)		
(g) Exciter	A	Check and Clean		
(h) Voltage regulator	A	Check and Clean		
(I) Measure and record resistance readings of windings with insulation tester (Megger)	A	Test		
9. General				
(a) General condition of EPSS, any unusual condition of vibration, leakage, noise, temperature, or deterioration	W	Check and Clean		
(b) Service room or housing housekeeping	W	Check and Clean		
10. Resore system to automatic operation condition	W	Check		
Note A: Every 5 years or 500 hours				
Note B: Every 3 years or 300 hours				
Note C: Every 3 years for 4 hours				

NNMC MONTHLY EMERGENCY DIESEL GENERATOR TEST

TEST OVERVIEW

Per JCAHO requirements, Emergency Generators and all Automatic Transfer Switches (ATSs) serving Healthcare Occupancies are to be tested every 20-40 days for at least 30 minutes with at least 30% load. This test procedure fulfills those requirements.

This procedure should be followed for the testing of the emergency power system that serves the Healthcare Occupancy in Buildings 9 and 10. The order of this procedure is designed to test all portions of the emergency power system and minimize possibilities of equipment damage. The sequence of events is very important and will require good communication and coordination between personnel involved.

The Monthly Generator Test Roster will be approved by the NNMC Hospital Engineer at least three (3) working days prior to the test. The training sign off sheet included in this procedure will be submitted with the roster each moth.

A brief overview of starting the test is as follows:

1) There are 21 Normal Power Breakers in Building 9, Rooms 0201, 0314, 0604, and 1203. Each of the breakers will start one of the 4 Emergency Diesel Generators in Bldg 55 basement. Prior to the test, 4 Normal Power Breakers will be chosen on a rotating basis as the breakers that will start each of the generators. Breakers will be opened to start the test.

2) Once the four initial breakers are opened, continue with manually opening the remainder of the Normal Power Breakers to activate the remainder of the ATSs.

3) Monitor all ATSs, generators and building areas while under the emergency power conditions. Verify that mechanical equipment in Buildings 9 and 10 is running under emergency power.

Returning the power system to normal shall be:
1) Bldg 9, Room 0201, Emergency Switchboard: Open motor control center emergency breakers.
2) Close all Normal Breakers that were opened.
3) Close all motor control center emergency breakers.
4) Make sure all ATSs have returned to normal.
5) Verify that mechanical equipment in Buildings 9 and 10 is running under normal power.

At the completion of the test, turn in all paperwork documenting the test to the NNMC Facilities Management Department (FMD) Hospital Engineer within 24 hours, including documentation of any faults that require repair.

Before the Test:

1) 3 days before EDG Test:

a) Fill out the test roster with names of qualified personnel and turn in to the NNMC Hospital Engineer. Personnel operating Electrical Circuit Breakers will be qualified electricians.

b) Select four (4) Normal Power Breakers that will be used to start generators during the test

c) Review previous EDG Tests for items requiring repair or attention. Perform repairs as needed under FMD direction.

2)

- Breakers to start test selected
- Personnel on site
- Communications check sat
- Title V Training complete and documented
-

0545 – Muster all personnel in Bldg 55 EDG Room and conduct in-brief.

- Annotate roster sheet that all personnel are present. Assign substitutes as needed. Provide check sheets for each position (ATS Lists and "Equipment Running (Emergency and Normal Power) Forms
- Verify which 4 circuit breakers to be used to start the test.
- Assign radio or phone communications between Bldg 55 EDG Room, and Bldg. 9 Rooms 0201, 0314, 0604, and 1203.
- Personnel post to stations indicated on roster sheet.
- Bldg 55 EDG Room – Perform "Weekly Generator Check" (approx. 30 minutes duration). Document results on "Weekly Generator Check" form.
- Conduct Title V Training and document.

NNMC MONTHLY EMERGENCY DIESEL GENERATOR (EDG) TEST
DETAILED TEST PROCEDURES

0615 – Perform communications check with all stations.

Verify that:

- Bldg 55 EDG Room: Individual generator control board selector switch is set to 'auto'
- Bldg 55 EDG Room: Input / Output breakers for each generator on switchboard (at bottom) are 'CLOSED'
- Bldg 55 EDG Room: Tie breakers for each generator on switchboard (at middle) are 'OPEN'
- Bldg 9, Room 0201 – check each breaker on emergency switchboard; breakers are to be 'CLOSED'
- Bldg 9, Room 0201 – on end of generator switchboard - Check annunciator panel by pressing the 'test' button – all lights should come on.

0620 – Make announcement in hospital. Representative is at Bldg 10 CDO desk to coordinate announcement.

0625 – Make final announcement in Hospital.

0630 – Open four (4) selected breakers to bring the generators on line
(Used to be Substation #1, breakers #52-16 ATS 1600; #52-17 ATS 1700 and #52-14 ATS 1400. 2) Substation 32, breaker #52-23 ATS 2300)

0633 – proceed with opening 17 normal power breakers, allowing several seconds between each:

1) Substation #1, breaker #52-13 ATS 1300
2) Substation #2, breakers #52-27 ATS 2700, #52-52 ATS 2500, and #52-24 ATS 2400
3) Substation #3, breakers #52- 34 ATS 3400, #52-38 ATS 3800, and #52-37 ATS 3700
4) Substation #4, breakers #52-44 ATS 4400, #52-46 ATS 4600, #52-45 ATS 4500 an d#52-43 ATS 4300, #52-41 ATS 4100.
5) Distribution switchboard #3100, Breakers 3100-3 ATS 3130 and 3100-2 ATS 3120. This switchboard is located in room 0604 Bldg 9, assigned personnel "TR-2" should do this.

6) Distribution switchboard #1500, breakers 1500-3 ATS 1530 and 1500-4 ATS 1540. This switchboard is located in room 0314 Bldg 9, assigned personnel in TR-1 should do this.
7) Distribution board (DSWB 2600) is located in room 1203 Bldg 9 (2600-4 ATS 2640), an assigned helper should do this

0634 – Check Bldg 10 room 0301 Air Handlers, Bldg 10 penthouses Air Handlers, Bldg 9 Room 0220, Bldg 9 Room 3200 and 3700.

0635 – After this is completed, the total emergency power system will be in operation. Personnel in the generator room shall take recordings of each generator for engine vitals, start/stop times and load reading. Any problems arising shoul be relayed to “Maintenance Control” by field personnel or hospital employees. Allow emergency power system to run for 30 minutes, then start procedure fo return to normal power.

NNMC MONTHLY EMERGENCY DIESEL GENERATOR (EDG) TEST
DETAILED TEST PROCEDURES

0710 – Open emergency switchboard breakers:
E-30-2 ATS 2300
E-20-3 ATS 1400
E-40-3 ATS 4500
E-40-6 ATS 4300
E-40-2 ATS 2400
(allows motors to decrease speed prior to switching back to normal power)

0712 – Close these normal breakers:
Bldg 9, Room 0201 - Substation 1: 52-16, 52-17, 52-14
Substation 2: 52-23, 52-24

0714 - Proceed to close the 16 Normal Power Breakers that have been opened at the start of the test. Allow several seconds between each one. After these steps have been done, ATSs should start restoring themselves to the normal position. Timer settings vary on each one from 5 to 30 minutes once normal power is restored to them.

- Bldg 9, Room 0201 - Close all emergency board breakers after the test is completed.

- Continue to take readings on Bldg 55 generators as long as there is load on the generators. Once all ATSs on one generator are back to “normal”, generators are on automatic relays to shut down.

0740 – Continue monitoring Title V emissions requirements until all generators secure and test is complete.

0740 – Conduct the “Equipment Running Under Normal Power” Checks to verify all critical equipment continues to operate under normal power.
Includes:
Bldg 9, Room 0220
Bldg 9, Room 3200
Bldg 9, Room 3700
Bldg 9, Penthouse (Anesthesia Exhaust)
Bldg 10, Room 0103
Bldg 10, East and West Penthouses
Check air handlers in Bldg 10, 0301, Bldg 9 0220 (all machinery), Air handlers in Bldg 9 rooms 3200 and 3700 per check sheets.

TEST DATE:_____ Ver.1.0 03May2006

NNMC MONTHLY EMERGENCY DIESEL GENERATOR (EDG) TEST
DETAILED TEST PROCEDURES

Within 24 hours of test completion: Fill in all paperwork listed below, and turn in to NNMC FMD Hospital Engineer:

1) NNMC Monthly EDG Test Overview Sheet
2) Detailed Test Procedures, initialed as needed
3) Title V Brief Sheet
4) Personnel Assignments
5) EDG Pre-Start Checklists for Generators 1-4
6) Generator Readings During Test, Generators 1-4
7) ATS Test Sheet, initialed, for all 21 ATSs
8) Equipment "Running" Check Sheets on Emergency and Normal Power: Technician will inspect equipment and initial sheets that equipment is running both during the test (on Emergency Power) and after the test is complete (on Normal Power).
    Bldg 9, Room 0220
    Bldg 9, Room 3200
    Bldg 9, Room 3700
    Bldg 9, Penthouse (Anesthesia Exhaust)
    Bldg 10, Room 0103
    Bldg 10, East and West Penthouses
9) Monthly EDG Test "Training Elements" Pre-Brief Sheet

TEST DATE:_____ Ver.1.0 03May2006

NNMC MONTHLY EMERGENCY DIESEL GENERATOR TEST

EMERGENCY RESPONSE PROCEDURES

Abort the Test if:

a) Any one of the generators fails to start.
b) There is a major malfunction of any one generator – excess exhaust smoke, unusual noise or vibration in the generator, major fuel or oil leak.

Other Situations:

If any one of the ATSs fails to switch from “Normal” to “Emergency” power once emergency power is available, the location where the ATS fails contacts the Test Director in Bldg 9 Room 0201. The Technician at the location of the faulty ATS then re-switches the primary power breaker back to ‘NORMAL” to bypass the operation of that particular ATS, and the test can continue. Make note of the failed ATS for after-action report and repair.

If air handlers or other equipment are discovered to be not operating during the test, technician who discovers the fault reports to the Test Director in Bldg 9 Room 0201. The Test Director directs troubleshooting. Note faults for after-action report and for repair.

Items to be Aware Of:
Individuals verifying if equipment is running in mechanical rooms must have the ability to re-start the equipment.

Elevators – ELCON assist with determining that generator test is running?

Develop a list of what breakers feed what generators
Develop a schedule of what breakers are opened for each test
Generator training checklist?

ATS 1400 had difficulty switching from emergency to normal power

Air Hanlders in Bldg 10, basement (Room 0103) – six (6) air handlers tend to trip off line when switching from “normal” to “emergency” power. Will need to be re-started after generators come on line and after generators are secured.

TEST DATE:_____ Ver.1.0 03May2006

NNMC MONTHLY EMERGENCY DIESEL GENERATOR TEST

PERSONNEL ASSIGNMENTS

Assignments:

- Bldg 55, generator room
  1 electrician
  1 mechanic
  Name:_____
  Name:_____

- Bldg 9, Room 0201
  1 high voltage electrician – in charge of test
  Name:_____
  1 electrician
  Name:_____

- Bldg 9, Room 0314
  1 electrician
  Name:_____

- Bldg 9, Room 0604
  1 electrician
  Name:_____

- Bldg 9, Room 1203
  1 electrician
  Name:_____

- Bldg 10 CDO Desk
  1 individual
  Name:_____

- Bldg 9, Room 0220 (mechanical room) – use checklist to verify machinery running
  1 Mechanic (use electrician from 0201?) Name:_____

- Bldg 10, Room 0103
  1 Electrician – rover from 0201 – use checklist to verify air handlers running
  Name:_____

- Bldg 10, Room Penthouses x 2 – verify air handlers running
  1 technician
  Name:_____

- Bldg 9, Room 3200 and 3700 – use checklists to verify air handlers running
  1 technician
  Name:_____

BUILDING 9 & 10
MONTHLY GENERATOR TEST

TEST DATE_____ START TIME_____

TEST ROSTER

	INITIAL	**DATE**
SUBMITTED AND APPROVED	_____	_____

GENERATOR TEST CHECKLIST

TEST COMMUNICATION SYSTEM BETWEEN SITES	_____	_____
WATCH ROSTER QUALIFIED AND ROTATED	_____	_____
BATTERY SPECIFIC GRAVITY TESTED	_____	_____
PREVIOUS MONTHS TEST REVIEWED	_____	_____
SWITCHES/TIES LEFT IN NORMAL POSITION	_____	_____
GENERATORS FUEL LEVEL CHECKED	_____	_____
GENERATORS CHECKED FOR WET STACKING	_____	_____
TEST SUMMARY ATTACHED	_____	_____

MONTHLY TESTING SHALL BE CONDUCTED ON THE LAST MONDAY OF THE MONTH AT 0630 TO 0730 UNLESS THIS DAY FALLS ON A HOLIDAY WHERE THE TEST WILL BE PERFORMED ON THE NEXT NORMALLY SCHEDULED WORK DAY.

ELECTRICAL FOREMAN _____ DATE_____

GENERAL FOREMAN _____ DATE_____

J-1502000-14 Emergency Generators (JCAHO) Emergency Generator Log at the National Naval Medical Center (NNMC)

Generators shall be load tested by transferring the load from normal power to emergency power and letting the generator carry the load. This procedure shall test the automatic operation of transfer switches if applicable. Items needing servicing shall be corrected and a record of date and description of trouble, maintenance performed, test run, etc. recorded in a log book that will be maintained at each site. Fuel tanks of the generators shall be checked and filled weekly. Drain water or sediment while visually checking for fuel contamination. Check for evidence of fuel leaks at fuel tank/fuel tank lines and repair as necessary. Test operation of control panel lamps. Inspect for and correct loose components, terminal screws or soldered connections.
Four of NNMC's Emergency Diesel Generators (Bldg.55) are under JCAHO- specific maintenance and are tested 12 times each year.

EMERGENCY ELECTRICAL POWER

THE EMERGENCY ELECTRICAL POWER SYSTEM CONSISTS OF 4 DIESEL POWERED 750 KV, 480 VOLT GENERATORS LOCATED IN THE LOWER SOUTHEAST CORNER OF THE SOUTH PARKING STRUCTURE, BUILDING 55.

TWENTY (20) AUTOMATIC TRANSFER SWITCHES FOR SWITCHING BETWEEN NORMAL AND EMERGENCY POWER AS NECESSARY ARE LOCATED THROUGHOUT BUILDINGS 9 AND 10. VOLTAGE SENSING RELAYS CONTINUOUSLY MONITOR THE PRESENCE OF NORMAL POWER AT THE SWITCHES. UPON LOSS OF POWER THESE RELAYS SIGNAL THE APPROPRIATE GENERATOR TO START AND SWITCH OVER THEIR LOAD TO THE EMERGENCY FEEDER. THIS WILL CAUSE LOSS OF ALL ELECTRICAL EQUIPMENT AND LIFE SAFETY POWER CIRCUITS TO BE DEENERGIZED AND ONLY EQUIPMENT AND LIFE SAFETY BRANCH CIRCUITS TO CONTINUE ENERGIZED. INFORMATION ON THESE CIRCUITS AND THEIR GENERAL USE CAN IS FOUND IN THIS SECTION, ELECTRICAL DISTRIBUTION SYSTEM. TO PREVENT OVERLOAD OF THE EMERGENCY GENERATORS UPON ACTIVATION THE AUTOMATIC TRANSFER SWITCHES ARE STAGGERED INTO SWITCHING BY PRIORITIES OF THE LOAD SERVED.

(See Form Next Page)

NATIONAL NAVAL MEDICAL CENTER
EMERGENCY GENERATOR LOG

		GEN 1	GEN 2	GEN 3	GEN 4
TEST DATE: _____	**START TIME**				
OPERATOR: _____	**STOP TIME**				

		GEN #1		GEN #2		GEN #3		GEN #4	
HOUR METER	START								
	STOP								
BATTERY SPECIFIC GRAVITY	HIGH								
	LOW								
	HIGH								
	LOW								
OIL LEVEL HIGH/NORM/LOW									
OIL PRESSURE									
ENGINE WATER TEMP									
GENERATOR LOAD AMPS (A)									
(B)									
(C)									

NORMAL OPERATING CONDITIONS:

WET STACKING OBSERVED: YES_____

NO _____

OIL TEMP + 180-225 DEGREES (F)

WATER TEMP = 170-195 DEGREES (F)

OIL PRESSURE AT 225 DEGREES (F)

=PSI AT IDLE

=45 PSI AT 1800 RPM

STATIC WATER TEMP = 80-125 DEGREES (F)

STATIC OIL TEMP = 80-120 DEGREES (F)

*READING SHALL BE TAKEN AT 15 MINUTE INTERVALS

J-1502000-14 Electric Generators Fuel Requirements at the National Naval Medical Center (NNMC)

Fuel tanks of the generators shall be checked and filled weekly. Drain water or sediment while visually checking for fuel contamination. Check for evidence of fuel leaks at fuel tank/fuel tank lines and repair as necessary.

Check and Fill Generator Fuel Tanks

(See Form Next Page)

Applicable Generator Tanks:	Size	Before Top-Off		After Top-Off	
Building	(Gallons)	Inches	Gallons	Inches	Gallons
053	1000				
070a	1000				
070b	2000				
042a	1000				
042b	2319				
001	1000				
007	6000				
054	1000				
055n	4000				
055s	4000				
139	100				
241	350				
020	?				
011	?				
202	?				
052	?				

Mechanic: _____ Date: _____