Let’s Review....
who is required to comply with electrical safety PPE?

• Do you work on 50 Volts or Greater?
• Do you use a Multi-meter?
• Anyone coming in contact with 50V +......Wear your gloves!
  Know the arc flash hazard exposure!

If your answer is Yes, to even one of these,
understand what PPE is required!
OSHA 1910.269 – Relates to work on or near electric power generation, transmission, and distribution lines and equipment and the electrical hazards they present.

OSHA 1926.960 – Qualified Employees may work on or with energized lines or parts of equipment....50 VAC + ...includes safeguards for personal protection. (a) use of protective equipment. (1) Personal protective equipment.
Educate yourself with the safety rules applicable to the environment:

- Industrial
- Commercial
- Utility
General Care & Use Guidelines:

• All PPE must be visually inspected before each use! **Osha 1926.960**
  • Gloves/sleeves/blankets require electrical retesting intervals after placed in-service, **In-service standards: ASTM F496 (gloves & sleeves), ASTM F479 (blankets)**
    • Gloves, every 6 months
    • Blankets & Sleeves, every 12 months
  • Line Hose, Covers, Guards and Footwear require visual inspection before each use **In-service standard: ASTM F478 (line hose & covers), and Product specification standard: ASTM F1117 (dielectric footwear)**
  • Live line tools such as hot sticks, switch sticks, inspect before each use and retest every 2 years, **In-service standard: ASTM F711**
  • Grounding equipment inspect before each use & retest at regular intervals, **ASTM F2249**
  • Insulated Tools, **Product specification standard: ASTM F1505**
  • Arc Flash clothing & shields inspect for rips and wear before each use, **Performance standards: ASTM F2178 (face shields) and ASTM F1506 (arc rated clothing)**
Rubber Goods Inspection Process:

1. Visual
2. Electrical
3. Retest Requirements / Frequency
Rubber Gloves

• First line of defense in electrical safety work!

  Specifying what gloves to wear:
  1. what class is required, what is the use voltage
  2. what size is required, fit is an important part of safe work
  3. educate the importance of daily inspections
  4. educate the in-service guidelines on when product is to be retested at your site; maximum of every 6 months after placed in-service
Sizing of Rubber Gloves & Protectors = SYSTEM FIT

• To determine the proper size, measure the distance around the palm of the hand between the thumb and forefinger = RUBBER GLOVE SIZE
• Rubber glove should fit “snug” with protector properly so hands are not stressed
• Protectors should meet ASTM F696 relative to materials, thickness & markings
**Visual Inspection of Rubber Gloves, ASTM F496...Do they hold air?**

**ASTM F496**

8.2 Insulating gloves and sleeves shall be visually inspected by the wearer for defects. Gloves shall be air-tested before use each day and at other times if there is cause to suspect any damage.

Mechanical Test allows better visibility of entire glove:

- **Type I** NATURAL RUBBER GLOVES should not be stretched more than twice
- **Type II** SYNTHETIC RUBBER gloves should not be stretched more than 1.25 times
Glove Field Inspection

- **Air test:**
  - ✓ Will the gloves hold air when inflated?
- **Hold up to cheek and ear:**
  - ✓ Feel air on face?
  - ✓ Hear air escaping?
- **Check between glove fingers for ozone cutting/checking**
- **Gloves shall be given a detailed inspection over the entire surface, e.g. outside and inside.**
- **Look For:**
  - ✓ Snags, tears, punctures, or cuts.
  - ✓ Embedded foreign objects.
Glove Field Inspection

- Look for:
  - Contrast colors on outside and inside

- ASTM F496
- 9.2 Gloves or sleeves found upon inspection to have cuts, snags, cracks, burns, ozone cutting, ozone checking, swelling, abrasions, contamination from injurious materials, or have lost their normal elasticity, shall be rejected, or repaired in accordance with Section 10.

- Minor surface corona cutting or ozone checking in the gauntlet area, above the water line, need not be cause for rejection.
Glove Field Inspection

➢ Look for:
  ✔ Ozone checking or ozone cutting (the cutting action produced by ozone on rubber under mechanical stress into a series of interlacing cracks).
Glove Field Inspection

- Look for:
  - Changes in texture, swelling, softening, hardening, or becoming sticky or inelastic.

- Petro Chemicals are a natural enemy of rubber. They should be removed with hot soapy water as soon as practical.

- ASTM F496 8.4 Gloves and sleeves shall be wiped clean of any oil, grease, or other damaging substances as soon as practicable.
Leather Protector Field Inspection

- Use your leather glove protectors only with your rubber gloves.
- Leather protector gloves that have been used for any other purpose shall not be used to protect insulating gloves.
Leather Protector Field Inspection

- **Look for:**
  - Holes, tears, open sewn seams, etc..
  - Embedded sharp or pointed objects, e.g. splinters, staples, etc..
  - Materials injurious to insulating gloves:
    - Oils
    - Greases
    - Chemicals
Leather Protector Field Inspection

- Leather protectors shall be replaced if they no longer give adequate mechanical protection to insulating rubber gloves.
- Leather protectors soaked in injurious materials, oils, greases, etc., shall not be used over rubber gloves until they are cleaned.
Care & Storage of Rubber Gloves

- Store gloves properly in their bags; fingers up! Do not fold, rubber band, or roll inside the bag. Do not place objects on top of your glove bag.

- Remove the leather protector as a best practice & reminder for glove inspection each day.

- Gloves should not be stored under other equipment.

- Gloves should be cleaned at the end of each day. Take care of your hands...inside the rubber glove is a great place for bacteria to grow if not kept clean!
Sleeve Field Inspection

- Sleeves should also be inspected prior to every use.
- Visual inspect lengthwise by rolling the sleeve on a clean surface area.
- Use same inspection criteria as gloves, w/o air test.
Sleeve Wearing Best Practice:

- This is a question that continually pops up, and while the vast majority of users wear the sleeves inside the gloves, there are a few users that choose to wear the sleeves on the outside of the gloves for comfort reasons.

- There is no specific language in the referenced documents below, concerning wearing sleeves inside or outside of rubber gloves:
  - ASTM F496 In-Service Care of Insulating Gloves and Sleeves
  - OHSA 1910.137 Electrical Protective Equipment
  - OHSA1910.269(I) Working on or Near Exposed energized parts

- As a manufacturer, we have no preference on how sleeves are worn but agree adequate protection for the upper arm can be achieved by wearing the sleeves either way.

- However, the wearing of sleeves outside the gloves exposes the lower portion of the sleeve to contamination from pole preservatives, contact inhibitors, hydraulic oils, etc., as well as tears and snags from sharp objects in the work area and could contribute to an increase in visual defects and/or electrical failures.
Blanket Field Inspection

- Roll blanket two times on each side so that each rolling will be at right angles to each other, look for:
  - Holes, tears, punctures, or cuts.
  - Corona cutting, ozone checking.
  - Imbedded objects
  - Texture changes

• Inspect before each use!
Line Hose & Covers Field Inspection

- **Same criteria as Blankets, plus the following:**
  
  ✓ Holes other than factory produced, rope or wire burns the extend more than one third the depth or the thickness of the rubber
ASTM F496 8.6 Gloves and sleeves shall be stored in a location as cool, dark, and dry as possible. The location shall be as free as practicable from ozone, chemicals, oils, solvents, damaging vapors and fumes, and away from electrical discharges and sunlight. Gloves shall be stored in their natural shape. Gloves and sleeves shall not be stored folded, creased, inside out, compressed, or in any manner that will cause stretching or compression.

- Sleeves may be loosely rolled lengthwise inside a sleeve rollup.
- Sleeves may be loosely rolled lengthwise inside a sleeve roll.
- Sleeves should be stored in a sleeve bag or sleeve roll up but never rolled wrist to cuff or folded.
- Blankets should be laid flat, rolled or hung by the eyelets for storage but never folded when stored.
- Line Hose should be laid flat so that it is not bent to fit into small compartments.
- Covers should be stored in such a manner that the natural shape is not distorted.

Best Practice for Rubber Goods Storage:
Best Practice: Follow company rules for removing rubber goods from service. Return product to lab for further review and comment to help improve life of product.

• **ASTM F496 8.10** Gloves and sleeves with any of the following defects shall not be used and shall be returned to an electrical testing facility for inspection and electrical retest.

*Notes: Standards provide the guidelines; your organization may choose to implement above and beyond the standard or at the standard; both are acceptable.*
Rubber Goods Storage - Best Practice Review:

- Store gloves, fingers up in a canvas glove bag
  - Do not leave gloves with extended exposure to the sun / ozone (such as the dashboard of your truck)

- Store sleeves in a canvas sleeve bag
  - Do not roll wrist to cuff

- Store blankets in blanket tubes / canisters
  - Use canisters for transporting rubber goods

- Manufacturer boxes available for purchase to store product!
## ASTM Use & Test Voltage

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<th>Class</th>
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<th>Max Use Voltage AC</th>
<th>Max Use Voltage DC</th>
<th>DC Proof Test Voltage</th>
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Record Keeping and Marking

- ASTM F496 11. Record-Keeping and Marking
  - 11.1 Gloves and sleeves shall be marked to identify the type, class, and size. (Manufacturer)
  - 11.2 The test procedures of the electrical test facility shall specify the test voltage for each class of glove to be tested or a record shall be kept of the voltage used in the test. A date specified as test or retest shall be either recorded or provided by marking or affixing a label to the glove or sleeve.

- Best Practice: Date tested is stamped on the glove; some locations require retest cycles that are more conservative than the standard. (Example: 1 month, 3 month vs. 6 months for gloves)

- Consistency is key!
Glove Testing
Sleeve Testing
Line Hose Testing
Blanket Testing
Electrical Re-Testing of Gloves, ASTM F496

In-service standards:
ASTM F496 (gloves & sleeves) &
ASTM F479 (blankets)
  • Gloves, every 6 months
  • Blankets & Sleeves, every 12 months

• Visit www.nail4pet.org for a list of certified re-test facilities in your area.
IN SERVICE Electrical Testing

• Periodic Testing
• 100% of Salisbury’s shipped products are visually and dielectrically tested.
• Periodic Testing

• Gloves: Before first issue and every 6 months thereafter.
• Sleeves: Before first issue and every 12 months thereafter
• Blankets: Before first issue and every 12 months thereafter.
• Line Hose and Covers: Upon indication that the insulating value is suspect.

• If the insulating equipment has been electrically tested but not issued for service, it may not be placed into service unless it has been electrically tested within the previous 12 months.
Grounding In-service Guidelines & Best Practices:

- Use EPZ; Equipotential Zone Grounding Practices OSHA 1926.962(c) 
  NOTE: The creation of an grounding EPZ does not completely eliminate the 
  voltage differences between two conductive objects but properly applied will 
  limit the voltage exposure to a safe levels.

- Inspect grounds before each use, or before each work day. ASTM F2249

- Implement an In-service maintenance program for inspection, cleaning, 
  and replacement. ASTM F2249. Best practice: Annually

- CAUTION! Grounding jumper assemblies should only be used by 
  “Qualified Employees: as defined in OSHA 1910.269; trained in and 
  familiar with the safety related work practices, safety procedures and 
  other safety requirements associated with the use of this type of 
  equipment.
Check List For Building a Ground Assembly

- **What ASTM Grade is required?** Review ASTM F855-09 Table 1 & 2 and confirm (review with your engineering standards group):
  - Maximum fault current in kilo amperes (kA)
  - Time duration of fault in Cycles (15-or-30)

- **Specify the clamps:**
  - Minimum and maximum Conductor/Buss size to be grounded in inches, e.g. 1.25” max - .9” min
  - How many are needed, is this a Single leads or 4 Way set?
  - Style of clamp, “C”, Duck-Bill, Flat-Face, Angle, Ball Stud, etc...
  - Clamp jaw preference, Serrated or Smooth
  - Clamp termination style, Threaded or Pin type
  - Heat shrink, parking studs, etc...

- **Specify the ferrules:** The size of the ferrule must match the size of the cable it will be used with.

- **Specify the cable gauge & length and of each ground lead**
Confirm Grounds and Cable Meet ASTM Standards
ASTM F855

Grounding components & cable should meet the specifications for material performance according to ASTM F855.

• 1.1 These specifications cover the equipment making up the temporary grounding system used on de-energized electric power lines, electric supply stations, and equipment.

• 1.4 These specifications for a system of protective grounding utilizing copper cables are covered in four parts, as follows:
  • Clamps for Temporary Protective Grounds 4-16
  • Ferrules for Temporary Protective Grounds 17-30
  • Cables for Temporary Protective Grounds 31-39
  • Protective Grounds (Complete Assembly With Clamps, Ferrules, and Cable) 40-52

• 1.5 Each of the four parts is an entity of itself, but is listed as a part of the system for completeness and clarification.
5. Inspection of Grounding Jumper Assemblies

• 5.1 Visual inspection shall be made of all grounding jumper assemblies prior to testing.

• 5.1.1 If the following defects are evident, the grounding jumpers may be rejected without electrical testing:
  • 5.1.1.1 Cracked or broken ferrules and clamps,
  • 5.1.1.2 Exposed broken strands,
  • 5.1.1.3 Cut or badly mashed or flattened cable,
  • 5.1.1.4 Extensively damaged cable- covering material,
  • 5.1.1.5 Swollen cable jacket or soft spots, indicating internal corrosion, and
  • 5.1.1.6 Cable strands with a black deposit on them.

• 5.1.2 Grounding jumper assemblies which are visually defective shall be removed from service and permanently marked, tagged or destroyed (if beyond repair) to prevent re-use.

• 5.1.3 Before the grounding jumper assembly can be placed back in service, it must pass the inspection requirements in 5.1.1, and the electrical requirements in Section 7.

• 5.1.4 All physical connections should be checked for tightness with specified torque values.
ASTM F2249
Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies

In Service Maintenance:

• It is recommended that in addition to a visual inspection prior to each use that all current carrying portions of clamps be wire brushed to remove any oxidation built up on these surfaces. This includes the ferrule to clamp connection and current carrying portion of the clamp jaw.

• Eye screws should be periodically lubricated with dry graphite or moly based lubricants to insure smooth operation of the clamp.
Grounding Re-Testing Requirements:

• **Electrical Test:**
  • ASTM F2249 offers two test methods, DC or AC, based on the total resistance of the grounding assembly as measured end to end. The standard also provides a table containing the max pass/fail DC resistance values for copper grounding jumper assemblies, see Table 2 and section 7 – Electrical Testing.

• **Record Keeping and Marking:**
  • It is recommended that tested grounding jumper assemblies be marked with date of test and test results be entered into a record keeping system. Grounding jumper assemblies that have been tested on a scheduled basis and returned to the field still require inspection and maintenance in the field.
Contact a Certified NAIL LAB for Retesting Product:

Product is tested at the manufacturer before it is shipped according to ASTM / OSHA requirements. Manufacturer does not “retest product”.

Contact a NAIL Lab for retesting and in-service testing requirements:
- Gloves
- Sleeves
- Blankets
- Covers
- Sticks
- Grounding
- Boots
- Line Hose

• Visit [www.nail4pet.org](http://www.nail4pet.org) for a list of certified re-test facilities in your area.
Key Factors of a Test Lab - ask for a tour!

• Proper ventilation of lab and test equipment.
• Regularly calibrated equipment.
• Temperature and humidity controlled environment.
• Cleanliness of equipment and product.
• Excellent lighting of inspection area.
• SPACE for proper product flow and storage.
• Passionate and committed personnel.
Electrical Safety Program – Best Practices!

1 - Truck Inventory Safety Checklist & Audit

Service Centers & Contractors, what should be required to be available on every service truck at minimum?

- Cat Id – Description – Quantity
  - Line Hose
  - Cable End Caps
  - Blankets, Class Type and Size
  - Hood Insulator Covers
  - Pole Guards
  - Glove Inflator
  - Face Shields, Arc flash Clothing
  - Gloves/Sleeves
  - Dielectric Footwear

2 – Implement Asset Tracking & Worker Compliance Tools
How do you stay compliant? Worker Compliance & Asset Tracking

- **Increase**
  - Safety
  - Productivity
  - Worker confidence

- **Decrease**
  - Enterprise risk
  - Operational downtime
  - Cost and complexity

---

**Centralized Interface**

- **Equipment Inspections**
  - Was this harness inspected on schedule? Is it compliant?

- **Equipment Assignment**
  - Which worker is assigned to it?

- **Job Compliance**
  - Which workers are fully compliant?

- **Training**
  - Has the worker completed the right training? Is he or she certified for the job at hand?

---

**Equipment Compliance & Asset Tracking**

- Was this harness inspected on schedule? Is it compliant?
- Which worker is assigned to it?
- Which workers are fully compliant?
- Has the worker completed the right training? Is he or she certified for the job at hand?
Save Time on Administration...

- Real-Time View of Compliance; What PPE inspections are due?, What is the status of worker training?
Worker Compliance & Asset Tracking Possibilities...
ROI: The Benefits of Asset Tracking Tools

**Compliance Costs**
- Electronic data capture reduces compliance costs by 25%
- Ensures workers are assigned and using proper PPE

**Worker Productivity**
- Improves data capture speed by 30% with hands-free
- Reduced error rate by 40% through less re-transcription

**Safety Costs**
- Fewer incidents, fines, claims and better doc management
- Automated data capture/search - faster response

**Profit Center**
- Allocate PPE expenses to appropriate profit center or project internal or external
Practice Safety & Wear Your PPE

Thank you!

Cindy Meister
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Salisbury by Honeywell

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