

## 2. Hand Protection

Gloves made from layers of flame-resistant materials provide the highest level of hand protection. Heavy-duty leather gloves also provide good protection. Where voltage-rated rubber protection gloves are used, leather protectors should be worn over the rubber gloves.

### c. Care, Maintenance, and Inspections of FR Clothing and FR Flash Suits

Foremen will follow the care, use, and inspection guidelines for Company-issued thermal protective clothing as required by the ASTM F 1506 Standard Specification for Protective Wearing Apparel for Use by Electrical Workers When Exposed to Momentary Electric Arc and Related Thermal Hazards. These should include:

- Inspect work uniforms and flash suits before each use.
- Clean or replace if contaminated, greasy, worn, or damaged in any way.
- Prevent clothing from becoming greasy or impregnated with flammable liquids.
- Launder according to manufacturer's instructions. (Generally, home laundering in hot water with a heavy-duty detergent will be effective.)
- Do not mix flame resistant garments with items made of other materials in the same wash.
- Observe manufacturer's instructions on the number of times garment can be laundered without degrading the garments flame-retardant chemical treatment.

FR cotton materials offer fair thermal protection lasting about one year. FR polyester-cotton materials offer fair to good protection lasting for two years. Nomex materials offer excellent thermal protection lasting four years. (Another FR product similar to Nomex is called PBI.)

### d. Flash Protection Field Marking

NEC 110.16 Flash Protection states that switchboards, panelboards, industrial control panels, and motor control centers in other than dwelling occupancies, that are likely to require examination, adjustment, servicing, or maintenance while energized, shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

## 11.0 RUBBER PROTECTION EQUIPMENT

### 11.1 ELECTRICAL WORKERS' PROTECTIVE EQUIPMENT

#### a. General Requirements

This section covers Company requirements for rubber protective equipment under the control and care of Foremen. Rubber insulating equipment includes rubber gloves, sleeves, mats, blankets, covers, and line hoses. The American Society of Testing and Materials (ASTM) publishes recognized industry standards that cover rubber insulating goods.

Each Foremen should ensure that the rubber protective equipment being used by his or her crew members are properly marked, stored, cared for, and inspected before each issue; rubber gloves are air tested before each use; items are cleaned after each use and taken out of service, when found defective and electrically tested, when insulating value is suspect; and tested every 6 months for rubber gloves and every 12 months for blankets and sleeves. Foremen must store all rubber protection equipment away from light, temperature extremes, excessive humidity, ozone and other injurious substances and conditions. Employees should be required to cleaned rubber protection equipment after each use to remove foreign substances.

Rubber goods are classed, color coded, rated, and tested at voltages as follows:

CLASS	COLOR	MAXIMUM USE VOLTAGE PHASE-TO-PHASE AC	MAXIMUM USE VOLTAGE PHASE-TO-PHASE DC
OO	BEIGE	500 V	700V
O	RED	1,000V	1,500V
1	WHITE	7,500V	11,250V
2	YELLOW	17,000 V	25,500V
3	GREEN	26,500 V	39,750V
4	ORANGE	36,000 V	54,000V

Rubber goods are required to be labeled as follows:

- Manufacturer's name.
- Type I for non-ozone-resistant equipment or Type II for ozone-resistant equipment.
- Size (Gloves only).
- Voltage class (0, 1, 2, 3, 4).
- Color coding according to voltage class.

Each Foreman should ensure that rubber protective equipment under his or her control and care is maintained, inspected, used, and tested as per the equipment manufacturer's instructions and as per the appropriate American Society for Testing and Materials (ASTM) standards that are available for review in the Safety Coordinator's office:

## b. Rubber Gloves

### 1. Standards

The Company Site Superintendent should ensure that insulating rubber gloves and their leather shell that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include:

- ASTM D120 Standard Specification for Rubber Insulating Gloves.
- ASTM F496 Standard Specification for In-Service Care of Insulating Gloves and Sleeves.
- ASTM F696 Standard Specification for Leather Protectors for Rubber Insulating Gloves and Mittens.

### 2. Selection, Inspection, Use, and Care of Rubber Gloves

Rubber gloves should never be used without their protective leather shells unless specifically designed for such use. Rubber gloves are available in five basic voltage classes from class 0 at 1,000 volts phase-phase AC to class 4 at 36,000 volts phase-phase AC and two types - ozone-resistant and non-ozone-resistant, having standard lengths of 10", 14", 16", or 18" with a standard cuff or contour cuff. Rubber gloves must be thoroughly inspected and air-tested by the employee before each use. Employees should only use a light dusting inside with talcum powder or manufacturer's supplied powder. Do not use baby powder on rubber gloves. Employees must be instructed to always check the last test date marked on the glove and not use rubber gloves if the last test was more than 6 months earlier than the present date.

## c. Rubber Sleeves

### 1. Standards

The Company Site Superintendent should ensure that insulating rubber sleeves that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include:

- ASTM D1051 Standard Specification for Rubber Insulating Sleeves.
- ASTM F496 Standard Specification for In-Service Care of Insulating Gloves and Sleeves.

### 2. Inspection, Use, and Care of Rubber Sleeves

Employees should be required to wear rubber sleeves to protect their arms and shoulders from contact with exposed energized conductors or circuit parts. They are especially useful, when working in cramped locations or reaching through energized conductors. Employees should be instructed to inspect rubber sleeves before each use and to check the last test date marked on the sleeves. If the date is more than 12 months earlier than the present date, the sleeve should not be used, until it has been retested. Insulating sleeves are available in five basic voltage classes (0 to 4), two basic types I & II, and two styles (A & B). Type I sleeves are made of non-ozone-resistant rubber compound, Type II sleeves are made of ozone-resistant elastomers. Style A sleeves are made in a straight style and style B are a curved elbow construction.

## d. Rubber Mats

### 1. Standards

The Company Site Superintendent should ensure that insulating rubber mats that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include ASTM D178 Standard Specification for Rubber Insulating Matting.

### 2. Inspection, Use, and Care of Rubber Mats

Rubber mats are used to cover and insulate floors for personnel protection. Rubber mats are usually installed on a permanent basis to provide both electrical insulation and slip protection. Since permanently installed rubber mats are subject to damage, contamination, and embedding of foreign materials, these should not be relied upon as the sole source of electrical insulation. Rubber insulating mats must not be confused with the rubber matting used to help prevent slips and falls exposures. This type of mat is not intended for electrical insulating purposes. Rubber mats must be clearly and permanently marked with the manufacturer's name, type, class and have ASTM D-178 also shown on the mat every 3 feet. Rubber mats should only be used as a backup type of protection for employees. Therefore, Foremen should ensure that rubber gloves, sleeves, blankets, and other personal apparel must always be worn by employees, when electrical contact is possible even when employees are standing on rubber mats.

## e. Rubber Blankets

### 1. Standards

The Company Site Superintendent should ensure that insulating rubber blankets that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include:

- ASTM D1048 Standard Specification for Rubber Insulation Blankets.
- ASTM F479 Standard Specification for In-Service Care of Insulating Blankets.

## 2. Inspection, Use, and Care of Rubber Blankets

Rubber blankets differ from rubber mats in that these are not permanently installed. Rubber blankets can be used by employees to cover switchgear, lines, buses, or concrete floors. Employees should be instructed to inspect rubber blankets before each use and to check the last test date marked on the blanket. If the date is more than 12 months earlier than the present date, the rubber blanket should not be used until it has been retested. Rubber blankets are available in five basic voltage classes (0 to 4), two basic types I & II, and two styles (A & B). Rubber blankets must be marked either by molding the information directly into the blanket or a color-coded label.

### f. Rubber Covers

#### 1. Standards

The Company Site Superintendent should ensure that insulating rubber covers that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include:

- ASTM D1049 Standard Specification for Rubber Covers.
- ASTM F478 Standard Specification for In-Service Care of Insulating Line Hose and Covers.

#### 2. Inspection, Use, and Care of Rubber Covers

Rubber covers are molded and shaped to fit the equipment for which they are intended to cover. The five basic styles of rubber covers are:

- Insulator Hoods.
- Dead End Protectors.
- Line Hose Connectors.
- Cable End Covers.
- Miscellaneous Covers.

Employees should be instructed to use rubber covers when assigned to any work that there is exposure to energized parts of the power system. Rubber covers should be inspected by employees before each use and taken out of service, when found to be damaged. The Foreman will immediately dispose of defective covers.

### g. Line Hoses

#### 1. Standards

The Company Site Superintendent should ensure that insulating rubber line hoses that are purchased and shipped to the jobsite meet or exceed the latest ASTM standards to include:

- ASTM D1050 Standard Specification for Rubber Insulating Line Hoses.
- ASTM F478 Standard Specification for In-Service Care of Insulating Line Hose and Covers.

#### 2. Inspection, Use, and Care of Rubber Line Hoses

Rubber insulating line hoses are portable devices used to cover exposed power lines and protect employees from accidental contact. Line hose sections are molded and shaped to completely cover the power line to which they are affixed. The four styles of line hoses are:

- Straight style, constant cross section.
- Connect end style.
- Extended lip style, with major outward extending lips.
- Same as above with a molded connector at one end.

When more than one section of line hose is used, connecting line covers must be installed by employees to completely cover the power line. Rubber line hoses should be inspected by employees before each use and taken out of service, when found to be damaged. The Foreman will immediately dispose of defective line hoses.

## 11.2 RUBBER GOODS TESTING GUIDELINES

The Site Superintendent should ensure that Foremen and employees inspect all rubber protection products before each use in accordance with the manufacturers' inspection guidelines and the ASTM standard:

- ASTM F 1236 Standard Guide for Visual Inspection of Electrical Protective Rubber Products.

The Safety Coordinator should maintain a master list of all Company rubber protection equipment and set up a testing schedule so that there will be an adequate amount and types of rubber protection equipment and devices on site while tested rubber goods are off site under going manufacturer's retesting.

### 1. Manufacturer's Periodic Electrical Testing Instructions

PRODUCT	MAXIMUM TEST INTERVAL, MONTHS	ASTM	NOTES
GLOVES	6	F496	Tested, unused gloves may be placed into service within 12 months of the previous tests without retesting.
SLEEVES	12	F496	Tested, unused sleeves may be placed into service within 12 months of the previous tests without retesting.
BLANKETS	12	F479	Tested, unused blankets may be placed into service within 12 months of the previous tests without retesting.
MATS	-	D178	Only needs to be tested by manufacturer, when new.
COVERS	-	F478	Retested when in-service inspection indicates a need.
LINEHOSES	-	F478	Retested when in-service inspection indicates a need.

## 2. Typical Rubber Goods Defects That Employees Should Look For

The following are typical types of rubber goods damage or imperfections that employees should look for while inspecting each item prior to being used:

- |                                |                                  |                  |
|--------------------------------|----------------------------------|------------------|
| 1. Abrasions and scratches     | 9. Form marks                    | 17. Punctures    |
| 2. Age cracks                  | 10. Hard spots                   | 18. Repair marks |
| 3. Chemical blooms             | 11. Mold marks                   | 19. Runs         |
| 4. Color splashes              | 12. Nicks, snags, and scratches  | 20. Skin breaks  |
| 5. Cuts                        | 13. Ozone cracks                 | 21. Soft spots   |
| 6. Depressions or indentations | 14. Parting lines or flash lines | 22. Tears        |
| 7. Detergent cracks            | 15. Pitting                      |                  |
| 8. Embedded foreign matter     | 16. Protuberance                 |                  |

## 3. Electrical Testing Requirements

Equipment must withstand the a-c and d-c proof-test voltage as specified in OSHA 1910.137 standard.

Apply the test voltage continuously for one minute for matting and continuously for three minutes for other equipment.

After a 16-hour water soak, gloves should withstand the a-c proof-test voltage specified in OSHA1910.137.

If the a-c proof-test is made at a frequency other than 60 hertz (Hz), compute the permissible proof-test current from the direct ratio of the frequencies.

Equipment subjected to a minimum breakdown voltage test cannot be used for electrical protection.

Equipment can have no physical irregularities that can be detected by the tests or inspections.

## 11.3 OTHER TYPES OF PROTECTIVE EQUIPMENT

### a. Insulated Tools

#### 1. Insulated Hand Tools

The Company Site Superintendent should ensure that insulating hand tools that are purchased/shipped to the jobsite meet or exceed the latest ASTM-F1505 Specification for Insulated Hand Tools. Employees should use insulated tools for work being performed on or near exposed, energized conductors or circuits parts.

#### 2. Fiberglass-Reinforced Plastic Rods

The Company Site Superintendent should ensure that fiberglass-reinforced plastic rods are purchased and shipped to the jobsite meet or exceed the latest ASTM F711-Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Use in Line Tools. Employees using a fiberglass-reinforced plastic rod (hot stick) should comply with the Foreman instructions for safety guidelines for the job task. At a minimum, employees should wear rubber gloves, hard hat-class B, safety glasses with sideshields, face shield, and flame resistant work clothes. When safety grounds are being applied employees should be required to wear a flash suit. Employees should inspect the hot stick before each use for signs of physical damage that may affect its insulating ability, such as, cracks or a split in the rod.

### b. Personal Safety Grounding Equipment

The Company Site Superintendent should ensure that temporary grounding equipment that is purchased and shipped to the jobsite meet or exceed the latest ASTM-F855 Standard Specification for Temporary Grounding Systems to be Used on De-energized Electric Power Lines and Equipment.

#### c. Nonconductive Ladders

The Company Site Superintendent should ensure that nonconductive ladders that are purchased and shipped to the jobsite meet or exceed OSHA ladders standards and the latest ANSI standards to include:

- ANSI A14.1 Safety Requirements for Portable Wood Ladders.
- ANSI A14.5 Safety Requirements for Portable Reinforced Plastic Ladders.

#### d. Voltage Rated Plastic Guard Equipment

The Company Site Superintendent should ensure that voltage rated plastic guard equipment that is purchased and shipped to the jobsite meet or exceed the latest ASTM F712-Test Methods for Electrically Insulating Plastic Guard Equipment for Protection of Workers. Guard equipment must fall into the following categories:

- Conductor guards and connecting covers.
- Structure and apparatus covers.
- Insulating barriers.

Plastic guard equipment are used to protect employees from accidental contact with exposed energized electrical conductors or circuit parts, or to protect the employee or energized equipment, or material from contact with ground.

#### e. Barricades

Foremen should instruct employees to install physical barricades only after the live parts are put into an electrically safe working condition, while the barrier is being installed or install barriers no closer than the restricted approach distance given in NFPA 70E -Table 2-1.3.4 of Part II - 2000 Edition.

#### f. Safety Signs and Tags

The Company Site Superintendent should ensure that safety signs and tags that are purchased and shipped to the jobsite meet or exceed the latest ANSI Z535 Series of Standards for Safety Signs and Tags. Foremen and employees should post or install safety signs, safety symbols, or accident prevention tags, where necessary to warn site workers about electrical hazards that might endanger them.

#### g. Attendant

On those job tasks where warning signs and barricades do not keep site workers out of the electrical hazard work zone, the Foreman should assign a crew member to keep unqualified employees outside the hazard work area. At least one crew member should be posted as long as there is a potential for site workers to be exposed to the electrical hazards.

#### h. Test Instruments and Equipment

Employees should be instructed to only use test instruments and equipment with accessories that are properly rated for the circuits and equipment to which they are connected. Employees should also ensure that the test instruments and equipment with accessories are also suitable for the work environment in which these are to be used. Employees must not use or connect test instruments and equipment on any electrical conductors, or circuit parts that have higher voltages and current than the test instruments or equipment is rated. Test instruments and equipment should be inspected by employees for defects and any leads, cables, power cords, probes, and etc. are required to be replaced and tested before being used again.