MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, ELECTRICAL DISTRIBUTION

SUPERVISOR, SHOP 82:_____
(DATE)

UTILITIES DIRECTOR:_____
(DATE)

PUBLIC WORKS SAFETY:_____
(DATE)

BASE SAFETY:_____
(DATE)

PUBLIC WORKS OFFICER:_____
(DATE)

1. Purpose. To establish Standard Operating Procedures (SOP's) to help ensure that electrical work is performed safely by qualified Shop 82 electrical workers who are trained and provided with appropriate safe work procedures, protective equipment and other controls. This program is intended to protect employees against electrical shock, burns and other potential safety hazards as well as ensure compliance with regulatory requirements applicable to electrical systems. The basic principles of this program are:

a. Minimize and/or eliminate working on exposed energized electrical circuits.

b. Utilize PPE and other equipment to mitigate potential electrical hazards.

c. Provide written guidance and training to support a safe working environment.

2. Background. This procedure provides employees of the MCB Camp Lejeune Electrical Distribution Shop (Shop 82) with safety requirements and guidance for anyone working on or near electrical components rated at 50 volts or above. The requirements address various aspects associated with work safety for electrical workers.

3. References.

a. Unified Facilities Criteria (UFC) 3-560-01, Electrical Safety O&M.

b. Marine Corps Occupational Safety and Health (MARCOR OSH) Program Manual (NAVMC DIR 5100.8).

c. ANSI/IEEE C2-2012, National Electric Safety Code (NESC).

d. Occupational Safety and Health Administration (OSHA)

(1) 29 CFR 1910.137, PPE, Electrical Protective Devices.

(2) 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout).

(3) 29 CFR 1910.269, Electrical Power Generation, Transmission and Distribution.

(4) 29 CFR 1910, Subpart S – Electrical.

e. NFPA 70-E, Standard for Electrical Safety in the Workplace.

4. Attachments.

a. Shop 82 Standard Operating Procedure, Lockout/Tagout.

b. Shop 82 Standard Operating Procedure, Work on or Near Exposed Energized Electrical Systems.

c. Shop 82 Standard Operating Procedure, Fall Protection Plan.

d. Shop 82 Standard Operating Procedure, Use and Care of Electrical Protective Rubber Goods and Live Line Tools.

5. Potential Hazards. Electricity-related hazards include:

a. Electric shock and burns. An electric shock occurs when electric current passes through the body. This can happen when touching an energized part. If the electric current passes across the chest or head, death can result. At high voltages, severe burns can result.

b. Arc-flash burns. An electric arc flash can occur if a conductive object gets too close to a high-amp current source or by equipment failure (for instance, while opening or closing disconnects). The arc can heat the air to temperatures as high as $35{,}000^{o}$ F, and vaporize metal in the equipment. The arc flash can cause severe skin burns by direct heat exposure and by igniting clothing.

c. Arc-blast impacts. The heating of air and vaporization of metal creates a pressure wave that can damage hearing and cause memory loss (from concussion) and other injuries. Flying metal parts are also a hazard.

d. Falls. Electric shocks and arc blasts can cause falls, especially from ladders or unguarded scaffolding/platforms.

6. Personal Protective Equipment (PPE).

a. All apparel, tools and equipment used on the job must comply with the associated references. Employees working in

areas where there are potential electrical hazards must be provided with and use PPE that is appropriate for the specific work to be performed. Regular inspections are also necessary to prevent the use of defective items on the job.

b. Any worker whose normal job includes working on or near exposed electrical equipment shall wear to work as a minimum:

(1) FR shirt (long-sleeve) and pants (or FR coveralls) with minimum arc rating of 8 cal/cm^2.

(2) Cotton or natural fiber underwear (conventional short sleeve t-shirt and briefs/shorts). T-shirts shall not have any organizational or other insignias or decals.

(3) Leather electrical hazard-rated (EH) work shoes/boots. Note: High voltage linemen are required to wear EH work shoes or boots while climbing.

c. Employees shall wear non-conductive head protection whenever there is a danger of head injury from electric shock or burns due to contact with live parts or from flying objects resulting from an electrical explosion.

d. Employees shall wear rubber insulating gloves where there is a danger of hand or arm contact with live parts or possible exposure to arc flash burns. Refer to Attachment (d) for use and care of electrical protective rubber goods and live line tools.

e. All PPE must be maintained in a safe, reliable condition and be inspected for damage before each day’s use and immediately following any incident that can reasonably be suspected of having caused damage.

7. Training.

a. Workers near energized, or potentially energized electrical circuitry of 50 volts to ground or greater, shall be trained in energized electrical safe work practices and procedures and retrained as necessary.

b. Employees must receive job safety training in avoiding the electrical hazards associated with working on or near exposed energized parts prior to performing energized electrical work. Such training will be provided when the employee is

initially assigned to the job and refresher training will be provided every three years or when conditions change. The following items are to be included in the training of Qualified Electrical Workers:

(1) The Lockout/Tagout Program, including safe work practices required to safely de-energize electrical equipment.

(2) Skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.

(3) Perform on-the-job training with a qualified electrical worker.

(4) The appropriate approach distances and the corresponding voltages to which the qualified electrical worker will be exposed.

(5) Selection and use of proper work practices, personal protective equipment, tools, insulating and shielding materials and equipment for working on or near energized parts.

(6) Recognition of signs and symptoms of electric shock, heart fibrillation, electric burns and proper first aid protocols for these conditions, to include Basic Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillator (AED), contacting emergency personnel and basic first aid.

c. Documentation of training shall be kept on file. Experience received by qualified electrical workers must be maintained for all personnel covered by this program. Documentation is necessary to demonstrate that individuals have met the training and experience requirements for the types of work being performed.

d. Supervisory personnel must conduct weekly safety meetings, but encourage other knowledgeable individuals to conduct training on specialized topics.

e. Meetings at the job site prior to the commencement of work are commonly called tailgate meetings. This meeting covers all aspects of the planned work, site hazards, safety precautions to be followed, special precautions, energy source controls and PPE. The individual in charge must conduct the job brief and must ensure that each crew member understands the precautions to be observed and the procedures to be followed.

These meetings shall be properly documented in the associated Tailgate Discussion Log Book.

8. Procedures.

a. Control of Hazardous Energy (Lockout/Tagout). Refer to Attachment (a).

b. Work on or Near Energized Electrical Systems. Refer to Attachment (b).

c. Fall Protection Plan. Refer to Attachment (c).

d. Use and Care of Rubber Goods and Live-Line Tools. Refer to Attachment (d).

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, LOCKOUT/TAGOUT PROGRAM

SUPERVISOR, SHOP 82:_____
(DATE)

UTILITIES DIRECTOR:_____
(DATE)

PUBLIC WORKS SAFETY:_____
(DATE)

BASE SAFETY:_____
(DATE)

PUBLIC WORKS OFFICER:_____
(DATE)

1. Purpose. To establish procedures for the protection of personnel and property against accidental, inadvertent start-up, or operation as work is performed on the MCB Camp Lejeune electrical distribution system.

2. Background. The requirements apply to all situations where the unexpected energizing of the system would be likely to endanger personnel and property; and is intended to apply to activities such as installing, repairing, operating and maintaining the system. When a system is to be de-energized for any reason, the appropriate equipment, processes and shutdown procedures are to be followed in order to render the system inoperable, tagged and locked.

3. References.

a. Marine Corps Occupational Safety and Health (MARCOR OSH) Program Manual (NAVMC DIR 5100.8).

b. Unified Facilities Criteria (UFC) 3-560-01, Electrical Safety, O&M.

c. OSHA 29 CFR 1910.147, Control of Hazardous Energy (Lockout/Tagout).

d. SOP, Shop 82 Electrical Distribution.

e. SOP, Shop 82 Use and Care of Electrical Protective Rubber Goods and Live-Line Tools.

4. Attachments.

a. Shop 82 Lockout/Tagout Log.

5. Potential Hazards. Electricity-related hazards include:

a. Electric shock and burns. An electric shock occurs when electric current passes through the body. This can happen when touching an energized part. If the electric current passes across the chest or head, death can result. At high voltages, severe burns can result.

b. Arc-flash burns. An electric arc flash can occur if a conductive object gets too close to a high-amp current source or by equipment failure (for instance, while opening or closing disconnects). The arc can heat the air to temperatures as high

as 35,000^{o} F, and vaporize metal in the equipment. The arc flash can cause severe skin burns by direct heat exposure and by igniting clothing.

c. Arc-blast impacts. The heating of air and vaporization of metal creates a pressure wave that can damage hearing and cause memory loss (from concussion) and other injuries. Flying metal parts are also a hazard.

d. Falls. Electric shocks and arc blasts can cause falls, especially from ladders or unguarded scaffolding/platforms.

6. Tools, Equipment and Personal Protective Equipment (PPE).

a. Refer to References (d) and (e).

7. Training.

a. Training shall be provided to all authorized and affected workers as required by references (b) and (c). Only Lockout/Tagout coordinators or authorized workers may perform Lockout/Tagout procedures.

b. Instructors qualified by the unit safety officer will conduct training and prepare a record certifying that employee training has been accomplished. Training records shall be maintained at Shop 82.

c. Retraining shall be conducted whenever there is:

(1) A change in job assignment, machine, equipment, or process that presents a new hazard.

(2) A change in the energy control procedures.

(3) Additional retraining shall be conducted whenever the annual evaluation or other reason indicates there may be inadequacies in personnel knowledge or use of energy control procedures.

8. Procedures.

a. Preparations. The authorized worker shall locate and identify all isolating devices to be certain which switch(es) or other energy isolating devices apply to the equipment to be locked or tagged out. All involved personnel, including non-

Shop 82 personnel, will be briefed as to the scope of the work, scheduled time and anticipated duration of the outage.

b. Procedures for Lockout/Tagout.

(1) The procedures for turning off the equipment so that it can be shut down in an orderly manner without endangering any personnel shall be thoroughly discussed in the Job Site Tailgate Meeting. All stored energy shall also be dissipated or properly restrained.

(2) Operate the circuit breaker or other energy isolating device(s) to ensure that the equipment is isolated from its energy source(s).

(3) Lock the switch, breaker, or disconnect in the proper position and place the tag. The locking device(s) shall be installed in such a manner as to forbid operation of the equipment.

(4) Tags that cannot be affixed directly to the energy isolating device shall be located close enough to be immediately obvious to anyone attempting to operate the device.

(5) Before performing any work, verify that the system is de-energized. A qualified person shall test circuit elements and electrical parts of equipment to which personnel will be exposed and verify all circuit elements and parts are de-energized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of circuit were de-energized. Test equipment shall be checked for proper operation immediately before and after this test.

(6) Enter all pertinent data into the attached Shop 82 Lockout/Tagout Log.

(7) If more than one worker is required to service a piece of equipment, each shall place their own assigned Lockout/Tagout device on energy isolating device(s). If necessary, an energy isolating device hasp may be used.

Attachment (a)

c. Restoring Machines or Equipment to Normal Operation.

(1) When service or maintenance is completed and machine or equipment is ready for normal operations, check the area around machines or equipment to ensure personnel are safe.

(2) After tools are removed from machine or equipment, guards reinstalled, personnel safely positioned or removed, and operating controls verified to be in safe or off position, remove all Lockout/Tagout devices and notify affected workers and responsible supervisor of their removal. Operate energy isolating devices to restore energy to machine or equipment.

(3) Complete applicable portions of Lockout/Tagout log.

(4) Ensure a signaling system is in place and effective for warning workers exposed to the unexpected release of energy during maintenance and servicing operations.

(5) If more than one worker is involved, each worker will remove their lock from the gang hasp as that worker finishes their portion of work. Only the last worker to remove their lock or tag may re-energize the machine or equipment. Each person applying a lock or tag shall make an entry into the Lockout/Tagout log when applying the device, and clear their device from the log when their portion of work is completed.

d. Removal of Lockout/Tagout Devices by Other Than Authorized Worker. Lockout/Tagout devices may be removed by the Lockout/Tagout coordinator if the authorized worker who applied it is not available, and:

(1) All reasonable efforts have been made to contact the authorized worker about the need to remove Lockout/Tagout device.

(2) The authorized worker will be informed that the Lockout/Tagout device has been removed before resuming work at the facility.

(3) An appropriate entry shall be made in the Lockout/Tagout log to indicate the name of the person who notifies authorized worker, and the time and date lock/tag was removed.

SHOP 82 LOCKOUT/TAGOUT LOG

DEVICE TYPE, SER NO, & SEQ NO	EQUIPMENT ID &/OR DESCR. & LOCATION	PURPOSE	POS. TAG'D	DATE & TIME	AUTHORIZED WORKER SHOP/CODE	CLEARANCE AUTHORIZED BY*	REMOVED BY*	DATE & TIME REMOVED

Signature:_____

Shop/Unit:_____

Attachment (a)

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, WORKING ON OR NEAR EXPOSED ENERGIZED ELECTRICAL SYSTEMS

SUPERVISOR, SHOP 82:_____
(DATE)

UTILITIES DIRECTOR:_____
(DATE)

PUBLIC WORKS SAFETY:_____
(DATE)

BASE SAFETY:_____
(DATE)

PUBLIC WORKS OFFICER:_____
(DATE)

1. Purpose. To establish safety related work practices and personal protective equipment (PPE) required to work on or near exposed energized electrical systems.

2. Background. When a person is exposed to an exposed energized conductor, he or she is at risk of injury not only to themselves, but also to others nearby. The hazards of working on or near exposed energized electrical conductors can result in electrical shock, electrocution, arc flash burns, arc blast, thermal burns, respiratory contamination and other physical trauma injuries related to falling or being struck by objects due to an arc blast. The definition of energized work is “work on or near (e.g. part of tools being used or worker’s body less than the minimum working distance (restricted approach boundary) for energized or potentially energized lines (i.e., grounding, live line tool (hot stick) work, gloving and bare hand work)).”

3. References.

a. Unified Facilities Criteria (UFC) 3-560-01, Electrical Safety O&M, Change 4.

b. SOP, Shop 82 Electrical Distribution.

c. SOP, Shop 82 Use and Care of Electrical Protective Rubber Goods and Live-Line Tools.

4. Enclosures.

1. SOP, Covering Energized Circuit with Rubber Protective Equipment.

2. SOP, Setting Utility Pole, Energized Circuit.

3. SOP, Replace an Insulator on a Cross Arm, Energized Conductors.

4. SOP, Install Fused Disconnects Overhead

5. SOP, Install/Replace Surge Arrester on a Utility Pole.

6. SOP, Remove/Replace Fused Disconnects Overhead.

7. SOP, Repair Overhead Electrical Conductors, Energized

8. SOP, Terminate High Voltage Cables, Elbow Connectors.

Attachment (b)

9. SOP, Terminate High Voltage Cables, Primary Air Switch.

10. SOP, Terminate High Voltage Cables, Underground to Overhead Transition.

11. SOP, Replace High Voltage Pole Mounted Transformer.

5. Potential Hazards. AC electrical potential above 50 volts, DC electrical potential above 50 volts, and associated mechanical devices.

6. Personal Protective Equipment (PPE).

a. Refer to enclosures (1) through (12) of this SOP for specific task-specific PPE requirements.

7. Training. Employees who are required to work on or near exposed energized electrical systems must be trained and thoroughly knowledgeable of this SOP. Training procedures are specified in reference (b).

8. Procedures. Electrical equipment/conductors to which an employee could be exposed shall be put in a safe work condition before the employee works on or near them.

a. All energized work requires written, task-specific procedures approved, in writing, by the Commanding Officer and considered necessary to support a critical mission, prevent human injury, or protect property. These procedures shall contain all appropriate safe work practices and PPE necessary to protect employees from the hazards associated with energized electrical work as required in references (a) and (b). Established below are the safety parameters for specific energized tasks.

b. Limits of Approach. The approach boundaries are specified distances from an exposed energized conductor that identify established requirements for additional safety measures. See Figure 1 to view a graphical approach boundary representation. The voltages to be used in determining the approach boundaries are the nominal phase-to-phase voltages. See Table 1 for approach distances for various system voltages. When working on systems of a lower voltage requires working near a higher voltage, the approach boundaries of the higher voltage are also applicable. If the lower voltage work requires working

inside the restricted approach boundary of high voltage (above 600 volts), the worker shall be a qualified person for high voltage work and wear the appropriate PPE or the high voltage circuits shall be put in a safe work condition. Overhead conductors on utility poles shall always be considered exposed (bare) regardless of the appearance of insulation.

c. Limited Approach Boundary. Any activity within the limited approach boundary is considered “working near”. A qualified person shall take measures as necessary to prevent anyone from entering the limited approach boundary that is not a qualified person or is knowledgeable of the task to be performed. This may involve the use of barricades, barricade tape, signs, or other means as necessary to control access. If signs and barricades do not provide sufficient warning and protection from the electrical hazards, an attendant shall be stationed to warn and protect employees or a safe work condition re-established.

Any object that is not fully insulated for the circuit voltage is considered to be conductive. Voltage rated hand tools must meet ASTM F 1505 or be considered conductive objects and be subject to the approach boundaries as an extension of the employee’s body.

(1) The minimum approach distance for an unqualified person is 10 ft (3m).

(2) An unqualified person, wearing the required PPE, can be allowed to cross the limited approach boundary only if a qualified person advises him or her of the possible hazards, provide the proper PPE and provides a continuous escort while inside the approach boundary.

d. Minimum Working Distance (Restricted Approach Boundary). Under no circumstances shall an unqualified person be permitted to cross the restricted approach boundary prior to a safe work condition being established. No qualified person shall approach or take any conductive object, hot stick or voltage rated hand tool closer to the exposed energized conductor than the restricted approach boundary, unless he or she meets all the following conditions:

(1) Follow the approved task-specific SOP.

(2) Use only voltage rated tools.

(3) Use appropriate PPE for protection from shock.

(4) Use appropriate PPE for arc flash protection.

(5) Minimize the risk from inadvertent movement by keeping as much of the body out of the restricted space as possible, using only protected body parts in the restricted space as necessary to accomplish the work.

(6) Be certain that no un-insulated part of the body crosses the prohibited boundary.

e. Prohibited Approach Boundary. No un-insulated part of the body shall be allowed to cross the prohibited approach boundary. Crossing the prohibited approach boundary is considered the same as making contact or “working on”. Troubleshooting, taking voltage readings, applying safety grounds, insertion or removal of revenue meters, installing or removal of individual starter buckets in a motor control center, and any work involving moving an exposed, energized conductor are also considered “working on.”

f. Flash Protection Boundary. The flash protection boundary is intended to trigger the need for PPE that can protect the worker from thermal injury. A conservative default flash protection boundary has been established at 4 feet for voltages between 50 and 600 volts. A conservative default flash protection boundary for electrical systems operating at greater than 600 volts has been established at 20 feet.

g. Required Safe Work Practices for Energized Work. The following procedures are general step-by-step work practices for each specific energized task.

(1) Access Job Site. Only qualified persons shall perform energized work. Examine job site for hazardous conditions and determine means to abate hazards.

(2) Job Site Setup. Flash protection boundary for low voltage systems is 4 feet. Determine limited approach boundary and restricted approach boundary using Table 1 and limit access within the limited approach and flash protection boundaries to qualified personnel only.

(3) Tailgate Meeting. Conduct a pre-job briefing to address all hazards and plan work. These meetings shall be

properly documented in the associated Tailgate Discussion Log Book.

(4) Inspect PPE, voltage-rated tools and test equipment. Perform a pre-use rubber goods and live-line tools inspection per reference (c).

(5) Don PPE. Remove all conductive articles of clothing or jewelry. Don all PPE and conduct proper grounding of equipment as required in enclosed task-specific SOPs.

(6) Perform Task. Perform task per enclosed task-specific SOP.

h. Overhead Work. Employees whose duties require work on overhead electrical conductors or equipment should be thoroughly knowledgeable of the portions of the associated references that are relevant to his/her work assignments. Use an arc-rated body harness with a secured safety lanyard for any work from an aerial bucket. Voltage of circuits (less than 600V) shall be treated as that of the highest voltage occupying one or more poles on which the circuit is run.

Table 1. Qualified Worker Minimum Approach Distances.

	Flash Protection Boundary	Limited Approach Boundary		Restricted Approach Boundary (3)	Prohibited Approach Boundary
Nominal System Voltage Range Phase-to-Phase (1)	From Phase-to-Phase Voltage	Exposed Movable Conductor	Exposed Fixed Circuit Part	Includes Standard Inadvertent Movement Adder	Includes Reduced Inadvertent Movement Adder
50V-300V	(2)	10ft 0in	3ft 6in	Avoid Contact	Avoid Contact
>300V-750V	(2)	10ft 0in	3ft 6in	1ft 0in	0ft 1in
>750V-15kV	(2)	10ft 0in	5ft 0in	2ft 2in	0ft 7in
>15kV-36kV	(2)	10ft 0in	6ft 0in	2ft 7in	0ft 10in

Notes for Table 1:

1. For single phase systems select the range that is equal to the system's maximum phase to ground voltage times 1.732.

2. The flash protection boundary is the distance from a potential arc source that triggers the need for PPE to protect employees from arc flash hazards. A conservative, default flash protection boundaries has been established at 4 feet for voltages between 50 and 600 volts. The flash protection boundary for electrical systems operating at greater than 600 volts should be determined by a flash hazard analysis, or, in lieu of a flash hazard analysis, a conservative default flash protection boundary for voltages above 600 volts has been established at 20 feet.

3. The restricted approach boundary as applied to hot sticks is the minimum distance permitted between a worker's hand and the working end of the stick.

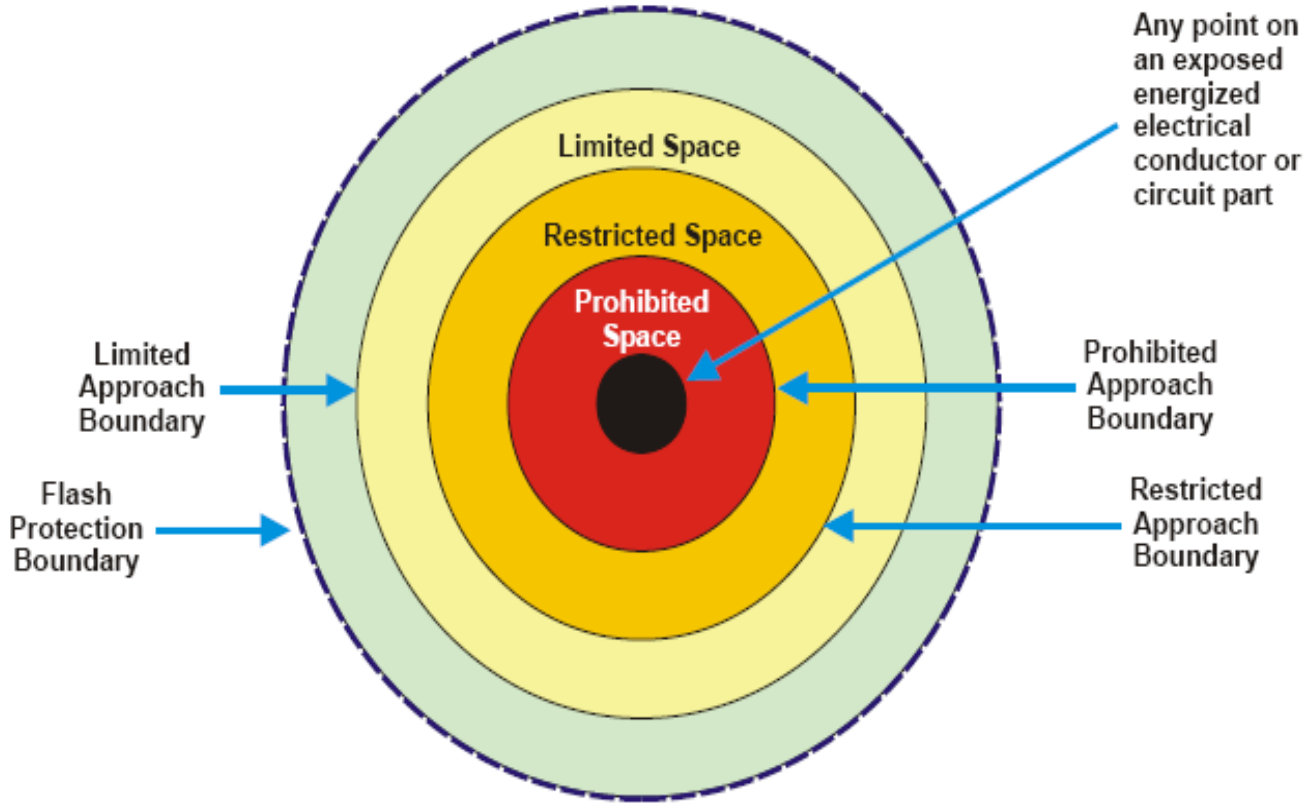

Figure 1. Approach Limits.

Attachment (b)

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, COVERING ENERGIZED CIRCUIT WITH RUBBER PROTECTIVE EQUIPMENT

1. Purpose. Procedure to insulate an energized overhead circuit with insulating rubber goods.

2. Potential Energy Sources.

a. Energized circuit being insulated.

b. Energized circuits in close proximity of work.

c. Deenergized circuits which are not included in the work and have not been grounded.

3. Tools and Personal Protective Equipment (PPE).

a. Tools. Bucket truck, rubber hoses, rubber blankets.

b. PPE. Fire Resistant (FR) rated uniforms, insulating rubber gloves, hard hat, safety shoes, safety glasses, safety vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. Occupational Safety and Health Standards for General Industry (29 CFR PART 1910): Subpart I, Personnel Protective Equipment - 1910.137, Electrical Protective Equipment; Subpart R, Electrical Power Generation /Transmission / Distribution; Subpart S, Electrical.

c. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

d. Electrical Transmission and Distribution Safety Manual, P-1060.

e. ASTM F 478-92 - Specification for In-Service Care Of Insulating Line Hoses and Covers.

f. ASTM F 479-93 - Specification for In-Service Care Of Insulating Blankets.

g. ASTM 496-93b - Specification for In-Service Care Of Insulating Covers, Gloves, and Sleeves.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Set up bucket truck per Reference (a). Be sure to ground truck if not sure a deenergized circuit has been properly grounded.

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer's specified limit.

(3) Do not perform energized work in wet weather.

(4) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

c. The following rules will apply to job:

(1) Bucket personnel will wear FR uniforms, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves and a back brace if required to wear one.

(2) Ground personnel will wear hard hats, safety shoes, work gloves, safety glasses and safety vest.

(3) Ground personnel will wear safety vests if working adjacent to a road or in a parking lot.

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

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

(6) 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.

d. Inspect the rubber protective equipment prior to each use.

(1) Rubber Blankets: Lay the blanket flat on any clean, dry surface. Start in one corner of the blanket, pull and roll the blanket, looking for signs of damage.

(2) Line Hose, Cable End Caps, and Composition Equipment: Examine the outer surfaces of the item for signs of damage. Inspect the inside by opening and stretching the rubber equipment and looking for signs of damage.

(3) Check the test date on the item. The test date must be within one year of the current date.

(4) Do not use an insulating rubber good if:

(a) There is a hole, tear, or puncture in it.

(b) There is evidence of ozone cutting or ozone checking.

(c) There is an embedded object in it.

(d) There is a texture change such as swelling, softening, hardening, sticky area, or an inelastic area.

(e) The test date is greater than one year from the current date.

Note: Defective rubber good may be used provided they are repaired.

(f) Rubber insulating line hose can be used in shorter lengths with the defective portion cut off.

(g) Rubber insulating blankets may be repaired using a compatible patch that results in physical and electrical properties equal to those of the blanket. A repaired blanket must be retested prior to use.

(h) A rubber blanket may be salvaged by cutting away the defective area. The resulting, undamaged, blanket may not be smaller than 24 inches (2 feet) X 24 inches (2 feet) square for a Class 1, 2, 3, 4, blanket.

e. Place the protective rubber equipment.

(1) Place on one phase at a time.

(2) Place on nearest and lowest conductor first, and then the next till all conductors to be insulated are covered.

(3) At a minimum insulate an energized conductor to a point which is 3 feet outside the work area.

f. Remove the rubber goods one phase at a time, and in reverse order of how they were placed.

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, SETTING UTILITY POLE, ENERGIZED CIRCUIT

Enclosure (2)

1. Purpose. Setting a utility pole in energized circuits.

2. Potential Energy Sources.

a. Energized conductors within close proximity.

b. Deenergized conductors which have not been properly grounded.

c. Underground utilities.

3. Tools and PPE.

a. Tools: Bucket truck, auger truck, rubber line hoses, insulating blankets, insulator hoods, insulated pole guards, hot stick, cant hook, shovel, tamp, certified lifting sling.

b. PPE: Insulating rubber gloves, FR uniforms, hard hat, safety glasses, safety shoes, safety harness, safety vest, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E, Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts.

d. ANSI C2-1987, National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman's and Cableman's Handbook.

g. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

h. Shop 82 SOP, Lockout/Tagout.

i. PWD Locates SOP

5. Procedures.

a. Have all underground utilities located prior to arriving at job site. Contact respective PWD Utilities Branch Shops to locate utilities owned by PWD and contact appropriate utilities to locate utilities not owned by PWD.

b. All personnel shall wear hard hats, work gloves, safety shoes, and safety vests if work is adjacent to a road or in a parking lot.

c. Check the site of the pole placement. Verify that underground utilities were inspected for and marked. Check for above ground and overhead obstructions. Adjust pole location to have 10 foot clearance of any overhead obstruction.

d. Set up bucket truck and/or auger truck per Reference (a).

e. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer's specified limit.

(3) Do not perform energized work in wet weather, unless an emergency.

(4) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

f. Insulate all energized overhead circuits which are within 3 feet of working area. Insulate any deenergized overhead circuits that have not been properly grounded as per Reference (h). Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves and hard hat.

g. Prepare auger truck for use. Raise boom from cradle and release auger from boom. All personnel have to be alert to boom and auger movement. The auger operator will be alert to movement by the bucket as well as any conductors or other obstructions that the boom may contact.

h. Dig the hole. VERIFY ALL UTILITIES HAVE BEEN LOCATED AND MARKED PRIOR TO DIGGING. All holes will be at least 6 feet deep. As a general rule, for every 5 foot of pole greater than 30 feet add 1/2 foot to the hole depth. Personnel will stay clear of the digging unless they have to clear loose dirt from around the hole or auger. When clearing dirt, personnel will be alert to boom and auger movements. All personnel shall wear safety glasses during the digging operation. If the hole will be left unattended, ensure it is securely marked to prevent entrance to the site.

i. Secure the auger. Ground personnel and the auger operator will be alert to a possible hazard of the auger suddenly falling while being stored in its cradle. This possible problem is due to the auger steel sling snapping as the auger is turned into its locking position.

j. Set new pole. Place insulated pole guards on pole, then place pole in position to set with boom and certified lifting sling. Ground personnel will be alert to all pole movements and those not assisting positioning the pole will clear the area of pole movement. Personnel assigned to handle the pole butt during setting will wear insulating rubber gloves, safety glasses, safety shoes and hard hat. Personnel handling the pole butt will not place any un-insulated part of their body on the pole. The auger operator will slowly bring the boom into position as the ground personnel guide the pole butt to the hole. As the butt is being moved, caution will be exercised to prevent the pole top from touching energized circuits. Once the pole is in the hole turn and line up pole into proper position.

k. Backfill and tamp hole. Place dirt back in hole, using shovels, and pack firm with a tamp. Once the backfill is complete, remove the lifting sling and the auger operator will secure the boom in its cradle.

l. Remove the insulating material from the overhead conductors. Remove insulating material in reverse order of placement. Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and safety belt. If pole is to be left unworked, the pole guards will remain.

m. Secure and remove trucks per Reference (a).

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STANDARD OPERATING PROCEDURE

SHOP 82, REPLACE AN INSULATOR ON A CROSS ARM, ENERGIZED CONDUCTORS

Enclosure (3)

1. Purpose. Procedure to replace a pole line insulator supporting energized conductors.

2. Potential Energy Sources.

a. Energized conductors within work area.

b. Deenergized conductors within work area which have not been properly grounded.

3. Tools and PPE.

a. Tools: Bucket truck, hand line, rubber hoses, rubber blankets, and insulator hoods.

b. PPE: Fire resistant (FR) uniforms, insulating rubber gloves, hard hat, safety shoes, work gloves, safety glasses, safety vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts.

d. ANSI C2-1987 National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman’s and Cableman’s Handbook.

g. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

h. Shop 82 SOP, Lockout/Tagout.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer’s specified limit.

(3) Do not perform energized work in wet weather.

(4) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket’s weight limitations.

(6) 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.

c. Insulate all energized overhead circuits which are within 3 feet of work area per Reference (g), Enclosure (1). Insulate any deenergized overhead circuits that have not been properly grounded per Reference (h). Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves and hard hat.

d. In order to replace the insulator, personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes,

insulating rubber gloves, and hard hat. Ground personnel will wear hard hat, safety shoes, gloves, and safety vests if work is adjacent to a road or in a parking lot. Personnel in the bucket will carry a hand line aloft with them.

e. Remove conductor from existing insulator by removing tie wire securing conductor to insulator. Lower or raise conductor from cross arm using a hand line.

f. Remove and replace the insulator. Unbolt and remove old insulator and arm pin. Install the new arm insulator and arm pin. The new insulator should have the same voltage rating and be the same type; pin or post, straight or angle, as the replaced one. Secure bolt on arm pin with the insulator in the proper position.

g. Place the conductor on the new insulator and secure it. Use the hand line to place the conductor on the insulator. The conductor should be placed so the securing tie wire will have minimum strain on it. The insulator and pin are to take the strain of the conductor. The tie wire just holds the conductor in place. Some general rule for tie wires are as follows:

(1) The tie wire will be the same kind of wire as the conductor, copper tie for copper wire, aluminum tie for aluminum wire, covered tie for covered conductor.

(2) Use soft annealed wire.

(3) Use solid wire.

(4) Never reuse a tie wire.

(5) In general use #6 tie wire for conductors #4 and smaller, and use #4 tie wire for conductors greater than #4.

h. Secure the conductor tightly via standard tying methods as any looseness between the tie wire, conductor, and insulator will lead to chafing and injury to the conductor. Personnel in the bucket will add FR uniforms to PPE while doing this task.

i. Remove insulating material from overhead conductors. Usually remove insulators in reverse order from which they were placed. Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat.

j. Secure bucket truck per Reference (a).

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STANDARD OPERATING PROCEDURE

SHOP 82, INSTALL OVERHEAD FUSED DISCONNECTS

Enclosure (4)

1. Purpose. Procedure to install overhead fused disconnects.

2. Potential Energy Sources.

a. Energized circuits in close proximity of work.

b. Deenergized circuits which are not included in the work and have not been grounded.

c. Generators supplying temporary power to facilities which have had their normal power switched off due to this work.

3. Tools and PPE.

a. Tools: Bucket truck, rubber hoses, rubber blankets, rubber insulator hoods, cutters, hand tools, high voltage tester.

b. PPE: Fire resistant (FR) uniforms, insulating rubber gloves, hard hat, safety shoes, work gloves, safety glasses, safety vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

d. ANSI C2-1987 National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman's and Cableman's Handbook.

g. Shop 82 SOP, Lockout/Tagout.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacture's specified limit.

(3) Do not perform energized work in wet weather.

(4) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

c. If the disconnects are being installed on an existing circuit, Shop 82 personnel will deenergize the circuit as per References (g) and (h). If the disconnects are being installed

on a new circuit, or a new lateral off an existing circuit, the conductors are already deenergized.

d. Insulate energized conductors within 3 feet of the work area per Reference (h), Enclosure (1). Insulate deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been grounded as per Reference (g).

e. Personnel shall wear listed FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat for this step. If Shop 82 deenergizes a circuit, test the circuit, using a high voltage tester test the circuit to be worked on to verify it is deenergized. Before the circuit conductors 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 and (a) notify Shop 82 personnel that the circuit is still energized, (b) wait for Shop 82 personnel to correct the problem, (c) perform the deenergization verification test once again after Shop 82 personnel finish switching operations and declare the circuit deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly.

f. The following rules will apply to job.

(1) Bucket personnel working poles which have energized circuits or circuits which have not been properly grounded will wear FR uniforms safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves, and a back brace if required to wear. The circuits in question have been insulated per Step d.

(2) Bucket personnel working on poles which have all other high voltage circuits deenergized and properly grounded, or which have no other circuits on the poles, will wear hard hats, work gloves, safety shoes, safety harness, safety glasses when required, and a back brace if required to wear

(3) Personnel in the bucket will carry a hand line aloft with them.

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

(5) Ground personnel will wear safety vests if working adjacent to a road or in a parking lot.

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

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

(8) 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.

g. Install mounting disconnect brackets - Ensure the brackets are mounted in proper position and are secured tightly to the pole crossarm. Mount the brackets in a position such that required clearances are met.

h. Install new disconnects on mounting brackets.

i. Connect jumpers from the load side of the disconnects to the circuit or equipment being fed from the fused disconnects. The jumper should be sized to handle the anticipated maximum load. Position jumper to meet the required clearances.

j. Connect jumpers from the line side of the fused disconnects to the circuit that will feed the disconnects. Ensure that proper clearances are met. If necessary, attach jumper to the pole or crossarm using an insulator and tie wire. The jumper should be sized to handle the anticipated maximum load.

k. Insert fuse links in the disconnect doors. Size fuses per the anticipated load.

l. Place disconnect doors in on the load side of the disconnects. Ensure the doors are hanging in the open position and are securely in position

m. Remove insulation placed on energized conductors. Remove insulation placed on conductors which are not included in the work and have not been grounded as per Reference (g). Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Remove insulation in reverse order that it was placed.

n. Secure bucket truck per Reference (a).

o. Shop 82 personnel will energize the circuit or equipment as per References (g) and (h).

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STANDARD OPERATING PROCEDURE

SHOP 82, INSTALL/REPLACE SURGE ARRESTER ON A UTILITY POLE

Enclosure (5)

1. Purpose. Procedure to install or replace a surge arrester on a utility pole.

2. Potential Energy Sources.

a. Energized conductors within close proximity.

b. Deenergized conductors which have not been properly grounded.

3. Tools and PPE.

a. Tools: Bucket truck, rubber line hoses, insulating blankets, insulator hoods, Meggar (voltage depends on arrester voltage), ground tester, shotgun stick, hand line.

b. PPE: Insulating rubber gloves, FR uniforms, hard hat, safety glasses, safety shoes, safety harness, safety vest, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E, Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts.

d. ANSI C2-1987, National Electrical Safety Code.

e. NETA MTS-1993, Maintenance Testing Specifications.

f. Electrical Transmission and Distribution Safety Manual, P-1060.

g. The Lineman's and Cableman's Handbook.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

i. Shop 82 SOP, Lockout/Tagout.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer's specified limit.

(3) Do not perform energized work in wet weather, unless an emergency.

(4) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

c. Insulate all energized overhead circuits which are within 3 feet of work area per Reference (h), Enclosure (1). Insulate any deenergized overhead circuits that have not been

properly grounded per Reference (i). Note, the circuit the arrester is on, or being placed, may fall in either of these categories. Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves and hard hat.

d. In order to install/replace a surge arrester personnel in the bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Ground personnel will wear hard hats, safety shoes, gloves, and safety vests if work is adjacent to a road or in a parking lot.
Personnel in the bucket will carry a hand line aloft with them.

e. Remove old arrester if replacing a blown surge arrester; install new arrester bracket if placing a new arrester. When replacing a damaged arrester remove the primary and ground wires if still attached.

f. Visually inspect the new arrester for any chips or cracks.

g. Install new surge arrester. Bucket personnel will put on FR uniform, prior to making primary connections. Connect ground wire first, then, using a shot gun stick, connect the primary lead.

h. Remove insulating material from overhead conductors wearing PPE as per Step 5(c). Remove material in reverse order of placement.

i. Test surge arrester ground. Ground should test 25 OHMs or less. If greater, then personnel may have to drive new rod or add an additional rod.

j. Secure bucket truck per Reference (a).

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STANDARD OPERATING PROCEDURE

SHOP 82, REMOVE/REPLACE OVERHEAD FUSED DISCONNECTS

Enclosure (6)

1. Purpose. Procedure to remove and replace overhead fused disconnects.

2. Potential Energy Sources.

a. Energized circuits in close proximity of work.

b. Deenergized circuits which are not included in the work and have not been properly grounded.

c. Generators supplying temporary power to facilities which have had their normal power switched off due to this work.

3. Tools and PPE.

a. Tools: Bucket truck, rubber hoses, rubber blankets, rubber insulator hoods, cutters, hand tools, and high voltage tester.

b. PPE: Fire Resistant (FR) uniforms, insulating rubber gloves, hard hat, safety shoes, work gloves, safety glasses, safety vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E Approach Distances To Exposed Energized Electrical Conductors and Circuit Parts.

d. ANSI C2-1987 National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman’s and Cableman’s Handbook.

g. Shop 82 SOP, Lockout/Tagout.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer’s specified limit.

(3) Do not perform energized work in wet weather.

(4) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket’s weight limitations.

(6) 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.

c. Shop 82 personnel will deenergize the circuit and disconnects as per References (g) and (h).

d. Insulate energized conductors within 3 feet of work area per Reference (h), Enclosure (1). Insulate any deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been properly grounded per Lockout/Tagout procedures.

e. Personnel shall wear listed FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Using a high voltage tester, test the circuit to be worked on to verify it is deenergized. Before the circuit conductors 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 and (a) notify Shop 82 personnel that the circuit is still energized, (b) wait for Shop 82 personnel to correct the problem, and (c) perform the deenergization verification test once again after Shop 82 personnel finish switching operations and declare the circuit deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly.

f. The following rules will apply to the job:

(1) Bucket personnel working poles which have energized circuits or circuits which have not been properly grounded will wear FR uniforms, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves, and a back brace if required to wear. The circuits in question have been insulated per Step d

(2) Bucket personnel working on poles which have all other high voltage circuits deenergized and properly grounded, or which have no other circuits on the poles, will wear hard hat, work gloves, safety shoes, safety harness, safety glasses when required, and a back brace if required to wear

(3) Personnel in the bucket will carry a hand line aloft with them

(4) Ground personnel will wear hard hat, safety shoes, work gloves, and safety glasses

(5) Ground personnel will wear safety vests if working adjacent to a road or in a parking lot

(6) Ground personnel not involved with the work will watch the personnel working aloft

(7) Ground personnel will stay clear of area underneath the bucket unless the work dictates

(8) 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.

g. Remove risers from the line side of the disconnects.

h. Remove jumpers from load side of the disconnects. Jumpers may be rolled back and left attached to equipment or fastened to the circuit.

i. Remove the disconnects from the mounting brackets. Brackets which are positioned wrong or in deteriorated condition should be repositioned or replaced.

j. Install new disconnects on mounting brackets.

k. Reconnect jumpers onto the disconnects’ load side.

l. Reconnect or replace jumpers onto the disconnects’ line side.

m. Insert fuse links in the disconnect doors. Size fuses per the anticipated load.

n. Place disconnect doors in on the load side of the disconnects. Insure the doors are hanging in the open position and are securely in position.

o. Remove insulation placed on energized conductors. Remove insulation placed on conductors which are not included in the work and have not been grounded as per Reference (g). Remove insulation in reverse order from which they were placed. Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat.

p. Secure bucket truck per Reference (a).

q. Shop 82 personnel will energize the circuit or equipment as per References (g) and (h).

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STANDARD OPERATING PROCEDURE

SHOP 82, REPAIR OVERHEAD ELECTRICAL CONDUCTORS, ENERGIZED

Enclosure (7)

1. Purpose. Procedure to repair overhead electrical conductors while energized.

2. Potential Energy Sources.

a. Energized circuits in close proximity of work.

b. Deenergized circuits which are not included in the work and have not been grounded.

3. Tools and PPE.

a. Tools: Bucket truck, hand line, hot hoist or slack blocks, wire grips, rubber hoses, rubber blankets, temporary jumpers, crimping tool (XPJ or Hypress), cutters, and temporary jumper.

b. PPE: Fire resistant (FR) uniforms, insulating rubber gloves, hard hat, safety shoes, work gloves, safety glasses, safety vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

d. ANSI C2-1987 National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman’s and Cableman’s Handbook.

g. Shop 82 SOP, Lockout/Tagout.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket. Do not use the bucket truck if winds exceed the truck manufacturer’s specified limit.

(2) Do not perform energized work in wet weather.

(3) Personnel in bucket will wear a safety harness with a lanyard attached to the boom or bucket.

(4) Do not exceed the bucket’s weight limitations.

(5) 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.

c. Insulate energized conductors within 3 feet of the work area per Reference (h), Enclosure (1). Insulate deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been grounded as per Reference (g). Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat.

d. The following rules will apply to the repair job:

(1) Personnel in the bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat and a safety harness.

(2) Personnel in the bucket will carry a hand line aloft with them.

(3) Ground personnel will wear hard hats, safety shoes, work gloves, and safety glasses. Ground personnel will wear safety vests if working adjacent to a road or in a parking lot.

(4) Ground personnel not involved with the work will watch the personnel aloft.

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

(6) 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.

e. Catch off the damaged conductor. Secure hot hoist or slack blocks to conductor with wire grips. Place grips on both sides of the damaged section. Allow enough space to remove the damaged section and replace it with a sleeve or wire and sleeves. Jack hoist or blocks enough to remove the conductor tension between the grips so the wire can be removed safely.

f. Install a temporary jumper. Place a jumper, of equal or larger size wire, on the conductor. The jumper has to span the damaged section to be removed. Ensure that the loose end of the jumper is held in the clear as the first end of the jumper is attached. The jumper will be energized once the first end is attached. Connect the loose end to the other side of the damaged conductor. The jumper will allow current to flow uninterrupted while the work proceeds.

g. Remove the damaged section of the conductor. Using cutters with insulated handles cut away the damaged section. Leave enough tail on each end to allow attachment of sleeves.

h. Replace the damaged section. Very short sections can be replaced with just a sleeve. Longer sections will require a section of wire and two sleeves, one on each end. Quick sleeves or compression sleeves may be used. Compression sleeves require a crimping tool (XPJ) or a hy-press.

i. Remove the temporary jumper. CAUTION: the jumper remains energized until both ends have been removed from the conductor. Ensure that the loose end of the jumper is held clear while the final end is removed.

j. Remove the hoist and wire grips. Slack off the hot hoist or blocks until the proper tension and sag are on the conductor. Ensure that the sleeves are holding, then remove the hoist and grips from the conductor.

k. Remove insulation placed on energized conductors. Remove insulation placed on conductors which are not included in the work and have not been grounded per Reference (g). Personnel in the bucket shall wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Remove insulation in reverse order that it was placed.

l. Secure bucket truck per Reference (a).

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STANDARD OPERATING PROCEDURE

SHOP 82, TERMINATE HIGH VOLTAGE CABLES, ELBOW CONNECTORS

Enclosure (8)

1. Purpose. Procedure to terminate high voltage cables onto elbow connectors.

2. Potential Energy Sources.

a. The cables being terminated can be a potential energy source if they have already been spliced into the underground circuit.

b. All cables already terminated on the oil switch if terminating onto an oil witch.

c. Secondary cables to the transformer if generators have been placed to supply temporary power to facilities which have had their normal power switched off due to this work if terminating onto a transformer.

3. Tools and PPE.

a. Tools: Shotgun stick, cable cutters, hydraulic press, torch, and assorted hand tools.

b. PPE: FR uniforms, insulating rubber gloves, 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 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.

4. References.

a. 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.

b. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

c. ANSI C2-1987 National Electrical Safety Code.

d. Electrical Transmission and Distribution Safety Manual, P-1060.

e. Shop 82 SOP, Lockout/Tagout.

f. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Terminating onto a distribution switch - Operations personnel will deenergize:

(1) The high voltage cables to be terminated if they are connected to an energized circuit.

(2) All circuits terminated on the switch.

b. Terminating onto a transformer or transformer switch - Operations personnel will perform deenergization switching if:

(1) The high voltage cables to be terminated are connected to an energized circuit.

(2) A generator has been placed at the facility to supply temporary power during the work period, and there is a possibility the generator can back feed the transformer. Personnel will follow References (e) and (f).

c. Personnel shall wear listed FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Terminating onto a distribution oil switch - After the switch has been cleared for work by operations personnel, test all cables to be terminated using a high voltage tester to verify that all the cables are deenergized. Before the cables are checked, test the high voltage tester on a known energized circuit to verify the tester is working. Test each cable separately, taking care not to cross phase during test. If voltage is detected, stop the test and (a) notify operations

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

d. Terminating onto a transformer or transformer switch - Using a high voltage tester test the high voltage cables to be terminated and/or the transformer's primary bushings, or transformer primary switch's bushings, to verify they are deenergized. Before the conductors are checked, test the high voltage tester on a known energized circuit 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 operations personnel that the circuit is still energized, (b) wait for operations personnel to correct the problem, (c) perform the deenergization verification test once again after shop 82 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 FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat while testing.

e. Cut the cables to proper length and prepare the cable ends per the elbow manufacturer's instructions.

f. Install elbow connectors on to prepared cable ends as per the elbow manufacturer's instructions.

g. Plug the elbow connector in the transformer or switch bushing wells.

h. Operations personnel energize all circuits and/or equipment as per References (e) and (f).

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, TERMINATE HIGH VOLTAGE CABLES, PRIMARY AIR SWITCH

Enclosure (9)

1. Purpose. Procedure to terminate high voltage cables onto a transformer primary air switch.

2. Potential Energy Sources.

a. The cables being terminated can be a potential energy source if they have already been spliced into the underground circuit.

b. Switch's line side cables if Generators have been placed to supply temporary power to facilities which have had their normal power switched off due to this work.

3. Tools and PPE.

a. Tools: Shotgun stick, cable cutters, hydraulic press, and assorted hand tools.

b. PPE: FR uniforms, insulating rubber gloves, 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 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.

4. References.

a. 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.

b. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

c. ANSI C2-1987 National Electrical Safety Code.

d. Electrical Transmission and Distribution Safety Manual, P-1060.

e. Shop 82 SOP, Lockout/Tagout.

f. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Shop 82 will perform deenergization switching if:

(1) The high voltage cables to be terminated are connected to an energized circuit.

(2) A generator has been placed at the facility to supply temporary power during the work period, and there is a possibility the generator can back feed the transformer. Shop 82 will follow References (e) and (f).

b. Personnel shall wear listed FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Using a high voltage tester test the high voltage cables to be terminated and/or the switch's line side cables to verify they are deenergized. Before the conductors are checked, test the high voltage tester on a known energized circuit 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 shop 82 personnel that the circuit is still energized, (b) wait for Shop 82 personnel to correct the problem, (c) perform the deenergization verification test once again after Shop 82 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.

c. Cut the cables to proper length and prepare the cable ends per the specific terminating kit's manufacturer's instructions.

d. Install the terminators per the specific terminating kit's manufacturer's instructions.

e. Mount and connect the terminated cables to the line side of the air switch.

f. Shop 82 personnel will close the switch and will energize the circuit as per References (e) and (f).

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, TERMINATE HIGH VOLTAGE CABLES, UNDERGROUND TO OVERHEAD TRANSITION

Enclosure (10)

1. Purpose. Procedure for terminating underground, high voltage cables at an overhead to underground transition point. The procedure is also valid for replacing existing terminators at an overhead to underground transition.

2. Potential Energy Sources.

a. Energized overhead circuits in close proximity of work.

b. Deenergized overhead circuits which are not included in the work and have not been grounded.

c. The cables being terminated can be a potential energy source if they have already been spliced into the underground circuit.

3. Tools and PPE.

a. Tools: Bucket truck, rubber hoses, rubber blankets, rubber insulator hoods, grounding spike, shotgun stick, hydraulic press, cable cutters, and assorted hand tools.

b. PPE: FR uniforms, insulating rubber gloves, 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 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

c. 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.

d. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

e. ANSI C2-1987 National Electrical Safety Code.

f. Electrical Transmission and Distribution Safety Manual, P-1060.

g. Shop 82 SOP, Lockout/Tagout.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

i. The Lineman's and Cableman's Handbook.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer's specified limit.

(3) When working near or around energized conductors or equipment in wet weather, ensure that personnel performing work are properly trained, and use the proper PPE.

(4) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

c. Shop 82 personnel may have to deenergize the overhead and underground circuits involved and as per References (g) and (h). The particular job will dictate the necessity of this step.

d. Insulate energized overhead conductors within 3 feet of the work area per Reference (h), Enclosure (1). Insulate deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been grounded as per Reference (g).

e. Personnel shall wear listed FR uniforms, safety glasses, safety shoes, insulating rubber gloves, and hard hat. Using a high voltage tester, test the underground cables, and, if applicable, the overhead conductors to verify they are deenergized. Before the 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 phase during test. If voltage is detected, stop the test and (a) notify operations personnel that the conductors are still energized, (b) wait for operations personnel to correct the problem, and (c) perform the deenergization verification test once again after operations personnel finish switching operations and declare the conductors deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly.

f. The following rules will apply to job:

(1) Bucket personnel working on poles which have energized overhead circuits or overhead circuits which are not included in the work and have not been grounded as Reference (g) will wear FR uniforms, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves and a back brace if required to wear. The overhead circuits in question have been insulated per Step d above.

(2) Bucket personnel working on poles which have all other high voltage overhead circuits deenergized and properly grounded, or which have no other overhead circuits on the poles, will wear hard hats, work gloves, safety shoes, safety harness, safety glasses when required, and a back brace if required to wear.

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

(4) Ground personnel will wear safety vests if working adjacent to a road or in a parking lot.

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

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

(7) 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.

g. Cut the cables to required length and prepare the cable ends to meet the specific termination kit’s manufacturer’s specifications.

h. Form the cables to proper position and secure to termination brackets.

i. Install terminators on the cables as per the manufacturer’s instructions.

j. Connect jumpers from the terminators to the load side of the switches. Ensure the switches are in the open position prior to connecting the jumpers. Ensure that proper clearances are met.

k. After termination work is completed, prepare to re-energize the circuit by:

(1) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(2) Remove insulation placed on energized conductors.

(3) Remove insulation placed on conductors which are not included in the work and have not been grounded as per Reference (g). Remove insulation in reverse order that it was placed.

l. Secure bucket truck per Reference (a).

m. Shop 82 personnel will energize the circuit(s) as per References (g) and (h).

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, REPLACE HIGH VOLTAGE TRANSFORMER, POLE MOUNTED

Enclosure (11)

1. Purpose. Procedure to replace a high voltage (12.5/7.2 kv) transformer mounted on a pole.

2. Potential Energy Sources.

a. Energized circuits in close proximity of work.

b. Deenergized circuits which are not included in the work and have not been grounded.

c. Generators supplying temporary power to facilities which have had their normal power switched off due to this work.

3. Tools and PPE.

a. Tools: Bucket truck, rubber hoses, rubber blankets, rubber insulator hoods, hand tools, high voltage tester.

b. PPE: FR uniforms, insulating rubber gloves, hard hat, safety shoes, work gloves, safety glasses, green vest, safety harness, and back brace if required by back injury prevention and control program. The class of rubber gloves 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.

4. References.

a. Bucket/Auger Truck Operator’s Manual.

b. 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.

c. NFPA 70 E approach distances to exposed, energized, electrical conductors and circuit parts.

d. ANSI C2-1987 National Electrical Safety Code.

e. Electrical Transmission and Distribution Safety Manual, P-1060.

f. The Lineman's and Cableman's Handbook.

g. Shop 82 SOP, Lockout/Tagout.

h. Shop 82 SOP, Working on or Near Exposed Energized Electrical Systems.

5. Procedures.

a. Set up bucket truck per Reference (a).

b. When operating a bucket truck the following safety rules will be followed.

(1) Only an authorized person, one with a current government license to operate an aerial lift, will operate the bucket.

(2) Do not use the bucket truck if winds exceed the truck manufacturer's specified limit.

(3) Do not perform energized work in wet weather.

(4) Personnel in bucket will wear FR uniforms, safety glasses, safety shoes, insulating rubber gloves, hard hat, and a safety harness with a lanyard attached to the boom or bucket.

(5) Do not exceed the bucket's weight limitations.

(6) 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.

c. Shop 82 personnel will deenergize the circuit and as per References (g) and (h).

d. Insulate energized conductors within 3 feet of the work area per Reference (h), Enclosure (1). Insulate deenergized overhead circuits within 3 feet of the work area which are not included in the work and have not been grounded as per Reference (g).

e. Using a high voltage tester test the circuit to be worked on to verify it is deenergized. Before the circuit conductors 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 and (a) notify Shop 82 personnel that the circuit is still energized, (b) wait for Shop 82 personnel to correct the problem, (c) perform the deenergization verification test once again after Shop 82 personnel finish switching operations and declare the circuit deenergized. If no voltage is indicated, retest the high voltage tester to re-verify it is working properly.

f. The following rules will apply to job.

(1) Bucket personnel working poles which have energized circuits or circuits which have not been properly grounded will wear FR uniforms, safety glasses, safety shoes, hard hat, safety harness, insulating rubber gloves, and a back brace if required to wear. The circuits in question have been insulated per Step 5(d).

(2) Bucket personnel working on poles which have all other high voltage circuits deenergized and properly grounded, or which have no other circuits on the poles, will wear hard hats, work gloves, safety shoes, safety harness, safety glasses when required, and a back brace if required to wear

(3) Personnel in the bucket will carry a hand line aloft with them.

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

(5) Ground personnel will wear safety vests if working adjacent to a road or in a parking lot.

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

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

(8) 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.

g. Inspect the current transformers for damage to determine which one(s) are damaged.

h. When a defective current transformer is identified:

(1) Write down the nameplate data.

(2) Disconnect the high voltage leads.

(3) First mark, and then disconnect the secondary leads to the meter.

(4) Remove conduit and connectors from the current transformer.

(5) Remove bolts from current transformer brackets and ground lugs.

i. Lower current transformer to ground using a hand line.

j. Using the nameplate data previously recorded, obtain an exact replacement current transformer.

k. Raise new transformer to pole top using a hand line.

l. Install the new current transformer .

(1) Place on mounting bracket and secure with the mounting bolts.

(2) Attach the ground lug.

(3) Reinstall the conduit and fittings.

(4) Reconnect the secondary wiring paying attention to the wire marking placed during the removal phase.

(5) Reconnect the primary wiring.

m. Remove insulation placed on energized conductors. Remove insulation placed on conductors which are not included in the work and have not been grounded as per Reference (g). Personnel in the bucket shall wear FR uniforms safety glasses, safety shoes, insulating rubber gloves, and hard hat. Remove insulation in reverse order that it was placed.

n. Secure bucket truck per Reference (a).

o. Shop 82 personnel will energize the circuit as per References (g) and (h).

p. Observe the meter for proper direction and speed of the disk as well as for proper voltage light indication.

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, FALL PROTECTION PLAN

SUPERVISOR, SHOP 82:_____
(DATE)

UTILITIES DIRECTOR:_____
(DATE)

PUBLIC WORKS SAFETY:_____
(DATE)

BASE SAFETY:_____
(DATE)

PUBLIC WORKS OFFICER:_____
(DATE)

Enclosure (1)

1. Purpose. Establish a fall protection program and provide policy and requirements for the implementation of the program and establish procedures on fall protection and fall prevention for Shop 82 personnel working at heights and exposed to fall hazards while conducting maintenance and inspection work.

2. Applicability. This SOP applies to GF, Shop 82 personnel who are working at heights and exposed to fall hazards while conducting maintenance, repair and inspection work.

3. Discussion. Falls are a leading cause of traumatic occupational deaths among workers according to statistics from the Department of Labor. Most fall-related fatalities could be prevented by the use of risk management and hazard control measures.

4. Tools and PPE.

a. Tools: Carrying bag, communication equipment, first aid kit, task-specific tools.

b. PPE: Hard hat, full body harness, shock absorber, lanyard, work gloves, connecting devices, mobile fall arrester, steel/fiberglass reinforced shank/toe boots, rope grab, safe climb device, manual descender.

5. References.

a. Marine Corps Occupational Safety and Health (MARCOR OSH) Program Manual (NAVMC DIR 5100.8).

b. OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual: Chapter 13, Fall Protection Program.

c. Department of the Navy Fall-Protection Guide for Ashore Facilities (15 Feb 2012).

d. American National Standards Institute (ANSI) Z359 Fall Protection Code/Standards.

e. 29 CFR 1910, Occupational Safety and Health Standards.

f. SOP, Shop 82 Electrical Distribution.

g. ComTrain’s Tribute to Safety, Tower Climbing Safety and Rescue, 4th Edition

6. Enclosures.

1. Shop 82 Tower Climbing Log

7. Procedures.

a. A personal fall arrest system is composed of a full body harness, lanyard with shock absorbing device, self-locking connectors, and anchorage system. All system components must be rated at 5,000 pounds breaking strength and compatible for use together as a system. Other systems may include horizontal and vertical lifelines, or self-retracting lifelines. Anchorages for lifelines must be independent of any anchorages used for suspended platforms, scaffolding.

b. Rescue Call In: Call Camp Lejeune 911, Emergency Consolidated Communications Center (910-451-3004) to inform them of the tower facility number that will be climbed. This will be done before the climb has started. The base Fire Department has an Aerial Rescue Team located at building Station #2. They will only be called if a self-rescue cannot be performed by the unit making the climb. The climb shall be performed using the two-person rule: one person shall remain on ground to watch and communicate with the climber at tower site throughout the duration of the climb.

c. At tower site, conduct safety briefing with involved personnel and conduct an inspection of all personal fall arrest equipment for the following and properly document using the enclosed Shop 82 Tower Climbing Log:

(1) Personal Fall Arrest Harness: check webbing, stitching, buckles, and attachment points for wear, burns, cuts, chemical contamination, marks, corrosion, pulled threads, deformation and other damage.

(2) Connectors: check snaphooks and connecting devices for cracks, marks, wear, deformation, corrosion, proper function, locking sleeve and proper operation of locking system.

(3) Lanyard: check rope, webbing, stitching, metallic pieces, and locking components for cuts, wear, burns, tears, pulled threads, deformation, cracks, corrosion, rivets, connector function and proper lanyard length.

(4) Energy Absorber: check rope, webbing, stitching, metallic pieces and connectors for cuts, wear, burns, marks, chemical contamination, deformation, corrosion and cracks.

(5) Helmet: check helmet shell, cradle adjustment strap, stitching and padding for cracks, marks, burns, chemical contamination, buckles and proper strap adjustment.

(6) Rope/Wire: check rope or wire lifeline for wear, burns, cuts, chemical contamination, marks, corrosion, pulled threads and deformation.

(7) Mobile Fall Arrester: check for wear, burns, cuts, cracks, deformation, corrosion and proper function.

If any of these defects are noticed, notify your supervisor and remove the equipment from service. Do not proceed with climbing if any defects are noticed. If possible, provide a digital photograph of defective towers, to include severe rusted ladder rungs, catwalks, guy wires, cracked footings, etc. If there are no defects, document inspection on the enclosed Shop 82 Tower Climbing Log and contact supervisor/competent person to confirm successful inspection of tower and equipment; supervisor/competent person will provide approval to begin climbing. Ensure the equipment inspection documentation is appropriately logged in the Shop 82 Fall Protection SOP binder.

d. Properly wear personal fall arrest equipment and attach to the tower's vertical lifeline.

e. If the climber should happen to fall while climbing, he should attempt self-rescue and attempt to climb back down the tower. If a fall occurs, the personal fall arrest system has been impacted and the climb shall not continue. If self-rescue is unsuccessful, the employee on the ground shall call base 911.

f. Upon completion of the climb, call Camp Lejeune 911 Emergency Consolidated Communications Center (910-451-3004) to inform them that tower climb is complete and secure. Properly document the climb in the Shop 82 Fall Protection SOP binder.

8. Aerial Lifts.

a. All situations that expose MCB Camp Lejeune personnel to fall hazards of 4 feet or greater will be assessed by a

competent, trained person with fall protection training to implement proper controls. Proper fall protection PPE equipment will be utilized after a fall hazard assessment has been conducted.

b. Requirements related to fall protection for personnel working on stairways and ladders are contained in reference (e).

9. Training.

a. Shop 82 supervisor shall ensure personnel who are potentially exposed to fall hazards receive appropriate fall protection training prior to climbing towers. ESAMS web based training can be used to satisfy annual refresher training requirements along with supervisor's input. Training shall consist of proper wear, inspection and use of equipment, communication, as well as all other requirements of this SOP.

b. Shop 82 supervisor will review annual training requirements with the employee through Job Hazard Analysis, (JHA) in ESAMS.

c. Employees shall report unsafe conditions of water, communication towers to supervisor.

Attachment (c)

SHOP 82 TOWER CLIMBING LOG

Date & Time:	Climber's Name:
Location:	Assistant's Name:
Purpose:	Safety Brief Conducted?

Notify Emergency Consolidated Communications Center
(910-451-3004)

Before Climb: After Climb:

Climbing Equipment & Tower Inspected? (Use below checklist)

ITEM	PASS	FAIL	COMMENTS
Fall Arrest Harness: wear, cuts, burns, corrosion, marks, pulled threads, chemical contamination, deformation.			
Connectors: cracks, marks, wear, deformation, corrosion, proper function, locking sleeve.			
Lanyard: cuts, wear, burns, tears, pulled threads, deformation, cracks, corrosion, rivets, proper function, proper length.			
Energy Absorber: cuts, wear, corrosion, burns, marks, chemical contamination, deformation, cracks, prior use.			
Helmet: cracks, marks, burns, chemical contamination, buckles, proper fit.			
Rope/Wire/Cable: wear, burns, cuts, chemical contamination, marks, corrosion, pulled threads, deformation.			
Mobile Fall Arrester: wear, burns, cuts, cracks, deformation, corrosion, proper function.			
Tower: anchorages, ladder, structure, foundation, vertical lifeline.			

NOTE: If any equipment or tower fails the inspection, make notes in COMMENTS column of this sheet, and notify supervisor of defects.

Climber's Signature:	Supervisor's Signature:

Enclosure (1)

MARINE CORPS BASE CAMP LEJEUNE
PUBLIC WORKS DIVISION
UTILITIES BRANCH

STANDARD OPERATING PROCEDURE

SHOP 82, USE AND CARE OF ELECTRICAL PROTECTIVE RUBBER GOODS AND LIVE-LINE TOOLS

SUPERVISOR, SHOP 82:_____
(DATE)

UTILITIES DIRECTOR:_____
(DATE)

PUBLIC WORKS SAFETY:_____
(DATE)

BASE SAFETY:_____
(DATE)

PUBLIC WORKS OFFICER:_____
(DATE)

1. Purpose. Many task-related and hazard-related SOP's in the electrical trade require rubber goods and/or live-line tools. While this SOP does not establish when the rubber goods and/or live-line tools are required, it does establish methods for the care, inspection, testing and use of electrical protective rubber products as required by the Unified Facilities Criteria (UFC) 3-560-01, Electrical Safety, O&M. This procedure also provides acceptance criteria by which electrical protective rubber goods can be evaluated by the user as to its readiness for continued service.

2. Background.

a. Electrical protective rubber goods designed to protect the worker from shock hazards and are available in six basic voltage classes from class 00 to class 4 and two types (Type I and Type II). The table below outlines the different voltage classifications. Type I products are made from a high-grade polyisoprene rubber compound of natural or synthetic origin. Type II products are ozone resistant and made of any elastomer or combination of elastomeric compounds.

Class	Maximum Use Voltage (AC)
00	500
0	1,000
1	7,500
2	17,000
3	26,500
4	36,000

b. Live-Line Tools are designed to enable qualified personnel to perform operations and maintenance on electrical distribution systems while energized. Live-Line Tools includes hot sticks, insulated cable cutters, insulated compression tools and many other tools designed for work on energized systems.

3. References.

a. Unified Facilities Criteria (UFC) 3-560-01, Electrical Safety, O&M.

b. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.137, PPE, Electrical Protective Devices.

c. SOP, Shop 82 Electrical Distribution.

Attachment (d)

4. Potential Hazards. Electricity-related hazards include:

a. Electric shock and burns. An electric shock occurs when electric current passes through the body. This can happen when touching an energized part. If the electric current passes across the chest or head, death can result. At high voltages, severe burns can result.

b. Arc-flash burns. An electric arc flash can occur if a conductive object gets too close to a high-amp current source or by equipment failure (for instance, while opening or closing disconnects). The arc can heat the air to temperatures as high as 35,000^{o} F, and vaporize metal in the equipment. The arc flash can cause severe skin burns by direct heat exposure and by igniting clothing.

c. Arc-blast impacts. The heating of air and vaporization of metal creates a pressure wave that can damage hearing and cause memory loss (from concussion) and other injuries. Flying metal parts are also a hazard.

d. Falls. Electric shocks and arc blasts can cause falls, especially from ladders or unguarded scaffolding/platforms.

5. Tools and PPE.

a. Rubber insulating goods.

(1) Gloves.

(2) Sleeves.

(3) Line hoses.

(4) Blankets.

b. Live-line tools.

(1) Hot sticks.

(2) Insulated cable cutters.

(3) Insulated compression tools.

c. Leather protectors for rubber insulating gloves.

6. Training. The correct use of electrical protective rubber goods is vital to the safety of each employee whose job involves working on or near exposed energized electrical conductors. Employees who are required to perform such work must be trained and thoroughly knowledgeable of the rubber goods program before being exposed to work conditions that involve electrical shock hazards. Training procedures and program responsibilities are specified in the Shop 82 Electrical Distribution SOP.

7. Procedures.

a. Periodic Evaluation and Testing.

(1) Rubber goods.

(a) The purchase and in-service inspection of rubber goods must be incompliance with reference (a). Damaged or otherwise obviously defective products will be destroyed and disposed. The maximum period between date of issue and removal from service for re-inspection/testing will be as follows:

Gloves	6 months
Sleeves	12 months
Hoses	12 months
Blankets	12 months

Rubber goods must be removed from service and re-inspected and tested at the electrical testing facility if a visual inspection gives reason to question their electrical integrity.

(2) Live-line tools.

(a) All live-line tool repairs, testing and/or refinishing will be performed in accordance with the manufacturer’s recommendations. Two sets of test records are to be kept. One record shall be stored in a database to be maintained by the Safety Specialist and will contain the testing records of all live-line tools. The second record is attached to the live-line tool itself. Both records will state at a minimum the serial number, date tested, next testing due date, and the initials of the person who performed the test. The maximum period between date of testing and removal from service for re-inspection/testing is 2 years. Live-line tools with test dates greater than two years shall not be used on energized systems.

Attachment (d)

b. Storage.

(1) All rubber goods and live-line tools shall be stored in a clean, cool, dark, and dry location free from ozone, chemicals, oils, solvents, electrical discharges, sunlight, moisture, dust, or other contaminates.

(2) Rubber goods shall not be folded, creased, inside out, compressed, or in any manner that will cause stretching or deformation. Gloves shall be stored in their natural shape and must be kept inside of protectors or in a bag, box or suitable container. Sleeves may be loosely rolled lengthwise inside a sleeve rollup. Tape shall not be used on gloves, sleeves or blankets for shipment or storage. Line hoses and covers shall be stored without distortion and mechanical stress. They shall be stored or packaged in a suitable compartment or in containers such as boxes or bags.

(3) Live-line tools stored in substations and work center's storage areas shall be protected from physical damage as well as moisture, dust, dirt or other contaminates. Live-line tools carried on vehicles shall be stored in storage bins or canisters.

c. Inspection.

(1) The field care and inspection of electrical protective rubber products performed by the individual user is an important requirement in providing protection from shock hazards. Prior to each use, electrical protective rubber products shall be given a visual inspection over the entire surface. Items found to have texture changes, swelling, softening, hardening, sticky surface, loss of elasticity, holes other than factory produced openings, punctures, cuts, corona or ozone cutting, contamination from injurious materials, or any other obvious condition that would adversely affect performance shall not be used. Where a visual inspection indicates that there may be reason to suspect the electrical integrity of an item, it shall not be used before it has been inspected and re-tested at an electrical test facility.

(2) Gloves shall be inspected over the entire surface and shall be rolled gently between the hands to expose defects and imbedded materials. They shall be air-tested before each day's use and at other times if there is cause to suspect any damage. The air test can be accomplished by rolling the cuff

tightly toward the palm in such a manner that air is entrapped inside the glove, or by using a mechanical inflater. When using the latter, care should be taken to avoid over-inflation. The glove shall be examined for punctures and other defects. Puncture detection may be enhanced by listening for escaping air or holding the gloves against the worker's cheek to feel for escaping air.

(3) Blankets and line hoses shall be inspected visually by the user for defects before being installed, and at other times if there is cause to suspect any damage. They shall be inspected on both sides over the entire surface for defects and imbedded materials.

(4) Prior to use live-line tools shall be visually inspected and wiped clean with a manufacturer approved silicone impregnated cloth. The glossy finish on the surface of the live-line tools is key to maximizing the electrical integrity of the tool. When contaminates such as dirt, creosote, grease, soaps and unknown substances that could adversely affect the insulating qualities are present after wiping, the tool shall be removed from service.

Caution: Do not use soap detergents, liquid or powdered form, such as 409, Fantastic, Comet, Spray 9, or Ajax to clean fiberglass tools. These cleaning agents can leave a conductive residue that would require larger quantities of water to rinse then normally available at job site conditions. Live-line tools having loss of glossy surface, deep cuts, scratches, nicks, gouges, dents, looseness, excessive wear, bent pins or bolts or any obvious condition that would adversely affect insulating qualities or mechanical integrity shall not be used until repaired and re-tested. Severely damaged live-line tools will be destroyed.

d. Field Care.

(1) Rubber goods should be wiped clean of any oil, grease, or other damaging substances as soon as practicable. Gloves and sleeves should be rinsed as necessary to remove perspiration. Care should be exercised to keep protector gloves as free as possible from oils, greases, chemicals, and other materials that may injure the insulating gloves. Line hoses and covers should be left in service on energized lines for minimum necessary periods of time as exposure may result in ozone checking, corona cutting, or excessive weathering.

(2) The field care of live-line tools is an important element in providing protection from shock and flash hazards. If the tool is not in use, return it to the truck, lay it on a tarpaulin, or prop it up on an improvised rack. Never lay live-line tools on the ground or expose them to moisture. Do not use a hot stick in inclement weather if it is not beading water. Live-line tools that become wet must be wiped dry as soon as practicable. Live-line tools are to be used only to accomplish the job for which they were designed.

(3) The purpose of the leather protectors is to provide mechanical protection for the rubber gloves and rubber mittens. ASTM F 696 standard applies. The leather protectors shall not be used for electrical protection. Protector gloves that have been used for any other purpose shall not be used to protect insulating gloves. Leather protectors are not subject to scheduled periodic re-testing but must be visually inspected by the user prior to each use. They must be free of cuts, tears or any obvious condition that would adversely affect performance. Leather protectors must be sized and shaped so that the insulating glove is not deformed from its natural shape. The minimum distance between the top of the cuff of the protector and the rolled top of the cuff of the insulating glove shall not be less than that specified below.

Minimum Distance Between Gauntlet and Cuff	
0	1/2 Inch
1	1 Inch
2	2 Inches
3	3 Inches
4	4 Inches

Attachment (d)

STANDARD OPERATING PROCEDURE
PWD UTILITIES LOCATES

9 Apr 13

1. Purpose. To establish standard operating procedures for all personnel requesting utility locates aboard MCB Camp Lejeune and MCAS New River.

2. Policy. The Public Works Department (PWD) will take all reasonable measures to provide a safe workplace and ensure the reliable operation of all utility systems. Failure to follow this SOP will be cause for disciplinary action for PWD employees and potential fines and penalties for contractors.

3. Enclosures.

1. PWD Utilities Locate Checklist.

2. 811 Utilities Locate Notification Form.

4. Procedures. The following steps will be taken to ensure proper utility locates prior to subsurface work. Caller will ensure they obtain ticket or work order numbers for each step below and will document them on Enclosure (1). Initials will also be provided in the appropriate section upon locate request, completion, and field verification.

a. Call 451-3001 to request locates for internal utilities (steam, high voltage, water/waste water). NOTE: Contractors must hire a private locating service for these utilities, but may still use Enclosure (1) for tracking.

b. Call 811 or 1-800-632-4949 to request locates for private communications, ONWASA, Progress Energy, Jones-Onslow EMC and Piedmont Natural Gas. Enclosure (2) contains a thorough list of questions to answer prior to calling 811. NOTE: Contractors will also call the above numbers for these utility locates and may use Enclosure (1) for tracking.

c. Call 451-3100 (working hours) or 451-1019 (after hours, emergency locates) to request locates for Base Telephone. NOTE: Contractors must hire a private locating service for Base Telephone assets, but may still use Enclosure (1) for tracking.

d. Upon completion of Enclosure (1), the subsurface work will be authorized.

J. C. SIDES

Public Works Division
Utilities Locate Checklist

Date Started:
Date Finished:

Internal Reviews (451-3001)		
Steam	High Voltage	Water/Waste Water
Ticket Number:	Ticket Number:	Ticket Number:
Initials	Initials	Initials
____ Locate Requested	____ Locate Requested	____ Locate Requested
____ Locate Completed	____ Locate Completed	____ Locate Completed
____ Locate Verified	____ Locate Verified	____ Locate Verified
Notes:		

811 Locate

811 or 1-800-632-4949

Initials

____ Locate Requested

____ Locate Completed

____ Locate Verified

Ticket Number: _____

Notes: Request locates from Charter, CenturyLink, AT&T, Sprint, Time Warner Cable, ONWASA, Progress Energy, Jones-Onslow EMC, Piedmont Natural Gas

Base Telephone

451-3100 working hours; 451-1019 after hours (emergency)

Initials

____ Locate Requested

____ Locate Completed

____ Locate Verified

Ticket Number: _____

Notes:

811 UTILITY LOCATE NOTIFICATION FORM.

*CALL TWO BUSINESS DAYS BEFORE YOU PLAN TO DIG. DIAL 811

INFORMATION REQUIRED FOR LOCATES:

1. COMPANY PHONE NUMBER _____
2. COMPANY NAME _____
3. CALLER NAME _____
4. EMAIL _____
5. COUNTY _____
6. TOWN _____
7. IN OR OUT OF CITY LIMITS _____
8. SUBDIVISION _____
9. ADDRESS _____
10. STREET NAME _____
11. CROSS-STREET NAME (nearest intersecting street) _____
12. IS CROSS-STREET WITHIN ¼ MILE ? _____
13. AREA TO LOCATE _____
14. BLASTING Y / N
15. BORING Y / N
16. RAILROAD Y / N
17. EMERGENCY Y / N
18. WORK DATE _____
19. WORK TIME _____
20. DURATION OF WORK _____
21. WORK TYPE _____
22. WORK DONE FOR _____
23. SUB-CONTRACTOR _____
24. SITE CONTACT _____
25. UTILITIES NOTIFIED _____
26. TICKET NUMBER _____
27. MAXIMO TICKET NUMBER _____

Enclosure (2)