



BEST PRACTICE: INSULATE & ISOLATE

SUBJECT: I&I TECHNIQUES FOR THE RUBBER GLOVE METHOD.

PRACTICE STATEMENT: The effective use of Isolate and Insulate equipment and procedures to provide the necessary level of safety when qualified line workers are working on energized lines & equipment.

The employer must ensure that any employee who performs energized line work is qualified (See 29 CFR 1910.269) through training and experience to perform the work assigned.

PRACTICE DESCRIPTION: Properly performed Insulate and Isolate (I&I) techniques used in conjunction with the necessary Insulating Personal Protective Equipment (IPPE) allows a qualified line worker to safely work on and around energized equipment and conductors.

I&I Definitions:

1. Insulated: (1) The use of IPE to protect the line worker while gloving energized lines/equipment.
2. Insulating Personal Protective Equipment (IPPE): Rubber Gloves and Sleeves.
3. Insulating Protective Equipment (IPE): rubber blankets, rubber line hose, rubber hoods, plastic covers, etc.
4. Isolate: (A) Physically separated, electrically and mechanically, from all sources of electrical energy. Such separation may not eliminate the effects of induction. (B) Not readily accessible to persons unless special means for access are used.
5. Minimum Approach Distance (M.A.D.): The distances set forth in 29 CFR 1910.269. This distance is measured from the end of the line workers reach or from the end of any conductive object being handled by the line worker.
6. Second points of contact: Accidental/inadvertent contact made between energized conductors or equipment and pathways to ground, which allows for current to pass through the body. Such contact can be made by the workers body or through a conductive tool/object.

I&I Best Practice: Energized Primary Rubber Gloving Method

1. Only qualified line workers shall be permitted to encroach M.A.D. using this Best Practice.
2. When working from an aerial lift the 'Cradle to Cradle' Best Practice shall be observed.



3. Before getting into a position where the qualified line worker can reach into, extend any conductive object into, or extend any other part of the body into the M.A.D., properly rated IPE/IPPE shall be used to insulate/isolate energized conductors and/or other conductive parts at a different potential.
4. For URD equipment the criteria for the 'Lock to Lock' Best Practice shall be observed.
5. Properly rated IPE shall be installed in the order of 'nearest first' and removed in the reverse order.
 - a. Energized or de-energized part(s) may have to be temporarily covered in order to install IPE on all parts necessary to insulate/isolate the part that is to be worked on.
 - b. The part to be worked shall only be uncovered after all IPE has been installed in the work zone that will allow no contact with conductors or equipment at a different potential.
 - c. IPE shall be installed/removed in such a manner so that the worker is not exposed to contact from energized conductors or second points of contact.
 - d. The line worker shall **NEVER** turn their back on exposed energized conductors or second points of contact within M.A.D.

BENEFITS:

- Eliminate contact injuries.
- Eliminate electric arc flash injuries.
- Safely working on energized circuits and maintaining the reliability of the electrical system.

REFERENCES:

- **NJATC** – Effective Cover Up; interactive training.
- **NECA** – Safety Risk Management for the Electrical T&D Line Construction
- **IBEW** – Ten States Safety Manual
- **OSHA** – 1910.269, 1926.950; subpart V
- **ASTM** – F 968-93
- **ET&D Partnership** – Existing Best Practices
- **WISHA-296-45** – Electrical Workers
- **IEEE 100** – The Authoritative Dictionary of IEEE Standards Terms (seventh edition)



Questions & Answers

1. What training and skills must a qualified person (qualified line worker) possess?

A: OSHA 29 CFR 1910.269(a)(2)(i) states:

Employees shall be trained in and familiar with the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments. Employees shall also be trained in and familiar with any other safety practices, including applicable emergency procedures (such as pole top and manhole rescue), that are not specifically addressed by this section but that are related to their work and are necessary for their safety.

OSHA 29 CFR 1910.269(a)(2)(ii) qualified persons shall also be trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment,
- The skills and techniques necessary to determine the nominal voltage of exposed live parts,
- The minimum approach distances specified in this section corresponding to the voltages to which the qualified employee will be exposed, and
- The proper use [and selection] of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment.

Note: For the purposes of this section, a person must have this training in order to be considered a qualified person.

2. How much cover is required if you are working on the center phase of a 3 phase circuit on cross arms?

A: If an employee(s) is working on the center phase on all configurations, all conductors, equipment and paths to ground within **M.A.D.** [including extended reach] effective cover-up (IPE) must be installed for the given voltage being covered.

- The term “effective cover-up” is used to describe the installation of phase-to-phase rated insulating protective cover on energized conductors and/or equipment of different potentials when the lineman is within reaching distance or in areas extended by handling conductive objects.
- The term “extended reach” is used to describe being within five feet of energized conductors and/or equipment or having a conductive object within five feet of energized conductors and/or equipment.



3. If I'm working on the neutral (or at the neutral position) what IPE is required?

A: If an employee(s) is working on a ground or the neutral, all energized phases within **M.A.D.** must be covered with properly rated IPE for the voltage being covered and insulated.

4. What IPPE is required for working on energized 'secondary voltage' circuits?

A: If working from an insulated aerial lift workers shall follow the 'Cradle to Cradle' Best Practice. If working from a structure, rubber protective insulating sleeves are not required when line workers are working circuits with a potential of 600 volts or less if there is no upper arm exposure and the worker will not encroach the M.A.D. to any primary conductors or equipment.

5. To work on de-energized parts, can a line worker remove their gloves and sleeves after everything is covered properly?

A: No. Unless an equipotential zone (EPZ) has been established, at the work location, for the protection of that worker, gloves & sleeves shall be worn.

6. How much cover is required when working with non-insulated tools?

A: When working with jumpers, tools, chains, conduit or cable slings, or other conductive devices, the employee's reach is extended the full length of that conductive device. When line workers are handling any such devices (including any tools, material or equipment that the worker may be holding) they shall properly install the properly rated IPE to the extent that all parts within the workers M.A.D. work area - that are at a different electrical potential than the part being worked - are insulated with IPE.

M.A.D. shall not be encroached unless:

1. The employee(s) is insulated or guarded from the energized conductor or equipment by use of properly rated IPE insulated rubber gloves/sleeves rated for the phase voltage involved.
2. The energized conductor or equipment is insulated or guarded by properly rated protective equipment.
3. The employee(s) is isolated, insulated or guarded from any other conductive object(s).

7. How should a line worker be positioned when installing IPE?

A: IPE should be installed from below the conductor(s). Correct positioning of the worker when applying rubber goods is of utmost importance. You cannot work near or adjacent to a conductor that is uncovered if it is within your M.A.D. until it is covered.



When an employee(s) are able to reach past the IPE, one or more of the following may be occurring:

- The employee(s) may be standing too high on the pole.
- The aerial lift device may be positioned too high or too close.
- The employee(s) may be too close to the conductor.

8. How does a line worker know if the IPE/IPPE is fit for service?

- A:
1. Selection of IPE/IPPE shall be for the circuit voltage class to be worked.
 2. All rubber/ plastic insulated equipment shall be inspected for any damage, wear or contamination that would compromise its ability to insulate or isolate the lineman from different potentials. Applicable service dates shall be observed. If upon inspection insulated protective equipment is found to be defective, the equipment shall be identified and removed from service.
 3. All rubber/ plastic insulated equipment shall be inspected immediately following any incident that could be suspected of having caused damage.

9. What voltage separates distribution voltage from transmission voltage?

A: According to the definition set forth by IEEE 100 7th Edition: Electric power lines which distribute power from a main source substation to consumers, usually at a voltage of 34.5KV or less.