
NAVY PUBLIC WORKS CENTER
NORFOLK, VIRGINIA
UTILITIES DEPARTMENT

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE

REPLACE 600 VOLT OR LESS CIRCUIT INSTALLED IN CONDUIT

PROCEDURE NUMBER

WC 624 HVE 033

DISTR:
Code 601C.3
Code 610.E1
Code 620
Code 622
Code 622.3

SIGNED:_____
(DATE)

APPROVED:_____
(DATE)

SAFETY PROFESSIONAL:_____
(DATE)

MANAGEMENT OFFICIAL:_____
(DATE)

REPLACE 600 VOLT OR LESS CIRCUIT
INSTALLED IN CONDUIT

DATE:_____ REVISION DATE:_____

Purpose:
Procedure replacing a low voltage circuit(600 volt or less) installed in conduit.

Potential Energy Sources:
1. The following low voltage circuits:
   circuit being replaced
   energized circuits within the work area; overhead, underground, etc.
   any alternate energy source to circuit being replaced
2. Energized 34.5/11.5/4.16 kv cables and equipment within the work area;
   overhead, underground, etc.
3. 34.5/11.5/4.16 cables and equipment which are deenergized and not properly
   grounded per SOP WC 622 HVE 013, Hazardous Energy Control(Lockout,
   Tagout

Tool and PPE:
Tools: Voltage tester, hand tools, auger truck, bucket truck, crimping tool(XPJ), pop tool, hypress, hoist, cable lubrication, tape, cable cutters, pulling string or rope, fiberglass ladder, blast blankets, and manhole hook. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, orange vest, safety harness, 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. SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck
3. 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
4. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.
5. ANSI C2-1987 National Electrical Safety Code
6. Electrical Transmission and Distribution Safety Manual, P-1060
7. American Electricians' Handbook
8. SOP WC 622 HVE 013, Deenergization, Lockout, Tagout
9. SOP WC 622 HVE 007, Switchout and Switchback Energized Circuit

10. SOP WC 624 HVE 031, Overhead Voltage & Phase Rotation Checks, Circuits 480 Volts or less
11. SOP HVE 8, Electrical Manhole Entry

Procedures:

1. Deenergize the circuit to be replaced as per SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout). If any high voltage switching will be required to deenergize the circuit to be worked, then WC 622 will perform the switching operations per SOPs WC 622 HVE 013 and WC 622 HVE 007, Switchout And Switchback Energized Circuit. Other circuits, high or low voltage may have to be deenergized if they interfere with the work.

2. This work can occur in manholes, on distribution poles, on the ground in electrical vaults/rooms/buildings, or any combination of these locations. The following job rules list requirements based on the work location.

Overhead

a) Refer to the JHA for bucket personnel PPE. The PPE varies based on site conditions.

b) Ground personnel will wear hard hats, safety shoes, work gloves, and safety glasses.

c) Ground personnel will wear orange vests if working adjacent to a road or in a parking lot.

d) Ground personnel not involved with the work will watch the personnel working aloft.

e) Ground personnel will stay clear of area underneath the bucket unless the work dictates.

Manholes

a) Traffic control devices per SOP 600 HVE 12, Traffic Control Devices, will be required for work in, or adjacent to roads.

b) A top watch is required when ever personnel are in a manhole.

c) Refer to the JHA for the PPE of the personnel in the manhole as this will vary based on the site conditions.

d) Blast blankets will be placed over all energized circuits in a manhole. After the blast blankets are in place, personnel in a manhole may remove their Nomex hoods, insulating gloves, and insulating sleeves. Work gloves will still be worn.

e) Personnel top side will wear orange vests if the work is in, or adjacent to, a road. Top side personnel will also wear safety shoes, hard hats,

and work gloves.

Electrical Vault/Room/Building
a) Always wear Nomex coveralls, safety shoes, safety glasses, and work gloves while at the site. Wear hard hats if work is occurring over the personnels' heads.
b) Refer to JHA for switching PPE.

3. If necessary set up bucket truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details.

4. When operating a bucket truck the following safety rules will be followed.
a) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.
b) Do not use the bucket truck if winds exceed the truck manufacture's specified limit.
c) Do not perform energized work in wet weather, unless an emergency.
d) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.
e) Do not exceed the bucket's weight limitations.
f) Stand firmly on the floor of the bucket with both feet. Do not sit on the bucket's edge or use planks, ladders, or other such devices.

5. Insulate energized conductors within 3 feet of the work area. Insulate deenergized high voltage overhead circuits which have not been properly grounded as per Lockout and Tagout procedures within 3 feet of the work area. Personnel in the bucket shall wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat.

6. If necessary open manhole(s) and gas free per SOP 600 HVE 8, Electrical Manhole Entry.

7. Using a voltage tester, verify that the circuit to be replaced is deenergized.

8. Mark the conductors to be cut as per SOP WC 624 HVE 031, Voltage & Phase Rotation Checks, and cut the conductors.

9. Remove the old wires - Conductors may be pulled out of conduit by hand if possible. If the conductors are to large, heavy, or to many, use a hoist or auger truck winch to remove them. When using truck winch or hoist take a certified 1/2" cable sling and weave around the conductors to be removed. Use a

shackle to attach the sling to the winch line or hoist. Tighten up winch or hoist slowly till the wires are removed. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details. Attach a pull string, or rope, to the conductor end which is pulled through the conduit.

10. Install new conductors - When conductors can be pulled by hand, set up cable reel on cable jacks or uncoil wire on the ground. Attach wires to pull string, or rope, and place wires in conduit. If the wires can not be pulled by hand, use a truck or hoist. When using a truck pull the winch line through the conduit using the pull string, or rope. Attach, and tape, a wire grip to each wire and, attach the opposite end of the wire grip to the winch line using a shackle. An alternate method is to remove the wires' insulation and loop the winch line around the conductors and tape if required. When using a hoist, attach and tape a wire grip over the conductors and attach the opposite end of the wire grip to the hoist. An alternate method is to remove the wires' insulation and loop the pull string, or rope, around the conductors, tape if required, and attach opposite end to the hoist. Tighten up winch or hoist slowly till the wires are pulled through.

11. Splice/terminate the new conductors - The conductor may be spliced with compression sleeves, split bolts, or two bolt connectors. They should be properly insulated with 130-C rubber insulating tape and protected with vinyl tape. A layer of vinyl tape should be placed over the split or two bolt connectors before applying the 130-C tape. This will facilitate future tape removal. To terminate the conductors cut away enough insulation, being careful not to nick the conductors, at the conductor end and connect to the device being terminated on.

12. Reenergize the circuit to be replaced as per SOP WC 622 HVE 013, Hazardous Energy Control(Lockout, Tagout). If any high voltage switching will be required to reenergize the circuit to be worked, then WC 622 will perform the switching operations per SOPs WC 622 HVE 013 and WC 622 HVE 007, Switchout And Switchback Energized Circuit. Other circuits, high or low voltage may have to be reenergized if they interfered with the work.

13. Check circuit voltage and, if necessary, phase rotation per SOP WC 624 HVE 031.

13. Close manholes if necessary.

14. Remove insulation placed on energized conductors per Step 5. Remove insulation placed on conductors not properly grounded per lockout and tagout procedure. Personnel in the bucket shall wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, insulating rubber gloves and sleeves, and hard hat. Remove insulation in reverse order that it was placed.

15. Secure bucket truck per SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger.

END