Care and Use of Rubber Goods

ASTM DEFINES BOTH THE CLASS AND TYPE OF RUBBER GOODS IN EACH OF THE FOLLOWING SPECIFICATIONS:

• D-120 GLOVES
• D-178 MATTING
• D-1048 BLANKETS
• D-1049 COVERS
• D-1050 LINE HOSE
• D-1051 SLEEVES
CLASSES OF RUBBER GOODS

VOLTAGE CLASSES

FOR ALL RUBBER PRODUCTS EXCEPT RUBBER GLOVES (D-120) THERE ARE FIVE VOLTAGE CLASSES. D-120 CONTAINS SIX.

IN EACH SPECIFICATION, THE CLASS DEFINITION IS IDENTICAL. i.e. CLASS 1 FOR RUBBER GLOVES HAS THE SAME VALUE AS CLASS 1 FOR MATTING, LINE HOSE, ETC.

THE “VOLTAGE” CLASS DEFINES:

PROOF TEST VOLTAGE FOR AC AND DC AND
MAXIMUM USE VOLTAGE FOR AC ONLY
**CLASSES OF RUBBER GOODS**

**PROOF TEST VOLTAGE**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>2500</td>
<td>10,000</td>
</tr>
<tr>
<td>0</td>
<td>5000</td>
<td>20,000</td>
</tr>
<tr>
<td>1</td>
<td>10000</td>
<td>40,000</td>
</tr>
<tr>
<td>2</td>
<td>20000</td>
<td>50,000</td>
</tr>
<tr>
<td>3</td>
<td>30000</td>
<td>60,000</td>
</tr>
<tr>
<td>4</td>
<td>40000</td>
<td>70,000</td>
</tr>
</tbody>
</table>

Gloves are the only product that also have a maximum current limit during proof testing.

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**CLASSES OF RUBBER GOODS**

**MAXIMUM USE VOLTAGE**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>VOLTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>500VAC</td>
</tr>
<tr>
<td>0</td>
<td>1000VAC</td>
</tr>
<tr>
<td>1</td>
<td>7500VAC</td>
</tr>
<tr>
<td>2</td>
<td>17000VAC</td>
</tr>
<tr>
<td>3</td>
<td>26500VAC</td>
</tr>
<tr>
<td>4</td>
<td>36000VAC</td>
</tr>
</tbody>
</table>
CLASSES OF RUBBER GOODS

EXCEPT FOR CLASS 00 AND 0, THE MAXIMUM USE VOLTAGE IS BASED ON THE FOLLOWING FORMULA:

\[ \text{MAX AC USE VOLTAGE} = 0.95 \times \text{AC PROOF TEST VOLTAGE} - 2000 \]

e.g. CLASS 1

\[ \begin{align*}
10000(0.95) & - 2000 \\
9500 & - 2000 \\
= 7500
\end{align*} \]

CLASSES AND TYPES OF RUBBER GOODS

ASTM DOES NOT SPECIFY A MAXIMUM USE VOLTAGE FOR D.C. APPLICATION

GLOVES AND SLEEVES ARE THE ONLY PRODUCTS THAT ASTM REQUIRES A LABEL BE PERMANENTLY AFFIXED

ALL OTHER PRODUCTS ALLOW THAT A LABEL MAY BE USED, BUT IS NOT MANDATORY
CLASSES AND TYPES OF RUBBER GOODS

ASTM Labeling Chart

for Salisbury Linemen’s Natural Rubber and SALCORG® Rubber Protective Equipment

<table>
<thead>
<tr>
<th>Class Color</th>
<th>Test Voltage AC / DC</th>
<th>Test Voltage AC / DC</th>
<th>Rubber Molded Products Label</th>
<th>ASTM Specification Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>200V/1500V</td>
<td>500V/750V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>8000V/25,000V</td>
<td>10,000V/12,500V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>10,000V/50,000V</td>
<td>7,500V/11,250V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>20,000/50,000V</td>
<td>17,000/23,500V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>30,000/60,000V</td>
<td>25,000/36,750V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>40,000/75,000V</td>
<td>30,000/45,000V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: These test voltages are not part of any ASTM specifications. Maximum AC voltage on qualified glove is 30,000V. Gloves are not to be used if they are marked “Suitable for low-voltage.”

Types of rubber goods:
- Natural rubber
- SALCORG®
- UV and ozone-resistant rubber

FOR ALL RUBBER PRODUCTS EXCEPT LINE HOSE (D-1050) ASTM DEFINES TWO MATERIAL TYPES. D-1050 LISTS THREE
TYPES OF RUBBER GOODS

• TYPE I - MADE FROM A HIGH GRADE CIS-1, 4-POLYISOPRENE RUBBER COMPOUND OF NATURAL OR SYNTHETIC ORIGIN, PROPERLY VULCANIZED
• TYPE II - MADE OF ANY ELASTOMER OR COMBINATION OF ELASTOMERIC COMPOUNDS, PROPERLY VULCANIZED
• TYPE III - MADE OF ANY COMBINATION OF AN ELASTOMER AND THERMOPLASTIC POLYMERS, ELASTIC IN NATURE
CLASSES AND MATERIAL TYPES BY PRODUCT

• GLOVES
  – AVAILABLE IN ALL CLASSES 00 THROUGH 4
  – ALL GLOVES CLASS 1 AND HIGHER ARE AVAILABLE IN TYPE I
  – ONLY CLASS 00 AND CLASS 0 ARE AVAILABLE IN TYPE II

CLASSES AND MATERIAL TYPES BY PRODUCT - SLEEVES

• DIPPED SLEEVES ARE AVAILABLE IN CLASSES 0 THROUGH 4
• DIPPED SLEEVES ARE AVAILABLE IN TYPE I ONLY
MOLDED SLEEVES ARE AVAILABLE IN CLASSES 1 THROUGH 4 AND TYPE I AND II, BUT NOT IN ALL COLORS OR MATERIALS.

LINE HOSE AND COVERS

• BOTH ARE AVAILABLE IN TYPE II ONLY
• THE COLOR IS ORANGE
SWITCHBOARD MATTING IS AVAILABLE IN TYPE II ONLY

BLANKETS
AVAILABLE IN CLASSES 0, 2, AND 4. AND IN TYPE I AND II BUT NOT ALL SIZES AND COLORS ARE AVAILABLE FOR ALL CLASSES
Rubber Insulating Gloves

The only product designed to come into continuous contact with energized conductors or equipment.
Application

- Sizing of Rubber Gloves
  - To determine the proper size, measure the distance around the palm of the hand between the thumb and forefinger.

Insulating Gloves

OSHA 1910.333(a)(1)

Rubber Insulating Gloves are among the most important articles of personal protective equipment for electrical workers. They are the first line of defense for contact with any energized components or lines.
Insulating Gloves

- Cuff design
  - Straight cuff is standard on 14”, 16” and 18” gloves
  - Contour cuff is available for 18” gloves
  - Bell and flair cuffs are available on 14”, 16” and 18” gloves

Glove Liner

Glove liners made from stretch fabric accommodate a range of hand sizes, absorb perspiration and improve wearer comfort and dexterity.
Leather Protector Gloves

Leather Protector Gloves should always be worn over TYPE I or II electrical insulating gloves to provide needed mechanical protection against abrasion or cuts.

Leather Protectors Inspection

- Should be inspected for:
  - Tears
  - Cuts
  - Open Seams
  - Grease and oil
  - Embedded wire or wood splinters
- Protectors should be replaced when they no longer give adequate protection
- Oil soaked protectors should not be used
Protectors Selection

• The minimum distance between the top of the cuff of the protector and the rolled top of the cuff of the insulating glove shall be not less than that specified in (ASTM F496)

<table>
<thead>
<tr>
<th>Class</th>
<th>Minimum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 0 and 00</td>
<td>0.5”</td>
</tr>
<tr>
<td>Class 1</td>
<td>1”</td>
</tr>
<tr>
<td>Class 2</td>
<td>2”</td>
</tr>
<tr>
<td>Class 3</td>
<td>3”</td>
</tr>
<tr>
<td>Class 4</td>
<td>4”</td>
</tr>
</tbody>
</table>

Blankets

• Blankets, as all other insulating products (except rubber gloves, used with leather protectors) are designed to provide protection against accidental contact with energized parts

• Salisbury Insulating Blankets, compliant with ASTM D1048 specification, are flexible and feature a reinforced beaded edge and eyelets for added strength and tear-resistance

• Salisbury insulating blankets are available in Type I – natural rubber and Type II SALCOR ® rubber
Switchboard Matting

- Placed permanently in front of switchgear, motor control center and other high voltage apparatus
- Meets the requirements of ASTM D178
- Class 2 Type II
- Available 24”, 36” and 48” width

Dielectric Boots

- Meet requirements of ASTM F1117 and are 100% tested in accordance with ASTM F1116
- Flexible hand-layered construction
- Durable nylon lining for easy donning and doffing
- Non-skid bar tread outsole
Roll Blankets
Salisbury is offering insulating blanket material on a roll. Salisbury’s insulating Roll Blankets, made from a high-strength fabric-reinforced TYPE II rubber or PVC clear blankets, allow workers to custom cut the blanket to fit each job assignment. The product is available in three classes: Class 00 (500v), Class 0 (1,000v) and Class 1 (7,500v). PVC is class 1 only.

Storeroom Storage of Rubber Gloves
• Rubber gloves should be stored:
  – Cool
  – Dark area
  – In pairs in boxes

• Do not expose to:
  – Direct rays of sun
  – Hot forced air
  – Next to steam pipes or radiators
  – Do not store in the same room where electrical testing is done
  – Never store gloves inside-out
Storeroom Storage of Rubber Sleeves

• Rubber sleeves should be stored:
  – Cool
  – Dark area
  – In pairs in boxes

• Sleeves should not be folded or rolled wrist-end to shoulder because of the many points of mechanical stress.

Storeroom Storage of Rubber Blankets

• Should be stored:
  – Flat
  – Kept rolled in the original cartons in which they were received.

• Do not:
  – Fold blankets
  – Place any objects on top
Storeroom Storage of Line Hose and Covers

• Should be stored in a relaxed or normal position.
• Should not be folded or distorted.

Preferred Storeroom Storage Set-up
Field Storage of Rubber Goods.

- Rubber gloves and sleeves should be stored in glove bags or sleeve bags or roll-ups.
- Do not store more than one pair of sleeve or gloves in each bag.
- Do not store on or in front of truck heaters.
- Do not roll, fold or tape.

Field Storage of Rubber Goods

- Do not store gloves or sleeves inside out.
- Blankets should be stored in blanket canisters or blanket roll-ups.
- Do not fold blankets.
- Do not place any objects on top of the blankets.
Field Use vs. Abuse

- Failing to inspect prior to use.
- Wearing or storing gloves or sleeves inside-out.
- Using gloves or sleeves all day without visual inspection.
- Storing overnight with petroleum-base products on them.
  - Using petroleum-based hand lotion.
  - Using baby powder.
  - Using oil- or grease-soaked protectors.
  - Using petroleum-based products to wash rubber products or hands.

Field Use Vs. Abuse

- Placing objects on top.
- Using protectors as work gloves
- Using electric tape to keep in place or store rubber products.
- Using blankets under fiberglass or plastic line guards
Field Use Vs. Abuse

- Overlapping or wrapping one blanket over another. This practice sets up a possible corona-cutting condition and creates a false sense of security.
- Using blanket as an insulated standing-mat.
- Inspecting rubber good on the ground without mechanical protection.

Field Use Vs. Abuse

- Using insulating tape instead of blanket pins or other proper mechanical devices.
- Overlapping straight end of the line hose over another straight end to hold two pieces together.

Stretching line hose over insulators instead of using hoods.
Effect of Petroleum Products on Rubber Goods.

- Loss of mechanical properties
- Swelling
- Stickiness
- Loss of Elasticity
- Hardness

Typical Products Containing Petroleum Products.

- Washing detergent
  - Safe Alternative - Salisbury’s Salco Cleaner.
- Hand soaps- Use Salisbury’s Rub-Out hand cleaner.
- Baby powder-Use Salisbury’s 10-4 Glove Dust.
More Typical Products.

• Electrical insulating tape.
• Hand Lotions.
• Greases.
• Gasoline.

Corona

• Corona - The discharge of electricity due to ionization of the air surrounding a conductor under high voltage. This ionization and discharge produces ozone, a very active form of oxygen.
Corona Cutting

- Corona cutting - Cutting action of ozone on rubber under mechanical stress. It manifests itself by sharp cuts in the stressed areas. The are caused by breakdown of the long-chain rubber molecules.

The degree of cutting depends upon the concentration of ozone, the amount of mechanical stress, and the duration of exposure.

Ozone damage can result if rubber protective equipment is stored near generators and in substations, especially if switching is done or arcing occurs.
Natural Oxidation.

Slower than corona but is still destructive if given sufficient time.

Field Inspection - Rubber Gloves

- At the beginning of each job and more often if necessary.
- Rubber gloves should be given a careful inspection and air test.
Reversing Gloves for Inspection

- Grasp the cuff and pull it over the fingers as shown.
- Holding the glove downward, grasp the cuff and twirl it upward toward your body to close cuff.
- Squeeze the rolled cuff into U shape to trap the air inside the glove and pop out the fingers by squeezing the inflated glove.

Inspecting Gloves for Small Leaks

- Hold the glove downward and grasp the cuff.
- Twirl the glove upward toward your body to trap the air inside the glove.
- Squeeze the rolled cuff into a U shape with the right hand to keep trapped air inside. Squeeze with the other hand and look for damage exposed by inflation.
- Hold inflated glove close to your face and ear, squeezing the glove, to feel and listen for air escaping from holes.
Field Inspection - Rubber Gloves

AIR TEST
- The glove is then held firmly closed with one hand.
- Different parts of the glove are squeezed with the other hand to make certain that no air leaks out.

Advantages:
- Gloves can be inspected with both hands.
- Type I gloves should not be stretched more than twice the normal size.
- Type II gloves should not be stretched more than 1.25 times the normal size.
Field Inspection - Sleeves

• Inside and outside surfaces should be inspected.
• Stretching or rolling the rubber between the fingers will aid in revealing defects.

Field Inspection - Gloves & Sleeves

• Rejection of Gloves and Sleeves
  – Cuts
  – Punctures
  – Ozone checking
  – Corona Cutting
  – Embedded foreign materials
  – Oil markings
  – Gloves that leak air.
Field Inspection - Line Hose

• Inspection procedure
  – full length of the line hose should be inspected inside and out.
  – Line Hose should be spread open as shown

Field Inspection - Line Hose

• Rejection
  – Deep cuts
  – Scratches
  – Cracks
  – Embedded foreign matter
  – Service injuries
    • Rope or wire burns
  – Any damage that extends one-half the depth of the thickness.
Field Inspection - Insulating Covers

- Inspection Procedure
  - Inspect outside and inside of the cover by flexing it

- Rejection
  - Cracks
  - Punctures
  - Rope burns
  - Any injury extending to the depth of one-half of the thickness.

Field Inspection - Blankets

- Procedure
  - Blanket should be rolled
  - Complete inspection requires rolling each side two times so that each rolling will be at right angles to each other
Field Inspection - Blankets

- Rejection
  - Cuts
  - Deep scratches
  - Corona cutting
  - Punctures
  - Embedded matter

Field Inspection

- All rubber products age and eventually reach the end of their useful life.
  - Special attention should be given to equipment that appears flabby;
  - It may pass electrical test but be weakened physically that it may fail in use.
Field Inspection - Leather Protectors

- Should be inspected for:
  - Tears
  - Cuts
  - Open Seams
  - Grease and oil
  - Embedded wire or wood splinters
- Protectors should be replaced when they no longer give adequate protection
- Oil soaked protectors should not be used

Gloves Testing

- The interval between electrical retest for issued Rubber Gloves shall not exceed six months
- Gloves that have been electrically tested but not issued shall not be placed into service unless they have been electrically tested within previous twelve months (ASTM F 496 Section 7.1)
Blankets Testing

Electrical Testing

- Blankets issued for service should be retested. The interval between test shall not exceed twelve months.
- Blankets that have been tested electrically, but not issued for service, shall not be placed in service unless they have been tested within the previous twelve months.

(ASTM F 479 Section 8.1)
Electrical Testing

- Where the inspection indicates there may be reason to suspect the electrical integrity of a line hose or cover, an electrical test shall be performed before reissuing the line hose or cover for service

(ASTM F 478 Section 7.1)
Rubber insulating gloves and sleeves should be worn while climbing and working on installations or structures in the vicinity of energized circuits or any wire or apparatus that may become energized by remote or accidental means.

• To provide complete protection from primary shocks, the second point of contact such as neutral, ground wires grounded guys, must always be covered with protective equipment.
Application

As the lineman advances to his working position, he should cover all conductors and equipment where contact is possible.