

64th Issue

SAFETY TIPS TO PREVENT ARC FLASHING



Overview:

Electricity is one of the most important blessings that science has given to mankind. It has become an elemental part of modern-day life. One cannot think of a world without it. Electricity has also played a decisive role in the modern industrial development. On one hand where electricity brings boon to us there is bane of hazards and risks associated with it. One of the prominent and serious hazards is 'Arc Flashing'. According to NFPA 70E, every year more than 2,000 workers are hospitalized in extensive injured condition caused by arc flash accidents. We at Liberty General Insurance Limited understand the severity of damage that can be caused due to arc flashing. We intent to provide an understanding and some useful measures to ensure adequate safety from possible arc flashing.

What is Arc Flash?

An arc flash is an undesired electric discharge that travels through the air between conductors or from a conductor to a ground. This occurs with a deadly release of energy with high temperatures ranging to 19,430^o C. The resulting explosion can cause fires and serious harm to equipment and people.

Case Studies:

Case 1:

In February 2018, an electrician went to install a new power supply in a wall-mounted, low voltage (415 V) switchboard to provide three-phase power for an electric motor. The switchboard was still live and, as he tried to remove an existing circuit breaker with a screwdriver, an arc flash occurred. Investigation into the incident revealed that an inadequate risk assessment was conducted before carrying out the live electrical work. Moreover, there were inadequate fault protection devices upstream of the switchboard, and inadequate personal protective equipment (PPE) was worn. The electrician received thermal burns to his face, hands and upper body. His assistant also received burn injuries and both workers were temporarily blinded.

Case 2:

September 2012: A worker was working in a panel box changing a contactor when the contactor failed, causing an arc flash that burned his left arm, face, and neck. It was found that circuit was energized, and the electrician lacked Arc flash suit and adequate PPEs to safeguard against Arc flash.



What Happens During an Arc Flash?

An Arc flash is initiated due to an Arc fault (a high-power discharge of electricity between two or more conductors). When an arc fault occurs, there is a massive electrical explosion. Both arc flash and arc blast are separate byproducts of that electrical explosion. The arc flash is the light and heat from the explosion, while the arc blast is a pressure wave that follows.

During Arc flashing electricity travelling through a desired path exits its course and starts conducting through air by ionizing the atmosphere near the circuit. This results into formation of a visible arc which intends to find its way towards a ground. This arc is highly dangerous for object and people present nearby.

Causes of Arc flash:

- Carelessness or accidents, e.g. touching the wrong surface with a test probe
- Improper tools, installation, and work techniques
- Lack of electrical safety awareness and training
- Use of damaged/substandard electrical materials/equipment
- Insulation damage, gaps, wear & tear, temporary connections
- Dust, debris, and corrosion on electrical conductors
- Improper preventive maintenance for circuit breakers and switches
- Exposed live parts in electrical circuit/panels
- Static electricity or high voltage cables
- Exposure of electrical equipment to water or other liquids





Potential risks associated with Arc Flashing:

- Fire & explosion damages to property
- Electrical breakdowns due to electrical surges
- Death due to electrocution
- Severe burns, eyesight, and auditory damages
- Business interruption

Preventive measures to safeguard against Arc flashing:

- Deployment of a detailed arc flash plan/guide with reference to standards such as National Fire Protection Association's (NFPA®) 70E.
- Avoid working on energized electrical equipment during maintenance.
- Ensure the equipment is de-energized by testing its potential before starting to work. Make sure power backup utilities like DGs and UPSs are isolated as well.
- Use remote racking technology to operate circuit breakers of energized equipment safeguarding the operators performing the task.
- Arc limiting fuses & high impedance bus protection systems can be installed in critical circuits working on higher potential.
- Adherence to LOTO (Lock Out Tag Out) and Energized Electrical Work Permit systems.
- Only trained and qualified personal must be allowed to enter and work in potential arc flash boundary/zone.
- All personnel entering potential Arc flash zone must wear Arc flash suit along with other PPEs like hood and face shield, gloves, safety glasses, ear plugs, etc.
- Electrical thermography should be performed periodically to encounter increase in resistance due to loosen connections or accumulation of foreign particles like dust.
- Installation of optical fiber-based arc flash fire detection and protection systems.



Trivia

Electrical arcs produce some of the highest temperatures known to occur on the Earth. These temperatures can range up to four times the temperature of the surface of the Sun. All known materials can get vaporized at this temperature.



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