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FREEPORT-McMoRan COPPER & GOLD

MORENCI OPERATIONS

BEST
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Hot Line Policy

The policy is to utilize hot line methods when working on energized overhead lines. The principle is to isolate/insulate the conductors from the people doing the work. The tools and work practices used are based on this fundamental principle.

1. Definitions

A. *Foreign Power Crossing* - Any line from a different power source.
B. *Hot Job* - A job that requires a qualified individual to engage in work on or within reaching and falling distance of energized overhead lines.
C. *Hot Line Tools* - Tools that allow qualified individuals to manipulate energized conductors and equipment from a safe distance.
D. *Hot Line* - An electrically energized overhead line that has a source of potential difference, or electrically charged to have a potential significantly different from that of earth in the vicinity.
E. *Qualified Individuals* – Individuals trained in and familiar with the operation and safety hazards of the equipment/process upon which they are working. By extension qualified individuals also:
    i. Are capable of recognizing hazards associated with the work.
    ii. Are capable of avoiding the hazards associated with the work.
    iii. Are physically and mentally able to do the work.
F. *Rubber Goods* - Gloves, Sleeves, Mats, Covers, Line Hose and Blankets that provide an insulating shield between the worker and the energized conductors.

2. Qualified Individuals

The safety of persons using hot line methods to work on energized conductors is directly related to the knowledge, training and experience of the workers, and demonstrated by the use of the required tools and safe work practices. As such, hot line work will only be performed by qualified individuals with recent hot line work experience. **Knowledge and training are not a substitute for hot line work experience.** New employees, even though experienced, will not be permitted to climb or engage in any “hot work” until they have demonstrated to the team and/or the supervisor that they are qualified to do so by assisting one of the qualified Lineman doing a “hot job”. No one

will be permitted to work energized overhead line if they appear to be physically or mentally unable to carry on the work safely.

3. **Work Guidelines**

A. General Guidelines

i. Each person working on energized conductors will be required to know and understand each of the rules that apply to the work being performed. In the event a specific rule or regulation is identified as absent from a local code, the regulations and requirements of the ANSI, NFPA, OSHA, MSHA or C-2 series National Electrical Safety Code will be used.
ii. The person performing the hot line work will have control of the job being done and all employees will understand the purpose of the job clearly as well as their duties.
iii. Time will be taken prior to starting work to make sure each person is properly instructed (tailgate meeting). Each person will check the job conditions.
iv. At least two qualified employees will be present at the job site whenever work is being performed on a pole or energized overhead line.
v. Other policies covering substation work are 98-001, 98-003, 98-004, 98-005 and others as established by the Branch Electrical Safety Team. All non job related talking will be kept to a minimum when live line work is being done.

B. All radio communications will be three point.

i. Message of sender
ii. Repeat of receiver
iii. Verifications of sender

C. Each person will so act as to provide:

i. Safety to themself
ii. Safety to fellow employees
iii. Protection to the public
iv. Protection to company property and the property of others
v. Notice of an unsafe condition. Work will not start without first calling the attention of all involved with a Standard Operating Procedure (SOP).

D. Procedures for Working Energized Overhead Lines from 300V to 13,800V with the rubber glove method.

i. Energized circuits will be worked with rubber gloves **only** if all of the following conditions are met.

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a. Properly trained personnel will perform rubber gloving of energized circuits
b. All equipment used must meet all regulatory requirements (see references).

E. Personnel

i. A minimum of two qualified individuals are required for this type of work and will consist of one journeyman and at least one other qualified person, both trained in pole top and bucket truck rescue, with a two-way radio available.

ii. One qualified individual will be on the ground at all times, remaining in the vicinity of the work and observing the operation.

F. Step by step procedures will be developed for each job using a Safe Operating Procedure (SOP).

G. Rubber Gloves

i. Rubber gloves and sleeves must be manufactured and rated for a voltage greater than the distribution voltage to be worked.

ii. Distribution voltages lower than 2400 volts may be worked using rubber gloves while the lineman's gaffs are engaged in wood poles.

iii. Rubber gloves will be worn within 5 ft. when working on energized overhead line, equipment, poles or structures carrying or supporting energized conductors.

iv. Rubber gloves will be worn by all persons on the ground working on energized structures, operating a wire reel or otherwise handling a conductor to an energized structure, setting and removing poles in or adjacent to an energized overhead line, or working with machines under or near energized overhead lines or apparatus.

v. Each person working live line will wear the appropriate class voltage rated gloves, of the correct hand size.

vi. Each person will visually check his/her rubber goods and give the gloves an air test before using them.

vii. Leather protectors will be worn over rubber gloves at all times when the voltage is above 250 volts. The gauntlet of the protectors will not cover the

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top 2 inches of the rubber gloves on Class 2, 3 inches on Class 3 and 4 inches on Class 4.

viii. Rubber gloves will be worn at all times when operating "ground operated switches." Switching platforms are required at all switches.

ix. Rubber gloves will be tested every 6 months or less and will bear a test date on the cuff.

x. Where it is necessary to work near energized equipment in such a position that parts of the body are touching or immediately adjacent to secondaries or grounded objects, they will be covered with rubber or other approved protective equipment, or a different working position will be assumed.

4. **Hot Line Tools**

As noted in the introduction, hot line work depends entirely on hot line tools and work procedures for the safety of workers. Given the personal safety function of these tools, it is critical that they be inspected and cleaned, if required, before each use. They will be electrically tested and certified on a scheduled basis and carefully stored. They will be replaced and destroyed when they become damaged or fail to pass testing/calibration. Circuits and equipment disconnects will only be opened and closed using live line tools and methods. Work on distribution circuits operating above 2400 volts requires the use of insulated aerial devices or insulated platforms to supplement the rubber gloves and sleeves. All trucks will be properly grounded to the system neutral or a screw ground when operating within the proximity of live lines. The trucks will be flagged, barricaded, or guarded to prevent unnecessary contact with the equipment.

A. Aerial Unit – will be maintained in good condition. No materials will be placed where controls cannot be readily operated or be accessible.

   i. Recommended – an articulating unit with upper boom entirely insulated and an insulated section in lower boom or pylon.

   ii. Acceptable – an insulated jib or telescoping boom, provided the insulated portion is a minimum of nine feet long with the baskets on the outer portion.

   iii. Along with standard safety equipment a basket safety belt (full harness type) and lanyard, attached to the boom, will be worn.

B. All cover up material will be tested every 3 years, hot sticks and rubber blankets will be tested once a year or whenever suspect.

   i. All potentials, including grounds, within reaching or falling distance, except the portion of line being worked on, will be covered with corona-resistant cover up

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material. Wood poles and crossarms are to be considered as being ground potential.

ii. Intentional contact with cover-up equipment or energized overhead lines and apparatus will not be made by any part of the body other than those protected by rubber gloves and/or sleeves rated for the voltage where work is being performed.

iii. Workers will avoid differences in potential by physically limiting work to one potential at a time.

iv. Rubber gloving will not be done in fog, snow, rain or high winds.

C. Handlines may be hung from the structure, but not from the basket or boom.

i. High dielectric rope will be used (for example: Poly, Nylon etc.).

ii. Rope will be inspected prior to any hot work. It will not be used if its physical integrity can be questioned.

D. Proper Personal Protective Equipment (PPE) will be worn at all times.

E. Only approved belts, straps and climbing boots will be used.

i. Linemen will wear a body belt and safety strap each time they climb a pole, tower or substation.

ii. Body belts will be repaired or replaced if there are any defects.

a. Cracked, dry or deteriorating leather
b. Cuts or sufficient wear to seriously weaken the material
c. Excessive wear at the “D” rings, buckles or snaps
d. Snaps with weak springs
e. Buckles with loose tongues
f. No more holes than necessary in a belt
g. Holes will be punched, not cut with a knife
h. Never expose leather to excessive heat or quick dry methods

iii. Belts and straps will be stored to avoid inclement weather and sharp tools or hardware. Linemen will inspect and maintain all climbing equipment every time it is used.

iv. Climbers

a. Foot and leg straps of climbers will receive the care given to body and safety belts.

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b. Gaffs will be sharpened to manufactures recommendations and to permit proper climbing and covered when stored.
c. Climbers will be removed when working or moving about on the ground, when climbing ladders and when riding in motor vehicles or baskets of aerial devices.

5. **Training/Work Practices**

Since the safety of persons doing hot line work depends entirely on the hot line tools and work procedures used, training is mandatory. Hot line work training is available to personnel experienced in high voltage work from a number sources.

6. **Working Clearances**

A. Only a qualified individual will be permitted to approach or touch a conductive object without an approved insulating handle, when working within distances to exposed, energized conductors, as indicated in table 1, unless.

i. The person is insulated or guarded from the energized part (gloves or gloves with sleeves, rated and tested for a voltage greater than the distribution voltage to be worked, will be considered insulation from the energized part).

ii. The energized part is insulated or guarded from the person and any other conductive object that may be at a different potential.

iii. The person is isolated, insulated or guarded from any other conductive objects, as during live bare-hand work.

B. The minimum working distance and minimum clear hot stick distance stated in table 1 will be strictly adhered to. The minimum clear hot stick distance is that for the use of live line tools held by linemen when performing live line work.

C. Conductor support tools, such as link sticks, strain carriers and insulator cradles, will be used provided that the clear insulation is at least as long as the insulator string or the minimum distance specified in table 1 for the operation voltage is satisfied.

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TABLE 1 (NFPA 70E - 2000 Edition)

Nominal System Voltage Range	Approach Distances to Exposed Electrical Conductors by a Qualified Individual
Phase to Phase	**Restricted Approach Boundary**
301V to 750V	1 ft. 0 in.
751V to 15kV	2 ft. 2 in.
15.1kV to 36kV	2 ft. 7 in.
36.1kV to 46kV	2 ft. 9 in.
46.1kV to 72.5kV	3 ft. 3 in.
72.6kV to 121kV	3 ft. 2 in.
138kV to 145kV	3 ft. 7 in.
161kV to 169kV	4 ft. 0 in.
230kV to 242kV	5 ft. 3 in.
345kV to 362kV	8 ft. 6 in.
500kV to 550kV	11 ft. 3 in.

7. **Lineman First Aid**

A. All linemen will have a working knowledge, above the regular or general safety program, of the principles of pole top rescue (rescue from electrically energized overhead lines) and know the care for electric shock victims, including a thorough knowledge of CPR.

8. **Procedures**

A. Grounding

i. All conductors and equipment will be treated as energized until tested and grounded.

ii. Properly rated grounding cables and clamps, based on available fault current, will be used to ground all voltage lines.

iii. Properly rated "hotsticks", based upon voltage, will be used to ground all voltage lines.

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iv. Equi-potential grounds will be installed between the worker and every possible source of energy and within sight of the worker. This will comply with grounding policy #98-010 (Personal Protective Grounding) or equi-potential grounding.

v. Equi-potential grounds will be installed between the working area and all foreign power crossings, regardless of which line crosses the other.

vi. When two or more crews are working on the same line independently, each crew will be responsible for its own equi-potential ground protection. The crews will coordinate the job with the SOP to eliminate the potential for error.

vii. In attaching protective grounds, a voltage measurement prior to the grounding is made. The ground connection will be made first, then the line connections, closest first, farthest last. In removing grounds, the line is disconnected first, farthest first, closest next and the ground connection last.

viii. In placing and removing protective grounds, a position well below the conductor or apparatus will be taken to eliminate any danger from arcing.

ix. When grounds are placed on the same pole where the work is to be done, they will be placed so that the workers cannot reach beyond the protective ground.

x. Delta-connected lines will be considered shorted only when all primary conductors are connected to a low resistance ($\leq$.5 ohm) temporary or permanent ground with a properly rated ground cable.

xi. Wye-connected lines will be considered shorted when all primary conductors are connected to the primary neutral with an approved ground cable.

xii. Protective grounds do not provide adequate protection in case of lightning surges. No line work will be done under lightning conditions.

xiii. Vehicle/truck frame will be grounded while basket or boom is in use within proximity of energized conductors, with a properly rated ground cable and clamps, to the system neutral or a screw ground. The trucks will be flagged, barricaded, or guarded to prevent unnecessary contact with the equipment. Trucks should be considered energized while performing Hot Work.

xiv. Neither multi-grounded neutrals, static wires, driven or screw type grounds fully eliminate the possibility of hazardous voltage existing between the vehicle and earth at the time of a fault. All personnel will stay clear of the vehicle during the period it is grounded.

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B. Neutrals and Ground Wires

i. High voltage multi-grounded neutrals are current carrying conductors and will be treated accordingly.

ii. Before cutting or opening any ground conductors, rubber gloves will be worn and the following types of grounds will be bridged.
   a. Overhead grounds or neutral wires.
   b. Pole ground wires.
   c. Transformer neutrals and grounds.
   d. Substation ground wires.

iii. Conductor size for bridging will be at least one size larger than the conductor being bridged.

C. Wire

i. Stringing, Sagging, Salvaging

   a. When stringing wire over or near energized conductors, the pay out reel will be grounded in an approved manner. The person attending the reel will either insulate or isolated him/herself from the reel.
   b. Conductors being pulled in are considered grounded when one ground has been installed at the point of temporary dead end, stringing sheaves have been grounded every mile and on both sides of a hot crossing, and/or running grounds are installed at the pay out reels on spans less than a mile in length.
   c. After sagging, the neutral ground rule would apply.
   d. Persons handling wire over or near any energized conductors will wear rubber gloves. Exposure to voltage can be reduced by using ropes, tag lines, and hold down lines.
   e. When working over thoroughfares and where there is danger of the wire interfering with or falling into traffic, proper warning signs will be set out and signalmen with flags will control traffic.
   f. If it becomes necessary for conductors to remain on the job, unsagged and untied without supervision, the conductor will be pulled to a legal height above grade and secured in a safe manner.
   g. The same precautions will be observed in salvaging wire as required in the stringing operation.

ii. Fallen Wires

   a. Fallen wires will be de-energized, tested and grounded before repairs are made and scene safety shall be initiated.

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b. Breaks in the neutral of a wye-connected system will not be repaired while the primary is energized unless the neutral break can be bridged with a cable or length of conductor.
c. When a fallen primary conductor is or may become an energized hazard, and is not positively known to be dead, it will be guarded until it can be safely removed or repaired.
d. Materials and tools will not be placed where they may fall to the ground.
e. Materials will not be raised or lowered until all workers are in the clear.
f. Linemen will work from below the wires.
g. Linemen will perform only one operation at a time, and keep their minds strictly on the job at hand.

h. Near live lines, each move will be well planned and extreme care exercised in changing positions.
i. Linemen will not lean over, or crowd through unprotected wires or place themselves where they may fall on high voltage lines.
j. When more space is required, or when it would be more convenient than working from pole or tower, safety platforms will be used.

9. **References**

A. NFPA 70E - 2000 Edition
B. ASTM D & F
C. ANSI A92.2
D. NESC C2 Series ANSI / IEEE
E. MSHA 30 CFR 56.15006 & .12017
F. OSHA 29 CFR 1910.137, 269 & 331-335
G. Lineman's Handbook

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