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

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE
TERMINATE HIGH VOLTAGE CABLES
DISTRIBUTION OIL SWITCH

PROCEDURE NUMBER
WC 624 HVE 057

SIGNED: _____
(DATE)

APPROVED: _____
(DATE)

SAFETY PROFESSIONAL: _____
(DATE)

MANAGEMENT OFFICIAL: _____
(DATE)

REVISION

A

TERMINATE HIGH VOLTAGE CABLES DISTRIBUTION OIL SWITCH

Purpose:

Procedure to terminate high voltage cables onto a distribution oil switch.

Potential Energy Sources:

1. The cables being terminated can be a potential energy source if they have already been spliced into the underground circuit.
2. All cables already terminated on the oil switch

Tools and PPE:

Tools: Shotgun stick, cable cutters, hydraulic press, torch, and assorted hand tools. 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. ANSI C2-1987 National Electrical Safety Code
5. Electrical Transmission and Distribution Safety Manual, P-1060
6. SOP WC 622 HVE 013, Deenergization, Lockout, Tagout
7. SOP WC 622 HVE 007, Switchout and Switchback Energized Circuit

Procedures:

1. WC 622 will deenergize
 - a) the high voltage cables to be terminated if they are connected to an energized circuit.
 - b) All circuits terminated on the oil switch.

WC 622 will follow the following SOPs

WC 622 HVE 007, Switchout and Switchback Energized Circuit
WC 622 HVE 013, Deenergization, Lockout, Tagout

2. After the switch has been cleared for work by WC 622 personnel, test each circuit to verify it is dead. The circuit to be terminated can be tested at the work site. For each circuit already terminated on the switch, go to the closest transformer site, or overhead device, and test the circuit there.

Before a circuit's conductors are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each conductor separately, taking care not to cross

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phase during test. If voltage is detected, stop the test and (a) notify WC 622 personnel that the circuit(s) 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.

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.

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.
5. Remove spare way terminator covers if installing new circuit. Unbolt and remove the existing terminators if replacing circuit or terminators.
6. Cut the cables to proper length and prepare the cable ends per terminator manufacture's instructions.
7. Using a hydraulic press, install lugs onto the cable ends. Apply 130-C rubber insulating tape in accordance with the voltage of the cables. Apply semi-con(Scotch 13) tape for stress relief. Apply stress relief tape(Scotch 2220). Attach bond wire with shielding braid(Scotch 24) and solder in place.
8. Insert and secure terminations in the terminators per manufacture's instructions.
9. Bolt terminators to the switch tank. Take care to prevent chipping or breaking porcelain. If this occurs the terminator will have to be replaced.
10. Put the top of the oil switch on and bolt down.
11. 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.
12. 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,

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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.

13 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.

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

15. 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)

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

END