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Don't Test Your Luck When Exposed to Arc Flash & Electrical Safety Hazards

Test Your Rubber Goods for Continued Safety, Compliance, and Cost Savings

Did you know that OSHA reports that 80% of electrical-related accidents and fatalities involving “qualified workers” are caused by arc flash/arc blast? Most often, when there is an arc flash hazard there is also an electrical shock hazard, as arc flash hazards involve or are in close proximity to energized equipment.

The danger of exposure to arc flash and electrical hazards continues to increase as workers’ responsibilities expand to include interaction with electrical equipment. In reality, almost every single facility has a need for electrical safety – whether the company is a larger facility with building engineers overseeing distribution, or a smaller facility with maintenance staff working around floor or wall sockets. Janitorial staff, facilities staff and equipment operators all risk exposure to electrical shock.

OSHA, NFPA, and ASTM standards mandate the use and testing of in-service rubber insulating equipment when even the smallest probability of contact (with 50 volts AC or higher) exists. Regardless of the heavy

finer, serious injuries and deaths that occur from arc flash and electrical incidents, compliance continues to remain an issue because the shocking truth is that many workers are not using rubber insulating equipment (or having them dielectrically tested for that matter) because they don’t know they need to. Therefore, education and awareness are paramount – not only about the requirements for use, but also about the requirements for in-service inspection and testing of rubber insulating equipment for continued safety, compliance, and cost savings.

Establishing Safe Practices

While the best way to prevent arc or electrical incidents from happening is to de-energize equipment before beginning work, there are instances where turning off the power could create an even greater hazard. As such, employers and facility owners must establish safe practices, including the use of personal protective equipment (PPE), to protect their workers against arc flash and electrical incidents.

Rubber insulating gloves (electrical gloves) are the only protective gear designed for constant contact with, and protection from, energized conductors and equipment. All of the other items are designed for protection from accidental, incidental, or brush contact. Arc-rated work gloves alone provide no protection from voltage. Voltage-rated rubber insulating gloves are an essential element in protecting workers that are exposed to high-voltage currents. Shock protection is the primary benefit. However, electrical gloves worn together with the appropriate leather protector gloves also provide significant burn protection in the event of an arc flash.

According to the OSHA 29 CFR 1910.137 standard, electrical gloves must be rated for the voltage to which a worker will be exposed (phase to ground or phase to phase) and marked to indicate their rating. For in-service use, the maximum use voltage must be above the actual exposure, but it is important to take note of the proof test voltage as well. All electrical gloves are tested

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by the manufacturer at the specified proof test voltage. Manufacturers also perform a dielectric breakdown test at an even higher voltage to validate the dielectric strength of the rubber material. The result is a significant margin of safety between the test voltages and the maximum use voltage. Each specific hazard assessment will help in determining which class of gloves is appropriate for the application.

Voltage protection is broken down into the following classes, and each class of gloves is clearly marked with the maximum use voltage on the color-coded label:

Class Label Color	Proof Test Voltage AC / DC	Maximum Use Voltage AC / DC
00 Beige	2,500 / 10,000	500 / 750
0 Red	5,000 / 20,000	1,000 / 1,500
1 White	10,000 / 40,000	7,500 / 11,250
2 Yellow	20,000 / 50,000	17,000 / 25,500
3 Green	30,000 / 60,000	26,500 / 39,750
4 Orange	40,000 / 70,000	36,000 / 54,000

The ASTM standards also include DC test and maximum use voltages.

The Power of Testing

Testing is also a critical, required, and often overlooked component to maintaining arc flash and electrical safety. ASTM standards mandate the testing of the rubber insulating products by the manufacturer or supplier prior to the first delivery to the end user. Users also have the option of performing or requiring an acceptance test upon receipt of the goods and prior to placing rubber insulating products into service. The interval between the date of issue and electrical testing should be based on work practices and test experience. For gloves, the interval shall not exceed six months, except for industries such as telecommunications that utilize insulating gloves as precautionary protection, in which case the maximum interval may be increased to nine months. However, do not place rubber insulating products into service unless they have been tested electrically within the previous 12 months. These in-service re-test intervals are the maximum permitted and

in addition to the daily field care and inspection. It is quite common for users, including power utilities and contractors, to specify shorter intervals.

Periodic re-testing of electrical gloves should be performed at the proof test voltage to ensure that they are still safe using specialized equipment designed to gradually increase the voltage to the desired test level. The dielectric test is two-fold: pass/fail on the ability to withstand the rated test voltage and, for gloves, quantitative on the ability to prevent electric current from passing through the rubber goods above the maximum contained in the specifications. Products passing the inspection and test procedures can then be returned to service for continued use and cost savings over purchasing a new pair of gloves that could have been re-tested and re-certified by a qualified test lab for a fraction of the cost. If you do not have the equipment required to perform these electrical tests, there are independent testing facilities that can perform the acceptance and in-service testing on behalf of end users. At a minimum, ASTM standards require that the inspection and testing process include the following steps:

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1. Check-in
2. Removing previous testing marking
3. Washing using cleaning agents that will not degrade the insulating properties
4. Visual inspection of all surfaces (inside and out)
5. Electrical test
6. Final inspection
7. Recordkeeping
8. Marking
9. Packing in appropriate containers (this means boxes, or similar sturdy packaging materials to prevent folding, creasing or similar loose storage that can cause stress on the rubber) for storage or shipment

When selecting a test lab for use, make sure that it is a NAIL-accredited test lab. NAIL stands for **National Association of Independent Laboratories for Protective Equipment Testing**. It incorporates the only Laboratory Accreditation for the electrical equipment test labs program in North America. NAIL4PET

helps develop uniformity in testing and works in close association with the American Society of Testing Materials (ASTM International).

All in all, nearly every industrial workplace has a need for arc flash and electrical safety, and regulatory standards require ongoing testing of in-service equipment in order to maintain compliance and ensure the products' integrity and safety when exposed to a wide range of voltages. Fortunately, there are practices that you can implement to prevent the lost time, damage to equipment and facilities, legal liability, increased insurance premiums, hefty fines, and unnecessary PPE spending that can result from arc flash and electrical

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incidents. It starts with understanding the need for electrical protective equipment and periodically re-testing rubber insulating equipment for continued confirmation of effectiveness.

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Best Practices for an Electrical Safety Program

Most of these accidents are caused by non-electrical workers. These findings help to create new materials and prevent future incidents from occurring. The materials can be used to create an electrical safety program or to supplement an existing program with new resources created yearly. ESFI also recommends following the guidelines outlined in the "NFPA 70E: Standard for Electrical Safety in the Workplace." The NFPA 70E is the National Fire Protection Association's guidebook, which addresses electrical safety requirements for workplaces that are necessary for the practical safeguarding of employees to help prevent injuries and fatalities from electrocution, shock, arc flash, and arc blast. A revised and updated NFPA 70E edition is released every three years. The current version is the 2021 edition, which was recently released.

Educating the workforce of electrical hazards and how to avoid them requires a mutual effort between employees and employers. It is imperative all parties be involved in

an electrical safety training program to prevent any accidents from occurring. If a job requires workers to be near electricity, an electrical safety program should be in place to teach workers how to avoid accidental contact with electricity. Download ESFI's free-to-share electrical safety videos and infographics from esfi.org to amplify the electrical safety of your workplace. Distribute the content directly to your employees or your customers to help prevent future workplace injuries and fatalities and forward our mission of reducing electrically related deaths, injuries, and property losses at home and in the workplace.

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