

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

**ELECTRICAL SUBSTATION CIRCUIT BREAKER
LINEUP SWITCHOUT AND SWITCHBACK**

**PROCEDURE NUMBER
WC 622 HVE 008**

**DISTR:
601A
610
620
WC 622**

SIGNED: _____ (DATE)

APPROVED: _____ (DATE)

SAFETY PROFESSIONAL: _____ (DATE)

MANAGEMENT OFFICIAL: _____ (DATE)

DATE: _____ REVISION DATE: _____

SUBSTATION CIRCUIT BREAKER LINEUP

SWITCHOUT AND SWITCHBACK

Purpose:

Procedure to switchout an energized substation circuit breaker lineup and to switchback the deenergized circuit breakers.

Potential Energy Sources:

1. 34.5 kv equipment and cables.
2. 11.5 kv equipment and cables.
3. 4.16 kv equipment and cables.

Tools and PPE:

Tools: shotgun stick, and ground cables. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, safety glasses. 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, NAVFAC P-1060
6. US Corps of Engineers Safety and Health Requirements Manual
7. PWC, Code 600, Lockout and Tagout Procedure
8. PWC SOP# 600 HVE 6, PWC Switching or Breaker Operation

Procedures:

1. When performing all switching operations, lockouts, and tagouts of this SOP, follow the Switching Package provided as per Code 600 Lockout and Tagout Procedure. If in an emergency situation perform all switching operations, lockouts, and tagouts as per verbal orders of foreman, general foreman, operations control personnel. Have a system one line available for reference. Refer to SOP#600 HVE 6, PWC Switching Or Breaker Operation and Code 600 Lockout and Tagout Procedure. Maintain constant radio communication with the operations control personnel.

SUBSTATION CIRCUIT BREAKER LINEUP SWITCHOUT AND SWITCHBACK

If there are any discrepancies between actual switch positions and the switch positions noted in the switching package, or orders given, stop the process and contact the foreman, general foreman, or director, in order to receive directions on how to proceed. All switching personnel will wear listed PPE.

SWITCHOUT

2. Transfer substation loads to alternate sources.

3. Check open the breaker then open, lock, and tag the first line side isolation device, in the field or in the substation, of each feeder breaker in the lineup. Then open the breaker. If a breaker has no line side isolation device, just open the breaker.
4. Open, lock, and tag the substation transformer's primary circuit breaker. If there is no primary circuit breaker then open, lock, and tag the transformer's secondary main breaker.
5. If the substation has a capacitor bank, open the bank's breaker and, using a shotgun stick close the capacitor bank's shorting links to insure capacitor discharge.
6. Test each incoming line, and the main bus, for deenergization. Before the circuit conductors and bus are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each deenergized circuit conductors separately, taking care not to cross phase during test. If voltage is detected, stop the test. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear listed PPE to test the circuit.
7. Attach grounds onto the circuits and main bus. Each circuit conductor and bus phase will be grounded. To attach grounds, first connect one ground cable end to station ground, or a grounded structure, then attach the other end to a fiberglass shotgun stick. Using the shotgun stick bleed off any static build up on the circuit conductor. Once the static has been bled off, attach the ground cable to the circuit conductor using the shotgun stick. Repeat for each phase. Follow Code 600's Lockout and Tagout Procedure concerning ground tags. Wear listed PPE to attach the grounds.

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SWITCHBACK

8. Test each incoming line, and the main bus, for deenergization. Before the circuit conductors and bus are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each deenergized circuit conductors separately, taking care not to cross phase during test. If voltage is detected, stop the test. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly. Wear listed PPE to test the circuit.
9. Remove all grounds placed during switchout. First , using a shotgun stick, remove ground connection on circuit conductor or bus phase. Second, using the shotgun stick, remove the ground connection on the station ground or grounded structure. Repeat for each phase. Follow Code 600's Lockout and Tagout Procedure concerning ground tags. Wear listed PPE to remove the grounds.
10. If applicable, open capacitor bank shorting links with a shotgun stick.
11. Remove lock and tag from the substation transformer's primary, or secondary main, circuit breaker and close the breaker. Verify that the substation's bus has voltage.

12. Close feeder breakers and capacitor breaker as per Switching package or verbal orders.

13. Remove locks and tags from substation breaker isolation devices and perform switching operations to place distribution system back into normal switching arrangement as per Switching package or verbal orders.