

The numbers below represent the key notes from the one line diagram.

1. Generator operating at 480V 3phase capable of 902 Amps of current.

a. 1000 amp main breaker installed in generator is fed to the 1<sup>st</sup> disconnect using 4/0 wiring normally used for stage lighting, type SC wire. This wiring is rated at 405 Amps. Recommended corrective action is to install proper wiring for 1000 Amps. Proper THHN wiring for a 1000 Amp circuit is 3ea (3-500MCM, 1-500MCM Neutral, 4" Conduit)

b. The Neutral inside generator was not firmly attached to bus. Recommended corrective action: tighten the newly installed wiring, above, with torque wrench according to manufacture recommendation.

2. Generator disconnect is rated for 600V @ 600 Amps with 3ea 500 Amp fuses.

a. Recommended corrective action: Install triple lugs for 500MCM wires on each phase of the Line Side.

b. The lugs for the Neutral and Ground are attached to the frame using self tapping screws. The lugs must be secured to the frame using available nuts attached to the frame by the manufacturer. Recommended corrective action is to replace the Neutral and Grounding lugs with ones made for the disconnect and attach them according the manufacturer's recommendation.

c. The Neutral is not grounded at the 1<sup>st</sup> means of disconnect (Floating Neutral). This must be corrected during the installation of the new Neutral lug.

d. The Neutral wire that leads from the disconnect to the Transfer Switch in the Computer Room was trimmed, wires were removed to allow it to be installed in the Neutral lugs inside the disconnect. Recommended corrective action is to install proper Neutral lug for the disconnect and properly install the Neutral to the lug.

e. The wiring from the disconnect to the Computer Room is 500 MCM rated for 430 Amps, however the disconnect has 500 Amp fuses. The fuses must be replaced with 350 Amp fuses to protect the 500 MCM wires.

f. The disconnect also has been double lugged on the supply side to a portable HVAC unit. The installation currently has 4/0 THHN wiring which has been double lugged with the 500 MCM wiring that leads to the Computer Room. 4/0 THHN wiring is rated at 260 Amps. The wiring to the portable HVAC unit must be protected by a 200 Amp fuse. Recommended corrective action: install another NEMA 3R disconnect next to the 1<sup>st</sup> disconnect; 600V 400 Amp disconnect with 225 Amp fuses, install 3-500MCM, 1-500MCM Neutral, #4 Ground, 4" Conduit between the disconnects, connect wiring to the load side of the existing disconnect. This new disconnect must be installed within 10 feet of the original disconnect.

g. Conduits installed do not have isolation/bonding bushings to protect wire from chaffing and grounding out to the frame and to ground the conduit to the frame. Recommended corrective Action is

to install isolation bushings to protect the wire. Any future metallic conduits will also require bonding bushings.

3. Disconnect at portable HVAC is rated at 240V @ 400 Amps with 400 Amp fuses (for 250V)

a. The disconnect is not rated for 480V system for which it has been installed. Recommended corrective action: This disconnect must be replaced with one rated for 600V @ 400 Amps and must be a NEMA 3R. This disconnect does not require a fuse because a fuse must be installed near the Generator.

b. The NEMA 3R wireway installed to hold the pigtail for the HVAC system, is installed horizontally; however the box installed is designed to be installed vertically. Recommended corrective action is to re-install wireway vertically or replace the wireway with a NEMA 3R wireway designed to be installed horizontally.

c. The wiring installed from the 1<sup>st</sup> disconnect to this disconnect includes a Neutral, however no ground wire is installed in the conduit. Recommended corrective action: If the portable generator does not need a neutral connection, re-label the neutral wire as a ground wire and attach it accordingly at the new disconnects. If the portable generator does need a neutral connection then another ground wire must be pulled to the location, use a #4 ground.

4. Manual Transfer Switch

a. Not internally inspected because downtime would be required.

5. Conduit from the Transfer Switch to Panelboard AA

a. The conduit from the Transfer Switch to Panelboard AA is missing a lock nut on the Transfer Switch side of the conduit. Recommended corrective action: remove the wiring and install the locknut and bonding bushing; this will require system downtime because it is the only path available to the downstream power panels. During this downtime the Manual Transfer Switch can be inspected and corrective action accomplished if something is discovered.

6. Panelboard AA

a. The lug for the Ground is attached to the frame using self tapping screws. The lug must be secured to the frame using available nuts attached to the frame by the manufacturer. Recommended corrective action is to replace the Grounding lug with one made for the panelboard and attach it according the manufacturer's instructions.

b. The feed from the Transfer Switch is double lugged at Panelboard AA then feeds the Disconnect used for Panelboard AC. The wire gauge is decreased from 500 MCM to 2/0. Recommended corrective action: Replace the existing wire with 3-500MCM, 1-500MCM Neutral, 4" Conduit.

7. Disconnect for Panelboard AC.

a. Not internally inspected because downtime would be required.

## 8. Panelboard AC

a. The wiring from the disconnect is 2/0 rated at 195 amps. Recommended corrective action: If the disconnect has a 200 amp fuse install 3-3/0, 1-3/0 N, #6 GND, 2"C. If the disconnect does not have a fuse install 3-500MCM, 1-500MCM N, #6 GND, 2"C.

b. Phase A lead into Panelboard AC from disconnect switch is not securely connected to the lug. Recommended corrective action: tighten the lug with torque wrench according to the manufacture's recommendation. Special tools are required to perform this while the circuit is energized, otherwise downtime will be required.

c. Conduits that have been installed are missing bushing and bonding bushing. Recommended corrective action: install plastic bushings to protect the wiring at the fitting. Future installations should include bonding bushings.

d. The leads on the breaker occupying slots 8, 10, & 12 are not completely inserted into the lug. Recommended corrective action: Turn the breaker off, insert wires and retighten lugs.

e. The breaker used to power the 45KVA transformer in DDS is oversized for the transformer. Recommended corrective action: Replace 80 amp 3 pole breaker with a 55 amp 3 pole breaker.

f. The breaker used to power the Roof Rack Disconnects is oversized for the #10 wiring installed. Recommended corrective action: Replace wiring to the Roof Rack Disconnects 3-#6, 1-#6 N, #10GND, ¾" C.

## 9. Conduit from Panelboard AC to Panelboard AH, Elevator Room.

a. The wiring inside the junction box, outside the building, has been shorting to the conduit inside the junction box because the conduits were installed without plastic bushings. This has been causing the circuit breaker to trip in Panelboard AC. The existing junction box location will not allow for a proper repair to be performed without removing the existing junction box. Recommended corrective action: Cut the wire inside the junction box, remove the existing junction box and one length of conduit each side of the existing junction box. Install two new junction boxes at the ends of the conduits and install new wiring and conduit between them. These two new junction boxes must be sufficiently large to accommodate a splice of all the wiring between to the panelboards. Use Polaris connector blocks for each wire at each new junction box. Size the junction box according to Polaris recommendations.

## 10. Panelboard AH in Elevator Room

a. Panelboard AH is a main lug only panelboard with no means of disconnect within line-of-sight for the electrician when maintaining the panelboard. Recommended corrective action: Purchase a Lock-Out/Tag-Out device for the electrician to use when working on this circuit.

b. The panelboard is not grounded. Recommended corrective action: ground the panelboard IAW with NEC.

c. There is a ground rod installed in the elevator room that is extended through Panelboard AH back to the computer room into Panelboard AC, that is then extended to DDS. We are not certain why this separate ground rod was installed and cannot determine what affect it may be having on the system. The ground wire should be isolated along the route to DDS from the electrical ground system as to not create a ground loop.

d. The wiring harness used in the panelboard is metallic conduit straps. Recommended corrective action: These straps must be removed and non-conductive strapping installed as needed.

#### 11. 120/208V Panelboard after 75KVA transformer in Elevator Room

a. The 75KVA transformer is being fed from Panelboard AH at 480V 3 phase and the secondary side of the transformer going to the 120/208V Panelboard is single phase power. You are not using the available power through the transformer. To correct this, the 120/208V single phase panelboard must be replaced with a 3 phase panelboard. This issue is not currently causing any issues but if the War Room increases loads you may want to reconsider this issue.

b. The conduits connecting to the 120/208V Panelboard are missing the bonding bushing. Recommended corrective action: Install isolation bushings to protect the wire. Any future metallic conduits will also require bonding bushings.

c. The 100 amp breaker in position 26, 28 feeds Panelboard CE#2 has wiring insufficient for the breaker. Recommended corrective action: Replace the wiring going to Panelboard CE #2, this recommendation is because the wiring is fed through the Contactor Box then through the wall to CE #2 does not include conduit or connectors. The sharp edges of the hole cut in the Contactor Box and Panelboard CE #2 have left the wires vulnerable to cutting the insulation which would ground them to the box. Conduit must be used to connect through the wall and bushing must be installed to keep the wires from shorting to ground.

d. The wiring harness used in the panelboard is metallic conduit straps. Recommended corrective action: These straps must be removed and non-conductive strapping installed as needed..

#### 12. Elevator Room

a. Most Mechanical/Elevator Equipment Rooms are to be fire rated. This room does not appear to be fire rated because of the penetrations in the walls.

#### 13. 400 Amp Panelboard in Computer Room closet connected to 112.5 KVA transformer.

a. The wires in the 100 Amp breaker connected to Panelboard CPD are not securely fastened. Recommended corrective action: install the wires IAW NEC.

b. The conduits connected to the 400 Amp Panelboard do not have bushings. Recommended corrective action: Install isolation bushings to protect the wire. Any future metallic conduits will also require bonding bushings.

14. Panelboard CPD

a. The conduits connected to the Panelboard do not have bushings. Recommended corrective action: Install isolation bushings to protect the wire. Any future metallic conduits will also require bonding bushings.

b. The bottom of the panelboard has a large area cut-out and left open to the environment. Recommended corrective action: Install a cover.

15. UPS Disconnect – 240V @ 400Amp.

a. Not internally inspected because downtime would be required.

16. Main UPS

a. Wiring inspected – no issues discovered.

17. Main UPS to Panelboard AB II

a. The output of the Main UPS has wiring connected to two output circuit breakers. Each circuit breaker is connected, in parallel and bonded together at the panelboard, to a 400 Amp Panelboard which is being used as a junction box. The Panelboard is improperly Triple Lugged to wiring that is then fed to Panelboard AB II. Recommended corrective action: Install proper lugs for Triple Lugging.

b. The electrical loads for each breaker were monitored and found the loads on the panel are currently A: 38.3amps, B: 37.5amps, C: 46.7amps.

18. Panelboard AB I not connect to power.

19. 45KVA transformer in hallway of DDS

a. The 45KVA transformer is being fed directly from Panel AC and has no service disconnect within line-of-sight for the electrician when maintaining the transformer. Recommended corrective action: Purchase a Lock-Out/Tag-Out device for the electrician to use when working on this circuit.

b. The 45KVA transformer is being used as a junction box with multiple feeds leaving the transformer. Currently there is a conduit with electrical wiring entering the transformer but not connected, this conduit connects to a junction box mounted inside the wall behind the transformer. Recommended corrective action: Remove the conduit and wiring from the transformer, then install a cover for the hole.

c. There are two service connections on the secondary side of the transformer; one to Panelboard A1 and the other Panelboard AK. Two of the 4 wires are improperly double lugged with

another wire using a single lug. Recommended corrective action: Install the proper double lug for that transformer and re-install the wire.

20. Disconnect above 45KVA transformer connected to Panelboard AK

a. The disconnect is a 240V 3 pole 150 Amp circuit breaker used as a means of disconnect for a Panelboard AK. This disconnect was not internally inspected because downtime would be required.

21. Panelboard AK, DDS hallway

a. Not inspected all circuit breakers are single pole 20 amp breakers.

22. Panelboard A1, DDS hallway

a. This panelboard has a 100 amp main breaker used as a means of disconnect when servicing this panelboard.

b. All circuit breakers are single pole except for a single 3-pole 80amp circuit breaker feeding the panelboard inside the DDS computer room.

c. The conduits connected to the panelboard do not have bushings. Recommended corrective action: Install isolation bushings to protect the wire. Any future metallic conduits will also require bonding bushings.

23. Panelboard inside DDS computer room.

a. This panelboard has a 100 amp main breaker used as a means of disconnect when servicing this panelboard. The circuit breaker ahead of this panelboard is rated at 80 amps.

b. Installation in this panelboard is very neat and clean however the conduit from Panelboard A1 does not have a plastic bushing. Recommended corrective action: Install isolation bushings to protect the wire.