Department of Veterans Affairs **MEMORANDUM**

Date: February 2, 2010

From: Chief, Engineering Service (138)

Subj: Electrical Distribution System Operational Plan – Murfreesboro Campus

To: All Engineering Supervisors
All Murfreesboro Plant Operations Personnel
All Murfreesboro Electric Shop Personnel

1 The following information is provided to describe the electrical distribution system, both normal and emergency circuits for the Alvin C. York campus of the Tennessee Valley Healthcare System. In addition to the systems described, the other areas covered are system performance standards, responsible parties, systems components, supporting utilities, failure response, shutdown procedures, maintenance and testing intervals, and training requirements.

2. **DESCRIPTION OF SYSTEMS**

a. **Utility Main Power Feeders:** Power enters the facility from Middle Tennessee Electric Membership Corporation via an overhead distribution system at 24, 940 volts. The primary feeder is brought into the facility from the Lacassas substation and designated as circuit LAS 254. The secondary feeder comes to the facility by way of the Lacassas substation and is designated circuit LAS 224. These two (2) feeders are set for automatic transfer in the event either circuit is disrupted from the utility. In the event that both circuits are unavailable, a third manually operated circuit can be made available from Murfreesboro power company substation. Two (2) utility poles located on the south side of Compton Road provide power through fused jacks to two (2) 2500 KVA transformers (numbered 1 and 2 from west to east) located on the north side of Compton Road. A third tap located on the utility pole on the north side of Compton Road provides power through a fused jack to transformer number 3. Transformers are numbered 1, 2 and 3 from west to east.

b. **Primary Power Distribution –Normal Circuit**

(1) Primary power exits the three (3) transformers on the North side of Compton Road at 4160 volts. Power is then routed through the main switching station located in Building 111. Power voltage of 4160 from transformers 1 and 2 is supplied to main breakers 1 and 2, which in turn powers main busses 1 and 2 at 1200 amperes per bus. Transformer number 3 powers facility Fused switch # 3 and Breaker # 6 at 4160 volts and 600 amperes. Main bus 1 provides power to facility circuits #1 and #5. Main bus 2 provides power to facility circuits #2 & #4. The main bus tie is at this time a manual switching device that connects main bus #1 and #2 in the event of a loss of power on either main breaker #1 or main breaker #2. Power voltage of 4160 is then distributed through a series of Underground Duct banks and manholes to building transformers.

(2) The chart shown below provides information concerning transformers.

LOCATION	SIZE	VOLTAGE	IMP.	SERVICE	CIRCUIT
B-107A, Mezz.	1500 KVA	480/277	5.75%	B-107, B-109 York	6 or 3
Bldg. 1, Rear Ent.	750 KVA	208/120	5.79	Bldg.1	1 or 4
Bldg. 2, Load Dock	750 KVA	208/120	5.79	Bldg. 2 & 9	1 or 4
Bldg. 105	500 KVA	480/277	5.3	Bldg. 3	1 or 4
Bldg. 4, Northeast	225 KVA	208/120	4.87	Bldg. 4	2
Bldg. 5, Rear	1000 KVA	208/120	6.95	Bldg. 5 & 6	2 or 5
Bldg. 7 North end	500 KVA	208/120	4.74	Bldg. 7	4 or 1
Bldg. 8, Park Lot	750 KVA	208/120	5.78	Bldg. 8	4 or 1
Bldg. 10 Park Lot	500 KVA	208/120	4.77	Bldg. 10 & 11	5 or 2
Bldg. 14, East End	1000 KVA	208/120	6.94	Bldg. 12 & 14	5 or 2
Bldg. 15, South Side	300 KVA	208/120	5.38	Bldg. 15	5 or 2
Bldg. 16, South Side	300 KVA	208/120	4.10	Bldg. 16	5 or 2
*Bldg. 19, East	150 KVA	240/120	5.75	Bldg. 18 & 19	1
Bldg. 107, Rm 111	500 KVA	208/120	4.60	Bldg. 107	5A
Bldg. 112, West Side	500 KVA	208/120	5.66	Bldg. 112, 146, 147	2 or 5
Bldg. 116, South	500 KVA	208/120	5.75	Bldg. 116	1 or 4
Bldg. 105	1500 KVA	480/277	5.88	Bldg. 117 &120	1 or 4
Bldg. T118, North	150 KVA	208/120	4.41	Bldg. T118	5B

* Single phase power only.

c. **Power Distribution – Emergency Circuit:** In the event of a total loss of power from MTEMC generators paragraph 2c(1) chart located throughout the facility provide power to critical areas/equipment. The automatic transfer switches (ATS) shift power between the normal circuit and the emergency circuit paragraph 2c(2) chart.

(1) The chart shown below provides information concerning each generator.

LOCATION	SIZE(KW)	TANK	CONSUMPTION	RUN TIME	BLDG. SERVED
Bldg. 2	350	2,000 Gals	20 GPH	100 Hrs.	1, 2, & 9
Bldg. 5	150	2,000	12	166	4, 5 & 6
Bldg. 8	275	1,000	20.3	49	8, & 107
Bldg.16	180	200.	17	11.7	15 & 16
Bldg. 112	275	250	13.8	18	112, 146, &147
Bldg. 116	75	550	15	36	116
Bldg. 105	600	4,000	50	80	3, 10, 11, 117, &120
Bldg. 7	250	1000	18.6	49	7 & 107
Portable	300	350	21.8	16	

(2) The chart shown below provides information concerning the Automatic Transfer Switches (ATS)

LOCATION	DESIGNATOR	FEED
Bldg. 2, Rm. G19	ATS Q2	Bldg. 2& 9
Bldg. 1, Rm. G30	ATS LC1	Bldg. 1
Bldg. 1, Rm. G30	ATS Q1	Bldg. 1
Bldg. 5, Fan Room 15	ATS Q5	Bldg. 5 & 6
Bldg. 7, Gen. Room	ATS Q7	Bldg. 7
Bldg. 7, Gen. Room	ATS C7	Bldg. 7
Bldg. 7, Gen. Room	ATS L7	Bldg. 7& 107
Bldg. 8, Gen. Room	ATS Q8	Bldg. 8, &107
Bldg. 8, Gen. Room	ATS C8	Bldg. 8 & 107
Bldg. 8, Gen. Room	ATS L8	Bldg. 8
Bldg.16, Outdoors	ATS Q16	Bldg. 15 & 16
Bldg. 105, Rm. 2	ATS Q7	Bldg. critical equip. for 5, 6, 105, 117, 120, med. Gases, and SPD ventilation.
Bldg. 105, Rm. 2	ATS C7	Critical Circuit bldg. 105, 117, and 120.
Bldg. 105, Rm. 2	ATS L7	Life Safety 105, 117, 120
Bldg. 105, Rm. 2	ATS Q3	Equipment Bldg. 3
Bldg. 105, Rm. 2	ATS C3	Critical Circuit Bldg. 3
Bldg. 105, Rm. 2	ATS L3	Life Safety – Bldg. 3
Bldg. 11, Fan Rm. 23	ATS 10/11	Bldg. 10 & 11
Bldg.112	ATS 112	Bldg. 112, 146, 147

3. **PERFORMANCE STANDARD**

a. The normal electrical power distribution system will provide electricity at proper voltage and of sufficient ampacity to all connected loads. The quality of this power (excluding any power anomalies occurring, such as excessive voltage surges/sags, transients, spikes, etc.) will be such that most loads connected will operate as designated without resort to line conditioners, filters, etc. Sensitive medical electronics and/or computer equipment loads may require further power conditioning to operate reliably and satisfactorily.

b. The emergency electrical power generating and distribution system will have the same electrical quality characteristics as the normal power system when on-line and connected to emergency loads. The emergency power system will start and operate under load within ten (10) seconds of a loss of normal power; it will then transfer from emergency power back to normal power as normal power is restored to each and every ATS.

4. **RESPONSIBLE CONTACT:** Electrical Supervisor – Extension 23974 After normal duty hours, contact the A/C Equipment Operator in the Engineering Control Center located in Building 107, extension 24554 or 24535. The Electrical Supervisor and/or the M&O General Supervisor are responsible for notifying staff in affected areas when utilities are malfunctioning and shut off is necessary.

5. **COMPONENTS:** The following components are listed in order of criticality for the normal and emergency circuits.

a. Normal Circuit: Building 111 main switching station, building transformers as identified in paragraph 2b (2), switchgear, motor control centers, distribution panels, breaker panels, and distribution system wiring.

b. Emergency Circuit: Diesel generators (9), including generator starting batteries, generator control panels, automatic transfer switches, tie controls, emergency system feeder circuit breakers, and distribution system wiring.

6. **SUPPORTING UTILITIES:** The normal power electrical system is a primary utility that is independent of supporting utilities. Once operating, the emergency power system will also operate independently of other utilities. However, when the emergency power system is not operating, it depends on the normal power system to charge generator engine starting batteries, to operate engine block heaters, lube oil circulating pumps, and fuel oil transfer pumps. The normal power system may be supplemented by the emergency power system even if there is no loss of emergency power. The two (2) systems are isolated up to the automatic transfer switches. Power leaving the ATS feeds common components such as distribution panels, lighting, receptacles, etc. which operate critical systems, equipment, and devices.

7. **FAILURE RESPONSE:**

a. Loss **of Normal Power**

(1) In the event that normal power is lost to our medical center the generators indicated in the chart in paragraph 2c (1) will start automatically and shift connected critical loads to generator power within ten (10) seconds. Upon completion of the shift to emergency power plant operations personnel will check the status of the generators through the Energy Management System located in Buildings 107 and 16. Troubleshooting a loss of normal power will be dictated by the extent of the outage and the impact to the medical center. The following procedure will be followed upon the total loss of normal power and may be modified accordingly for partial outages. The Electrician Supervisor or, after duty hours, the on-duty A/C Equipment Operator, will be responsible for calling the individuals necessary to correct or give guidance in correcting the problem. In order to accurately assess the problem, the on duty personnel will contact MTEMC at 1-800-763-7164 (PIN # 2434) to determine the cause and anticipated length of the total outage.

(2) If a total outage occurs, responsible on-duty personnel will proceed to Building 111 to verify incoming power. To verify power the incoming voltmeters will be checked on each leg of the incoming power on switch main # 1 and main #2. Incoming voltage will read 4160 volts on each leg at each meter. In the event that power exists on one switch and not the other, a manual transfer may be accomplished at the main bus tie by placing the tripped main 1 or main 2 in the open position. Open the switchgear door at the open main breaker Rack out the main breaker and install a lock out tag out with your lock

and a number to reach you. Then verify that the Bus tie switch is in the open position. Then proceed to rack in the bus tie breaker. After this has been accomplished close the bus tie breaker at the control switch. After the Mains have been restored power you will do the above procedure in the reverse order to restore the switch gear back to normal operating positions.

(3) If proper voltage is present on main switch #1 and #2, responsible personnel will check the main breakers for main circuits #1, #2, #4, #5, and #6. Circuit #3 is a fused circuit that must also be checked. Prior to reenergizing any circuit the on-duty personnel will make all necessary checks to determine the cause of the trip. If the breaker is reenergized and trips again a complete trace of the circuit must be accomplished to determine the cause, isolate the problem, and make the necessary repairs.

(4) If the problem is building specific then a check of the appropriate electrical gear must be accomplished. The check should include power to the panel, breakers are closed, and equipment is intact. The chart in paragraph 2c (2) indicates the location of the Main transformers and the building served along with the ATS designators.

(5) If power is available from MTEMC and power is fed through the breakers located in the main electrical rooms identified in paragraph 2c (2) chart the cause of the outage should be easily located and corrected. Troubleshooting this problem will include checking the appropriate secondary panels/breakers/switches, wiring, motor control centers, and electrical devices. Repairs will be initiated as needed to place the system back in normal operation.

b. **Circuit Failures**

In the event of a power failure on circuit# 3 and # 6 from the MTEMC Transformer #3 for the chiller plant. **CAUTION: It is absolutely necessary to power down 4,160 volt circuits prior to any switching at the gear or at the transformer. Switching is to be accomplished by qualified electrical personnel only.**

(1) Circuit Main #1 to Circuit #3 - Power may be supplied from circuit Main #1 to circuit #3 but cannot be provided from circuit #3 to circuit main #1. The keyed system in place does not allow for this. To power circuit #3 from Circuit main #1 the procedure outlined below must be observed.

(a) Open switch #3 and # 6 in the PMSG107C located outside on the west side of the chiller plant. This removes the load off of transformer # 3 at Building 111. Open Breaker # 6 on the switchboard at bldg 111 and then the 600 amp fused breaker by placing the key in the cylinder for the left hand lever. Rotate the key to the stop and operate the left hand lever to the down position.

(b) Remove the key from the cylinder and place it in the cylinder for the right hand lever.

(c) Rotate the key to the stop and move the right hand lever to the up position. This energizes the 600 amp normally open switch located between circuits #3 and main #1

(d) Circuit #3 is now being fed from transformer #2, bus #1. All loading is now off of transformer #3. You can now energize the switch PMSG107C Cicuit 3 located outdoors on the west side of the chiller plant.

(e) To transfer power back to normal configuration circuit # 3 and # 6 must first be de-energized at the the chiller plant at Switch PMSG107C located outdoor on the west side of the chiller plant.

(f) Back at Building 111 rotate the kirk key and open the right lever by pulling down. This opens the 600 amp Switch between the main Bus #1 and circuit #3.

(g) Remove the key from the cylinder of the right hand switch and place it in the cylinder of the left hand switch.

(h) Close the 600 amp fused disconnect by rotating the kirk key until it stops and then operate the left hand lever to the up position. This energizes circuit 3 at the chiller plant switch PMSG107C.

(i) At the chiller plant you can now energize circuit # 6 which is the preferred circuit. Optional circuit # 3 can be energized if circuit # 6 is in fault conditions.

(j) In the event that the power could not be restored in a timely manner. Provisions have been made to temporarily install a 5 KV Generator at the PMSG107C switch. There is a Generator hook up termination box on the east side of the chiller plant. This termination box will feed PMSC107C switch. This will energize the chiller plant.

(2) **Buildings 1,2, and 9 Circuit failures**

(a) These buildings are fed from Circuits 1 and 4 at Building 111.

(b) Circuits 1 and 4 are fed into an Automatic Transfer Switch Labeled PMSG2 located between Building 2 and 9 at the loading dock at 4160 volts.
4160 volts exits the switch feeding the primary of two 4160 volt transformers one for Building 2 and 9 and a separate transformer for Building 1. The voltage is then reduced to 208 volt to feed the building switch gears.

(c) In the event of a power failure the automatic transfer switch will automatically transfer from circuit 1 to circuit 4 or in reverse order Within 2 seconds depending on which circuit that is presently being used as the preferred source. To restore power to Circuit 1 or 4 proceed to Building 111 to reset. After the power has been restored to circuit 1 or 4 the transfer switch will automatically transfer back to the preferred source within 20 minutes.

(d) In the event the Automatic Transfer Switch does not Transfer this operation can be accomplished manually at the control box of PMSG2. To do this manually you will open the control box and observe which source has power. This will be indicated by a green light will be lit just below source 1 or source 2. Switches must be transferred to this source. To accomplish this you must first open the source switch that is tripped. First put the Mode dial in Manual and then pressing the red button next to it. You should see a green light lit next to manual when this has been done. Then hold the toggle switch to the desired source you would like to open while holding the switch press the red open button. The green light should be lit to show the source you opened at the top of the control panel. Now you are ready to close the other source to the energized circuit. While holding the selector switch to the source you want closed press the red close button. This action will be indicated at the top of the control panel you should see a red light lit next to the source switch you just closed.

(e) In the event the control panel will not control the switch in automatic or manual due to a malfunction in the electronic control board you then must manually switch to the energized source inside the switches high voltage compartment. **This is not recommended without trained electrical personnel and high voltage PPE to include gloves, hot stick, arc face shield, and fire proof apparel.** For manual operation verify open or closed by looking through the viewing window nearest to the switch operators. To open first check the position indicator of the spring charging operator to make certain it is" charged to open". If so rotate the manual trip operating handle clockwise 45 degrees. This movement declutches the spring latching mechanism releasing the spring. The operating handle will return to its original position after rotating. Once released the switch contacts move rapidly from one position to the next, independent of the operating handle. To close you follow the same procedure to open with the exception of making sure the spring charging operator is charged to close. If the spring charge operator is not already charged to close or charged to open you will need to charge the spring. To do this you will need to position the hex nut handle over the hex nut of the adjacent external operator. To charge the spring for close you will rotate the handle clockwise 90 degrees until the handle movement stops. To charge the spring for open operation you will rotate the handle counter clockwise until the handle movement stops. In either case the handle will relax and remain in the rotated position when the spring is successfully latched. If the spring does not latch it will return to its original position.

(3) **Buildings 3, 105, 117, 120, and 149**

(a) These buildings are fed from circuits 1 and 4 at Building 111.
(b) Circuits 1 and 4 at 4160 volts are fed into an Automatic transfer Switch labeled PMSG3 located outside of Building 105. 4160 volts then exits the transfer switch and enters into two 5 KV switches inside Building 105. 1 switch feeds the transformer to Building 105, 117, and 120 and the other switch feeds the transformer to Building 3, and 149. The Voltage then exits the transformers at 480 volts to feed the switch gear for the buildings.

(c) In the event of a power outage you would follow the same procedures and operations as you would with PMSG2 mentioned above in 7b (2) c, d and e.

(4) Buildings 5, and 6

(a) These buildings are fed from circuits 2 and 5 at Building 111.

(b) Circuit 2 leaves Building 111 at 4160 volts and enters the automatic transfer switch PMSG5. Circuit 5 leaves Building 111 at 4160 volts and enters switch PMSG4B-5 and leaves this switch as circuit 5B at 4160 volts and then enters the automatic transfer switch PMSG5. 4160 volts exits the automatic transfer switch and feeds into the pad mounted transformer PMT-5 located adjacent to it where it is then transformed to 208 volt to feed the switchgear for Buildings 5 and 6 located in the Building 5, Transformer Vault.

(c) In the event of a power outage you would follow the same procedures and operations as PMSG2 as mentioned above in 7b (2) c, d, and e.

(5) Building 7

(a) This building is fed from circuits 1 and 4 at Building 111.

(b) Circuits 1 and 4 leave Building 111 at 4160 volts then enter switches PMSC4A for circuit 1 and PMSC4B for circuit 4 located near Building 7 in the quadrangle. 4160 then leaves these switches and enter into the Automatic transfer switch PMSG7 located on the West side of Building 7 in the Quadrangle. 4160 exits PMSG7 and enters PMT-7 located adjacent to PMSG7 where the voltage is transformed down to 208 volts then feeds the switchgear in Building 7.

(c) In the event of a power outage you would follow the same procedures and operations as PMSG2 as mentioned above in 7b (2) c, d, and e.

(6) Building 8

(a) This building is fed from circuit 1 and 4 at Building 111 switchgear.

(b) Circuits 1 and 4 leave Building 111 at 4160 volts and enter into switches PMSC4A for circuit 1 and PMSC4B for circuit 4 located in the Quadrangle near Building 7. 4160 volts then leaves these switches and enters PMSG8 Automatic transfer switch located on the north side of Building 8 in the quadrangle. 4160 volt leaves the transfer switch and enters PMT-8 where the voltage is reduced to 208 volts. 208 volts leaves PMT-8 and enters the switchgear in Building 8.

(c) In the event of a power outage you would follow the same procedures and operations as Outlined above for PMSG2 in paragraph 7b (2) c, d, and e.

(7) Buildings 10 and 11

(a) These buildings are fed from circuits 2 and 5 at building 111 switchgear.

(b) Circuits 2 leaves building 111 at 4160 volts and enters Automatic transfer switch PMSG10 located in the parking lot of Building 11. Circuit 5 leaves Building 111 at 4160 volts and enters switch PMSG4B-5 located In the Quadrangle near Building 7. Circuit 5 then exits switch PMSG4B-5 and enters the automatic transfer switch PMSG10. Leaves PMSG10 at 4160 volts and enter PMT-10 where the voltage is reduced to 208 volts. 208 volts leaves PMT-10 to feed into Fan Room 22 in Building 10 Switchgear and Fan Room 23 in Building 11 Switchgear.

(c) In the event of a power outage you would follow the same procedures and operations as outlined above for PMSG2 in paragraph 7b (2) c, d, and e..

(8) Building 116

(a) This building is fed from circuits 1 and 4 at building 111 switchgear.

(b) Circuits 1 and 4 leave building 111 switchgear at 4160 volts and enters the Automatic Transfer Switch PMSG116 located at the west end south entrance of Building 116. 4160 exits PMSG116 and enters PMT-116. Then the 4160 voltage is then reduced to 208 volts. Feeding the building 116 switchgear.

(c) In the event of a power outage you would follow the same procedures and Operations as outlined above for PMSG2 in paragraph 7b (2) c, d, and e.

(9) Building 107

(a) This building is fed from circuit 5 Building 111 switchgear.

(b) Circuit 5 leaves Building 111 switchgear at 4160 volts and enters switch PMSG4B-5 located in the Quadrangle near building 7 The circuit exits PMSG4B-5 as Circuit 5A then enters PMT-107 at 4160 volts where the voltage is reduced to 208 volts. 208 volt exits PMT-107 and enters the switchgear for 107 in room G-11.

(c) This building has no alternative circuit it is fed with circuit 5A only. If power is out for any length of time you would temporarily install the 300 KW Portable generators located behind the boiler plant.

(10) Buildings 12, 13,14,15,16, and 81

(a) These buildings are fed from circuits 2 and 5 at the Building 111 switchgear.

(b) Circuits 2 and 5 leave building 111 switchgear at 4160 volts and enters into PMSG15 which is a manual Transfer switch located on the south side of Building 15 it leaves PMSG15 and enters into PMS15 at 4160 volt. PMS15 is a

4-way switch. The line power enters the switch at the main switch and then is sent to 3 different transformers via three load switches. The first switch sends 4160 volts to PMT14. The voltage then is reduced to 208 volts to feed switchgear in Buildings 14 that feeds Buildings 12, and 14. The second switch sends 4160 volts to PMT15. The voltage is then reduced to 208 volts to feed the switchgear in Building 15 that feeds buildings 13, and 15. The Third load switch feeds PMT16 at 4160 volts where the voltage is transformed down to 208 volts to feed the switchgear in building 16 to feed power to Buildings 16,and 81.

(c) In the event that circuits 2 or 5 were lost we would need to follow this procedure to Transfer the circuit manually from 2 to 5 or 5 to 2. to do this you will need to start The generator if it is not already started from the power loss. Verify the automatic Transfer switch in building 16 is on emergency power. Then open the main breakers in each building 14, 15, and 16, this will unload the circuits to keep from closing PMSG15 manual transfer switch into a loaded condition. Then open doors on the PMSG15 transfer switch. **Using proper PPE for high voltage as gloves, face arc shield, fire proof apparel, and the hot stick.** The switch has 4 positions for the taps, tap A is circuit 5, Tap B is for Circuit 2, and 2 open positions. Using the hot stick on the switch rotate from tap A to Open and then from open rotate switch to Tap B. Just the opposite to go from Tap B to tap A. After this is complete and the PMSG15 switch has been closed you then can go to each switchgear and close the main breakers Buildings 14, 15, and 16. After this has been done then the generator will time out transfer and shut down.

(11) Buildings 112, 146, and 147

(a) These buildings are fed from circuits 2 and 5B at building 111 switchgear.

(b) Circuit 2 leaves building 111 switchgear at 4160 volts and enters PMSG112 Manual transfer switch located on the west side of building 112. Circuit 5 leaves 111 switchgear at 4160 volts and enters PMSG4B-5. Circuit 5 then exits PMSC4B-5 as circuit 5B at 4160 volts then circuit 5B makes its way to PMSG112 with Circuit 2. The load wires then exit PMSG112 and enters PMT112 where it is then reduced to 208 volts to feed the distribution panel located outside behind the generator to feed building 112, 146, and 147.

(c) In the Event of power loss to either circuit 2 or 5B you would follow the same Procedure as 7b (10) c above. After you have verified the 112 generator is running and the load has been transferred to the generator. This removes all loads off of PMSG112 before making the switch. After the switch PMSG112 has been Completed and power is restored the generator will time out and shut down.

(12) Building 118

(a) This building is fed from circuit 5B at building 111 switchgear.

(b) Circuit 5 leaves the switchgear at building 111 as 4160 volts and enters into

Switch PMSG4B-5. Circuit 5 then exits switch PMSG4B-5 as circuit 5B at 4160 volts. Then 5B makes its way to transformer PMT118 where it is Transformed down to 208 volts to feed the distribution panel of building 118

(c) Building 118 has no alternative circuit it is only fed from circuit 5B. If power Is to remain out for a length of time you will temporarily install the portable 300 KW generator located behind the boiler plant.

(13) Building 18, and 19

(a) These buildings are fed from circuit 1 at Building 111 switchgear.

(b) Circuit 1 leaves switchgear at 4160 volts in building 111 then enters into Transformer PMT19 located on the east side of building 19 where the voltage Is transformed down to single phase 240 volts to feed Buildings 18, and 19 main Panels.

(c) These buildings have no alternative circuits they are only fed from circuit 1. If Power is going to be out for a extended time we will temporarily install the Portable 300 KW generator located behind the boiler plant.

c. **Loss of Emergency Power**: Emergency power is provided by generators located throughout the medical as indicated in chart of paragraph 2c (1). In the event that power is lost from MTEMC and generator power is unavailable to specific buildings, the procedures outlined in the Attachments specific to each generator must be observed.

8. PLANNED SHUTDOWNS FOR TESTING AND MAINTENANCE:

All planned or scheduled maintenance involving normal power circuits, emergency power circuits, or the ability to generate emergency power will be scheduled a minimum of one (1) week in advance. Coordination shall include personal contact with using services as well as e-mail notification broadcast throughout the medical center. In the event that a standby generator is taken out of service for an extended period of time a portable generator shall be installed to satisfy the emergency load of the building.

9. MAINTENANCE/TESTING PROCEDURES/INTERVALS:

The emergency power generators will be inspected weekly. The emergency power system (including ATS) will be tested bi- monthly under full connected load. Switchgear, breakers, panels, and transformers will be inspected and/or tested annually by either Electric Shop staff or under contracted testing and maintenance programs.

10. TRAINING:

a. ORIENTATION: The Electrician Supervisor will orient all new electrical unit personnel on the operation and maintenance of the electrical distribution system. The Utility Systems Unit

Supervisor and the Electrical Unit Supervisor will orient all new A/C Equipment Operators in this regard. Training will be documented in TEMPO.

b. CONTINUING EDUCATION: Electricians and A/C Equipment Operators will continually update their knowledge concerning the electrical distribution system through on the job training.

11. REFERENCES:

JCAHO GUIDELINES
VHA DIRECTIVE 2000-046, (dated November 30, 2000)
NATIONAL ELECTRICAL CODE – (current edition)
NFPA CODES 99 & 101 – (current edition)

12. Rescission: This policy rescinds all previous SOP's.

Craig Hrobak

Attachments - 8

ATTACHMENT A

EMERGENCY GENERATOR FAILURE PROCEDURES

Building 2 Generator – Not running

(a) Check for adequate fuel level in day tank.
(b) Check battery charger for proper operation (24 volts, 1-2 amps).
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Open main breaker at Generator
(f) Rotate auto/ manual selector switch to manual
(g) Generator starts and comes up to speed.
(h) Close main breaker at generator
(i) ATS Q2 transfers to emergency power at this time.

Building 2 Generator Running - No Load Transfer

(a) Check generator voltage output at generator control panel. Voltage must be 208 phase to phase and 120 phase to neutral.

(b) If voltages are incorrect a problem exists electrically with the generator. The portable 300 KW generator located behind the boiler plant will need to be connected

(c) If voltages are correct a manual transfer of ATS Q2 must be accomplished.

(d) To shift ATS Q2 manually – place the Isolation handle to the open or test position then place the bypass handle to the available source of power.

(e) Building is now on emergency power. If emergency power is not restored, proceed to panel 2Q1 and assure that both 800 and 1200 amp breakers are closed. Assure main breaker ATS Q1 located on the east wall between the 1000 amp motor operated breaker and emergency panels 2Q2 are closed. Emergency circuit is now energized.

(f) **In the event that the generator will not start, the portable generator will need to be connected to the building via the Cam Lock box located outside near the generator enclosure on the west side of building 2.**

Attachment B

Building 105 Generator – Not Running

(a) Check for adequate fuel level in day tank.
(b) Check battery charger for proper operation (24 Volts, 1-2 amps)
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Place engine switch in manual on generator control board.
(f) Depress green start button on generator control board.
(g) Check voltages/amperages phase to phase. Voltage will be 480 volts. Amperage will be 250–500 amps.
(h) Check ATS Q7, L7, C7, L3, Q3, 10, and 11 for emergency power indicator. Indicator is red light for emergency power and green light for normal power.
(i) If all ATS have not transferred to emergency power this indicates a problem in a specific building (see chart 2.b.c.(2) for ATS feeds). Troubleshooting must be conducted at the building level at this point.
(j) **In the event the unit will not start the tie control to building 2 generator must be operated. This will start the B-2 generator and supply emergency power. The tie control will be operated as outlined below.**

Generator Tie Control (Bldg. 2)

This procedure is for connection of the Bldg. 2 generator to provide power to the Bldg. 105 transfer switches feeding Buildings 3, 10/11, 117 and 120. Follow this procedure to prevent tripping of the motor driven breaker and back feeding power into the Bldg. 105 generator.

1. Place Engine Control switch located on the generator control panel to the "Off" position.
2. "Open" the "Emergency Generator Circuit Breaker" located below the generator control panel. Lock Breaker in the open position with the Kirk key interlock
3. Remove the key and unlock the Kirk key interlock breaker for the tie control. Then close the tie control breaker.
4. Turn the tie control switch to on it is located on the ATS for Bldgs 10/11. You should hear the motor actuated breaker close. At this point the start contacts of the 105 ATS switches are tied to Building 2 generator. The Building 2 generator has started and is supplying emergency power to ATS Q7, L7, C7, L3, Q3, and ATS 10/11.

Upon completion of the test or generator run and all transfer switches have returned to normal power;

1. Turn the "Tie Control" switch to the "Off" position. You should hear the motor operated breaker "Open".
2. Open the tie breaker and lock the Kirk key interlock.
3. Remove the kirk key and unlock the generator main breaker Kirk key interlock. Close the generator main breaker.
4. Return the Engine control switch to the AUTO position. This may start the generator and run a 5 minute cool down cycle.

Attachment C

Building 105 Generator Running – no load transfer

(a) Check volts, phase to phase. (480 volts, 260 – 500 amps)
(b) Check ATS for proper transfer.
(c) If no transfer on ATS, transfer manually. The following procedures must be used to manually transfer ATS.

Manual Transfer ATS Q7:
Switch motor disconnect (S1) to off position.
Manually transfer load from normal to emergency power. ATS Q7 is a break before make switch. Switch must be centered and then travel can proceed to the appropriate circuit.

Manual Transfer ATS L7, C7, L3, Q3, & C3:
Place manual operator switch in the off position
Remove handle from cabinet and place in the switch.
Shift power to the appropriate circuit.

Building 5 Generator – Not running

(a) Check for adequate fuel level in day tank.
(b) Check battery charger for proper operation (24 volts, 1-2 amps).
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Place Auto/Off/Run switch on the generator control panel in the run position.
(f) Depress red start button located on the right hand side of the generator control panel.
(g) Generator starts and comes up to speed.

Building 5 Generator – Running

(a) Check generator voltage output at generator control panel. Voltage must be 208 phase to phase and 120 phase to neutral.
(b) If voltages are incorrect a problem exists electrically with the generator and the portable generator must be used.
(c) If voltages are correct a manual transfer of ATS Q5 must be accomplished.
(d) To shift ATS Q5 manually – Open the breakers feeding normal power (Transformer Vault distribution room) and Emergency power (generator building) to the ATS.
(e) Open the Cabinet door Remove the transfer handle from its holder. Insert the handle into the manual slot and place the switch to the required (in this case Emergency) position.
(f) Then close the required breaker (in this case Emergency) to provide power to the ATS.
(g) The building is now on emergency power.

Attachment D

Building 7 Generator – Not Running

(a) Check for adequate fuel level in day tank.
(b) Check battery charger for proper operation (24 volts, 1-2 amps).
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Place auto/off/run switch on the generator control panel in the run position.
(f) Generator starts and comes up to speed.
(g) If generator does not start the portable generator must be used.

Building 7 Generator - Running

(a) Check voltages (Phase to phase and phase to neutral) voltages should read 208 phase to phase and 120 phase to neutral.

(b) If Voltages are correct, you will need to manually transfer ATS Q7, C7, L7 located in the Generator room.

(c) To transfer ATS Q7, C7, L7 manually, Place the isolation handle to the open or test position, then move the Bypass handle to the emergency position.

(d) Check generator loading (amps) at the generator control panel to assure power transfer.

Attachment E

Building 8 Generator – Not Running

(a) Check for adequate fuel level in day tank.
(b) Check battery charger for proper operation (24 volts, 1-2 amps).
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Place Auto/Off/run switch on the generator control panel in the run position.
(f) Generator starts and comes up to speed.
(g) If generator does not start the portable generator must be used.

Building 8 Generator - Running

(a) Check voltages, "Phase to phase and phase to neutral" voltages should read 208 phase to phase and 120 phase to neutral.

(b) If the Voltages are correct, you will need to manually transfer ATS Q8, C8, and L8 located in the generator room.

(c) To transfer ATS Q8, C8, and L8 manually, Place the Isolation handle in the open or test position. Then move the bypass handle to the emergency position.

(d) Check generator loading (amps) at the generator control panel to assure power transfer

Attachment F

Building 16 Generator – Not Running

(a) Check for adequate fuel level in Tank located below generator.

(b) Check battery charger for proper operation (24 volts, 1-2 amps).

(c) Assure emergency stop button is pulled out.

(d) Check generator control panel for alarms. Correct as needed.

(e) Place Auto/Off/Run switch on the generator control panel in the Run position.

(f) Generator starts and comes up to speed.

(g) If generator does not start the portable generator must be used.

Building 16 Generator – Running

(a) Check voltages. Phase to phase and phase to neutral. Voltages should read 208 phase to phase and 120 phase to neutral.

(b) Voltages correct, manually transfer ATS Q16 located in the generator room, Building 16.

(c) To transfer ATS Q16 manually, open panel and hold toggle in the up or manual position.

(d) Using the manual switch located in the panel shift power from the normal circuit to the emergency circuit.

(e) Check generator loading (amps) at the generator control panel to assure power transfer.

Attachment G

Building 112 Generator – Not Running

(a) Check for adequate fuel level in tank.

(b) Check battery charger for proper operation (24 volts, 1-2 amps).

(c) Assure emergency stop button is pulled out.

(d) Check generator control panel for alarms. Correct as needed.

(e) Place Auto/Off/Run switch on the generator control panel in the run position.

(f) Generator starts and comes up to speed.

(g) If generator does not start the portable generator must be used.

Building 112 Generator – Running

(a) Check voltages "Phase to phase and phase to neutral" voltages should read 208 phase to phase and 120 phase to neutral.

(b) Voltages correct, manually transfer ATS Q112 located outside at the generator for Building 112.

(c) To transfer ATS Q112manually, Remove both normal and emergency power from the ATS

(d) Using the manual switch located in the panel shift power from the normal circuit to the emergency circuit.

(e) Check generator loading (amps) at the generator control panel to assure power transfer.

Attachment H

Building 116 Generator – Not Running

(a) Check for adequate fuel level in tank.
(b) Check battery charger for proper operation (12 volts, 1-2 amps).
(c) Assure emergency stop button is pulled out.
(d) Check generator control panel for alarms. Correct as needed.
(e) Place manual/auto switch on the generator control panel in the manual position.
(f) Depress red start button located on the right hand side of the generator control panel.
(g) Generator starts and comes up to speed.
(h) If generator does not start, the portable generator must be used.

Building 116 Generator – Running

(a) Check voltages, "Phase to phase and phase to neutral" voltages should read 208 phase to phase and 120 phase to neutral.

(b) Voltages correct, manually transfer ATS Q116 located in the generator room of Building 116.

(c) To transfer ATS Q116 manually power down both emergency and normal power sources.

(d) To power down the normal circuit the breaker labeled Transfer Switch ATS located on the switchgear in room 114b, bldg. 116, must be opened.

(e) Open the panel for ATS Q116 and remove the tool used to move the switch from the left hand side of the cabinet.

(f) Place the tool in the actuator arm and move the switch to the appropriate power source.

(g) Check generator loading (amps) at the generator control panel to assure power transfer.