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**NAVY PUBLIC WORKS CENTER  
NORFOLK, VIRGINIA  
UTILITIES**

**STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS**

**TITLE  
PM SECTIONALIZING OIL SWITCH**

**PROCEDURE NUMBER  
622.3 ELE 101**

**SIGNED: \_\_\_\_\_**

**(DATE)**

**APPROVED: \_\_\_\_\_**

**(DATE)**

**SAFETY PROFESSIONAL: \_\_\_\_\_**

**(DATE)**

**MANAGEMENT OFFICIAL: \_\_\_\_\_**

**(DATE)**

**REVISION**

**A**

PM SECTIONALIZING OIL SWITCH

**DISTRIBUTION**

<b>CODE</b>	<b>REV/DATE</b>						
<b>620</b>							
<b>622</b>							
<b>610</b>							
<b>610.E1</b>							
<b>601A</b>							
<b>30A</b>							
<b>09A</b>							
<b>216</b>							
<b>226</b>							
<b>236</b>							
<b>622.3</b>							
<b>622.4</b>							



## PM SECTIONALIZING OIL SWITCH

**Purpose:**

Procedure to perform preventative maintenance on a 34.5 or 11.5 kv oil insulated sectionalizer switch.

**Potential Energy Sources:**

1. 34.5 or 11.5 kv cables connected to switch.
2. Generators if installed at facilities to provide temporary power during the PM.

**Tools and PPE:**

Tools: Hand tools, high voltage tester, Meggar, Micro-Ohm meter. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, and back brace if required by back injury prevention and control program. The class of rubber gloves and sleeves will depend on the exposure voltage as per the following: Class 0 - up to 1,000 volts, Class 1 - up to 7,500 volts, Class 2 - up to 17,000 volts, Class 3 - up to 26,500 volts, Class 4 - up to 36,000 volts.

**References:**

1. PWC Occupational Safety and Health Program Manual, PWCNORVAINST 5100.33E
2. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment; Subpart R, Electrical Power Generation / Transmission / Distribution; Subpart S, Electrical
3. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.
4. SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
5. SOP WC 622 HVE 007, Switchout And Switchback Energized Circuit
6. SOP WC 624 HVE 062, Clean, Repair, Replace Insulating Barrier Boards.

**Procedures:**

1. Operations personnel will deenergize the primary circuits connected to the switch per SOPs
  - a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
  - b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

Operations personnel will ensure that facility emergency generators or temporary power generators, if present, are isolated and will not back feed to the circuits.

2. The circuits connected to the sectionalizer switch can not be tested for voltage at the switch. The PM personnel have two options to check if the switch has been deenergized.
  - I Visually check that the PM outage Switching Order Package has been carried out as written. The PM personnel will visually see that all devices have been opened and all grounds placed as per the Switching Order Package. After the PM personnel are satisfied that the necessary switching has been completed, then the switch can be opened and tested for deenergization.

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II Go to a transformer site on each circuit, which has accessible conductors, and perform the deenergization verification test there.

Deenergization verification test - Using a high voltage tester test the primary circuit's cables to verify they are deenergized. Before the conductors are checked, test the high voltage tester on same voltage as circuit voltage to verify the tester is working. Test each deenergized conductor separately, taking care not to cross phase during test. If voltage is detected, stop the test and (a) notify Operations personnel that the circuit is still energized, (b) wait for Operations personnel to correct the problem, (c) perform the deenergization verification test once again after Operations personnel finish switching operations and declare the cables deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat while testing.

The PPE for the PM work will include work gloves, safety shoes(oil resistant), safety glasses, and hard hats. Refer to the JHA for further information.

3. Drain the oil from the switch. Place oil into clean, dry, 55 gallon drums. Cover the drums tightly during the repair work.
4. Unbolt and remove top from switch. Do not to damage the gaskets. Remove bottom cable termination covers.
5. Inspect the switch tank for damage and/or oil leak evidence.
6. Check the cable terminations for leaking compound or damage.
7. Check that the case ground is connected and tight.
8. Clean the tank and parts inside with lint free rags. If a solvent is necessary, use clean insulating oil.
9. Inspect all insulators in the switch. Look for cracking, chipping, or tracking. Repair or replace damaged units. Order new parts if necessary.
10. Check and, if necessary, tighten all bolts and electrical connections.
11. If present, inspect, clean, and/or repair the insulating barrier boards per SOP WC 624 HVE 062, Clean, Repair, Replace Insulating Barrier Boards.
12. Inspect, clean, and dress the contacts, main and arcing. If a contact requires replacement, note the switch manufacture, switch type, switch serial number, and part number(if available) so the contact can be ordered.

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13. Close each switch way and perform contact resistance test across each switch position contacts.

14. Open each switch way and perform insulating resistance tests: phase to phase, and each phase to ground. Note the switch buses are being tested. Test a 34.5 kv switch at 5000 volt DC and a 11.5 kv switch at 2500 volt DC.

Note - The tester will wear insulating rubber gloves, hard hat, safety shoes, safety glasses, and Nomex coveralls while performing electrical tests. Personnel will stay clear of switch while testing is in progress.

15. Install the switch top and it's gasket. Torque all fastening nuts and bolts to manufacture's specifications. Put bottom cable termination covers back on.

16. Using an oil filtering pump, pump oil back into device. If the existing oil is visually in poor condition, black or brown color and sludge present, then pump in new oil.

- a) Connect pump/filter and hose assembly to device's bottom drain valve.
- b) Turn pump on and open the device's drain valve's test port. Pump oil into a container till no air bubbles are present in the oil stream. At this point close the test port; open the drain valve and fill the tank to the proper level.

17. Obtain a sample of the oil and test it's dielectric strength.

- a) Pumping existing oil - If the oil tests greater than 25 kv proceed with procedures. If the oil tests below 25 kv, then oil has to be filtered and retested till the 25 kv point is reached. If 25 kv can not be obtained, replace the existing oil. Follow new oil procedure below.
- b) Pumping new oil - Test the new oil prior to placing in the device. If the oil is less than 30 kv obtain another batch of oil. Test the new oil after it has been placed in the device. If the oil tests below 30 kv, then oil has to be filtered and retested till the 30 kv point is reached.

18. Settling time - If air has been introduced into the switch's insulating oil by (a) not following the pumping procedure, (b) air bubbles in the oil stream, (c) air pumped into oil due to emptying the new oil container, (d) oil has been through a filter operation, then the switch will have to have a settling time of 8 hours. The settling time can be reduced to 1 hour by placing a vacuum in the oil tank. Do not exceed the tank's pressure strength. If this is not known then a 5 psig vacuum should be used.

19. Place a vacuum in the device's tank, if not already done, and install a 3 psig Nitrogen blanket over the tank's oil surface.

20. Inspect the switch one more time to ensure there are no oil or termination leaks.

PM SECTIONALIZING OIL SWITCH

21. Operations personnel will energize the primary circuit and transformer per SOPs
  - a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
  - b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

END