ARC FLASH

IDENTIFY

Electricity can injure or kill in two main ways. One is by electric shock, and the other is by arc flash, which causes an explosive expansion of air and molten metal.

An arc flash (also called a flashover) results when electrical current suddenly moves from its intended conductor to another conductor or to the ground. Electrical arcs typically give off great amounts of energy in the form of light, heat, pressure, and noise. They can produce temperatures of up to 35,000° F (19,400° C), which instantly vapourizes all known materials.

Arc flash incidents typically occur in applications exceeding 120 volts. High-voltage arcs produce pressure waves by rapidly heating the air and creating a blast. This can hit a worker with great force and send droplets of melted copper and aluminum electrical components great distances at extremely high velocities.

An arc flash can cause minor injuries, second and third degree burns, blindness, hearing loss, nerve damage, cardiac arrest, and death.

The causes of arc flash can include the following:

- Dust and impurities
- Corrosion
- Condensation of water on the surface of insulating material
- Spark discharge
- Accidental touching
- Dropping tools
- Improperly maintained electrical meters
- Over-voltages across narrow gaps
- Failure to insulate material
- Improperly designed or utilized equipment
- Improper work procedures

There are two conditions under which an arc flash is most likely to occur — while working on an energized circuit or when electrical equipment fails. Factors that determine the severity of an arc flash injury are proximity of the worker to the hazard, temperature generated, and the amount of time it takes for the arc circuit to break.

COMMUNICATE AND CONTROL

Electrical arcs, when they are controlled well and fed by limited energy, produce very bright light, and are used in arc lamps (enclosed, or with open electrodes) for welding, plasma cutting, and other industrial applications.

Workers who could be exposed to arc flash must have training to understand the hazard, how it is initiated, what personal protective equipment (PPE) is appropriate, and how to use it safely.

Guidelines on best protection practices

Conduct an arc flash analysis to determine the amount of thermal energy that could be generated in an arc flash incident. The information is then used to define a flash protection boundary around the potential source and to determine the level of PPE required when employees cross the boundary while they work on or near exposed live parts.

PPE commonly used for shock and arc flash protection includes safety glasses, voltage-rated gloves, fire-resistant (FR) work clothes, arc-rated face shields, flash suits with hoods, and hearing protection.

Key safety recommendations from NFPA 70E include creating what it calls an “electrically safe work condition” by doing the following:

- Identifying all power sources
- Interrupting the load and disconnecting power
- Visually verifying a disconnect has opened the circuit
- Completing lockout/tagout procedure on the circuit
- Testing for voltage
- Grounding all power conductors

The NFPA70E standard is also used in Canada, along with guidance provided by **CSA Z460:20, Control of Hazardous Energy - Lockout and Other Methods.**

COMMUNICATE AND CONTROL

Wherever practical, work on energized equipment should be done only by qualified, competent persons after equipment is de-energized and lockout/tagout procedure is complete. The use of warning labels is an important part of protecting workers and the public from arc flash. It is vital to clearly mark electrical equipment such as switchboards, industrial control panels, and motor control centres that are likely to require inspection, servicing, or maintenance while energized.

Even qualified persons trained in electrical safety must always be alerted to potential electrical arc flash hazards.

Legislation – for details on the required guidelines, refer to the Workplace Safety and Health Regulation Part 38.

THE QUIZ

1. Electrical arc flash causes an explosive expansion of air:
   TRUE_____ FALSE_____

2. Can an arc flash occur in non-conductive material?
   YES_____ NO_____

3. Which of these are among the causes of arc flash:
   a) Corrosion
   b) Condensation
   c) Accidental touching
   d) Improperly designed or utilized equipment
   e) Dust and impurities
   f) All of the above

4. The National Electrical Safety Association developed the 70E Standard to help protect workers from arc flash:
   TRUE_____ FALSE_____

5. Which of these are commonly used items of personal protective equipment when working with or near a potential arc flash hazard?
   a) Steel-toed boots
   b) Voltage-rated gloves
   c) Arc-rated face shields
   d) Flash suits
   e) All of the above

6. Where possible, work on energized equipment should only be done by qualified, competent persons after the equipment has been de-energized:
   TRUE_____ FALSE_____

7. Which of these is NOT among the steps to create an electrically safe work condition?
   a) Activate all power sources
   b) Visually verify that a power disconnection has opened the circuit
   c) Lockout/tagout the circuit
   d) Ground all power conductors

8. Does your workplace have written safe job procedures for de-energizing electrical equipment?
   YES_____ NO_____

9. Name the CSA standard for Control of Hazardous Energy.
   _____

10. What is the safety regulation on electrical safety? State the legislation.
   _____

ANSWERS:

1. TRUE; **2.** No; **3.** f; **4.** TRUE; **5.** e; **6.** TRUE; **7.** a; **8.** Site-specific answer; **9.** Z460:20; **10.** WSH Regulation Part 38