NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

REPAIR OIL LEAK AT BUSHINGS, VALVES, OR GAUGES

PROCEDURE NUMBER

WC 624 HVE 054

SIGNED:_____

(DATE)

APPROVED:_____

(DATE)

SAFETY PROFESSIONAL:_____

(DATE)

MANAGEMENT OFFICIAL:_____

(DATE)

REVISION A

DISTRIBUTION

CODE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE	REV/DATE
601.C3							
620							
622							
610.E1							
622.3							

REVISIONS

REV	DESCRIPTION	SIGNATURE	DATE
A	Initial Issue.		

Purpose:
Procedure to repair an oil leak on a transformer or switch. The leak can be at a bushing, valve, or gauge.

Potential Energy Sources:
1. 34.5/11.5/4.16 kv cables and equipment.
2. Generators if installed at facilities to provide temporary power during the transformer change out.

Tools and PPE:
Tools: Hand tools, high voltage tester, Multimeter, oil pump, oil filter, and oil dielectric test set.
PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes(oil resistant), 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. IEEE Guide for Acceptance and Maintenance of Insulating Oil in Equipment, C57.106-1991.
5. SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)
6. SOP WC 622 HVE 007, Switchout And Switchback Energized

Procedures:
1. WC 622 personnel will deenergize the primary circuit per SOPs
    a) WC 622 HVE 007, Switchout and Switchback Energized Circuit
    b) WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout)

WC 622 personnel will ensure that the facility's emergency generator or temporary power generator, if present, is isolated and will not back feed to the equipment being serviced.

2. 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 a known energized circuit 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 WC 622 personnel that the circuit is still energized, (b) wait for WC 622 personnel to correct the problem, (c) perform the deenergization verification test once again after WC 622 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.

If the primary circuit's cables can not be accessed, then go to another transformer site on the same circuit, which has accessible conductors, and perform the deenergization verification test there.

3. If applicable, test the transformer's secondary side for voltage. If the facility's power voltage is less than 300 volts, wear Nomex coveralls, safety shoes, and hard hat, and avoid contact with energized components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves. If voltage is detected, stop the test and (a) notify WC 622 personnel that the secondary is still energized, (b) wait for WC 622 personnel to correct the problem, (c) perform the deenergization verification test once again after WC 622 personnel finish switching operations and declare the secondary side is deenergized.

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

4. Open the top of the transformer or switch and drain the oil to a point below the device which is leaking. Place oil into clean, dry, 55 gallon drums. Cover the drums tightly during the repair work.

<u>Leaking Bushing</u>

5. Disconnect wires connected to the leaking bushing.

6. Remove the bushing from the tank wall.

7. Clean the bushing and tank surface where bushing is mounted.

8. Reinstall bushing.
    a) Obtain or make a new gasket. The gasket will be made from cork or oil resistant paper.
    b) Apply gasket cement to surfaces.
    c) Install bushing and secure with bolts.
    d) Reconnect wires to bushing.

<u>Valve Or Gauge Leak</u>

5. Remove valve, pipe, or gauge.

6. Clean all surfaces.

7. Apply teflon tape or pipe sealant to surfaces and reinstall the valve, pipe, or gauge.

9. Put the top of the oil switch or transformer back on and bolt down.

10. Using an oil filtering pump, pump oil back into device.
    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.

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

12. Settling time
    a) Oil Switch - 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.
    b) Transformer - The transformer's settling time will be 12 hours. Because there will be a 3 psig Nitrogen blanket placed, place a 5 psig vacuum on the tank during the settling time. Do not exceed the tank's pressure strength. If this is not known then a 3 psig vacuum should be used.

13. Place a 5 psig vacuum in the device's tank, if not already done, and install a 3 psig Nitrogen blanket over the tank's oil surface.

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

15. If the device repaired was a leaking transformer bushing, check the facility's voltage. If the facility's power voltage is less than 300 volts, wear Nomex coveralls, safety shoes, and hard hat and avoid contact with energized components while measuring the voltage. If the facility's voltage is greater than 300 volts, wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, and insulating rubber gloves.

16. Inspect the device repaired to ensure the oil leak was repaired. Wear Nomex coveralls while visually inspecting.

END