DISCLAIMER: These Standard Operating Procedures (SOP's) are for the exclusive use of Navy Public Works Center (PWC) Norfolk. They are promulgated as guidance for their NAVFAC Commands. If intended to be used by other activities, they must be tailored to each activity's particular requirements and must be reviewed/approved by the activity's safety professionals prior to use.

NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

PM 34.5 KV FUSED OIL SWITCH

PROCEDURE NUMBER

WC 624 HVE 072

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 perform preventative maintenance on a 34.5 kv fused oil switch.

Potential Energy Sources:
1. 34.5 kv cables and equipment.
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. Ops 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)

Ops personnel will ensure that the facility's emergency generator or temporary power generator, if present, is isolated and will not back feed to the transformer.

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

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 and, if necessary, the throat section. Place oil into clean, dry, 55 gallon drums. Cover the drums tightly during the repair work.

4. Unbolt and remove top from switch.

5. Clean the tank and parts inside with lint free rags.

6. Inspect all insulators in the switch. Look for cracking, chipping, or tracking.
Repair or replace damaged units. Order new parts if necessary.

7. Check fiber bolts on arc chutes if applicable.

8. Check and, if necessary, tighten all bolts and electrical connections.

9. Inspect, clean, and/or repair the insulating barrier boards per SOP WC 624 HVE 062, Clean, Repair, Replace Insulating Barrier Boards.

10. Inspect, clean, and dress the contacts. 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.

11. Remove the fuses. Clean the contact area of the fuses and fuse holders. Clean the insulating surfaces of the fuses and fuse holders. Put fuses back in when done.

12. Isolate the switch by disconnecting the flex connections.

14. Perform insulating resistance tests: phase to phase, and each phase to ground.
Refer to attached table.

15. Perform contact resistance test across each switch blade and fuse holder.

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

16. Reconnect the flex connections.

17. Install the switch top and it's gasket. Torque all fastening nuts and bolts to manufacture's specifications.

18. 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.

19. 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.

20. If necessary, following Steps 16-17 to fill switch's throat section with insulating oil.

21. 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.

22. 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.

23. Inspect the switch to ensure there are no oil or termination leaks.

24. Ops 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