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

STANDARD OPERATING PROCEDURE / JOB HAZARD ANALYSIS

TITLE
VOLTAGE & PHASE ROTATION CHECKS
CIRCUITS 480 VOLTS OR LESS

PROCEDURE NUMBER
WC 624 HVE 031

DISTR:
Code 601C.3
Code 610.E1
Code 620
Code 622
Code 622.3
Code 622.1

SIGNED: _____
(DATE)

APPROVED: _____
(DATE)

SAFETYPROFESSIONAL: _____
(DATE)

MANAGEMENT OFFICIAL: _____
(DATE)

DATE: _____ **REVISION DATE:** _____

VOLTAGE AND PHASE ROTATION CHECKS
CIRCUITS 480 VOLTS OR LESS**Purpose:**

Procedure to check voltage and phase rotation on an overhead circuit, 480 volts or less.

Potential Energy Sources:

1. Secondary service conductors, 480 volts or less
2. Energized 34.5/11.5/4.16 kv conductors within work area
3. Deenergized 34.5/11.5/4.16 kv conductors which are not included in the work and have not been grounded.
4. Generators

Tools and PPE:

Tools: Potential tester, phase sequence tester(rotation meter), hand tools. PPE: Nomex coveralls, Nomex hood, insulating rubber gloves, insulating rubber sleeves, hard hat, safety shoes, work gloves, safety glasses, orange vest, safety harness. 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. SOP WC 622 HVE 013, Deenergization, Lockout, Tagout
6. SOP WC 622 HVE 007, Switchout and Switchback Energized Circuit

Procedures:

1. If necessary, set up bucket truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger truck for details.
2. 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) When working on or around energized conductors or equipment in wet weather insure personnel performing work are properly trained and use the proper PPE.
 - 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.

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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.

3. The following rules will apply to job.

a) Bucket personnel working poles which have energized high voltage circuits(34.5/11.5/4.16 kv), or high voltage circuits which have not been properly grounded, within three feet of work area will wear Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves, and insulating rubber sleeves.

b) Bucket personnel working poles which have all high voltage circuits deenergized and properly grounded, or no high voltage circuits on the poles, will wear hard hats, work gloves, safety shoes, and safety harness if the secondary service being tested is less than 480 volts. Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves, and insulating rubber sleeves if the service being tested is 480 volts.

d) Ground personnel will wear hard hats, and safety shoes.

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

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

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

h) If ground personnel are present, then at least one of them will have been trained to operate the bucket in an emergency situation where the bucket personnel are no longer able to operate the bucket controls.

i) If a bucket truck is not needed personnel will wear hard hats, work gloves, and safety shoes if the secondary service being tested is less than 480 volts. Nomex coveralls, Nomex hood, safety glasses, safety shoes, hard hat, insulating rubber gloves, and insulating rubber sleeves if the service being tested is 480 volts.

4. Properly identify the circuit to be tested - Visually trace the circuit between the source and the service entrance transition. If the circuit can not be visually traced, then deenergize the conductors and use a tone generator to identify the circuit. Reenergize the service after identifying it.

5. Test for proper voltage at the source. If the voltage is correct at the source end, then check the voltage at the service entrance transition. If the voltage at the transition is correct, and the task was only to test voltage, stop.

6. If the voltage is incorrect, or no voltage detected, then correct the problem as per the appropriate SOPs, or have a work order opened for follow up repair work.

7. When the job is to check the phase sequence(phase rotation) of a three phase circuit do the following.

a) Connect a rotation meter to the three previously identified service conductors.

b) Operate the rotation meter. If the meter rotates clockwise, mark the service conductors to correspond with the meter's leads. If the meter operates counter clockwise, switch two of the meter's leads and then mark the service conductors.

If the conductors have to be cut, or changed out, the above procedure will provide a reference point when reconnecting.

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8. If a phase rotation meter is not available or it's use is not desired then the following steps can be followed.

a) When cutting conductors, mark the conductors with marking tape in two places and cut the cable between the marks. This should be done for all phase wires as well as the ground and neutral conductors.

b) When replacing a section of cable or wire, each conductor must be talked out, or toned, to insure that the markings on both ends correspond.

The above procedures can be used on high and low voltage circuits.

9. If necessary secure bucket truck. Refer to SOP WC 624 HVE 001, Set Up and Secure Bucket/Auger Truck, for details.

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