

# Arc Flash Safety Fact Sheet

HS26-004A (02-26)

**A**n electric arc flash is one of the most dangerous electrical hazards in the workplace. It happens when an electrical fault causes electricity to jump through the air from one conductor to another or to the ground. The heat from an arc flash can exceed 35,000 °F — nearly four times hotter than the sun's surface.<sup>1</sup> The blast can cause serious burns, hearing loss, blindness, broken bones, and death. Arc flash injuries can happen in any industry where employees work on or near energized electrical equipment.



Electric arc flash incidents injure thousands of workers every year.<sup>2</sup> Understanding the hazards and following safe work practices can prevent these life-threatening injuries.

## What is an arc flash?

An arc flash is a type of electrical explosion. It occurs when electric current leaves its intended path and travels through the air between conductors or from a conductor to the ground. The arc produces:

- **Extreme heat:** Temperatures can reach 35,000 °F, hot enough to vaporize metal and ignite clothing.
- **Intense light:** The bright flash can cause temporary or permanent blindness.

- **A pressure blast:** The explosive force is strong enough to throw workers across a room or cause broken bones.
- **Flying metal fragments:** Molten copper, steel, and aluminum can become dangerous shrapnel.
- **Deafening noise:** The blast can cause permanent hearing loss.

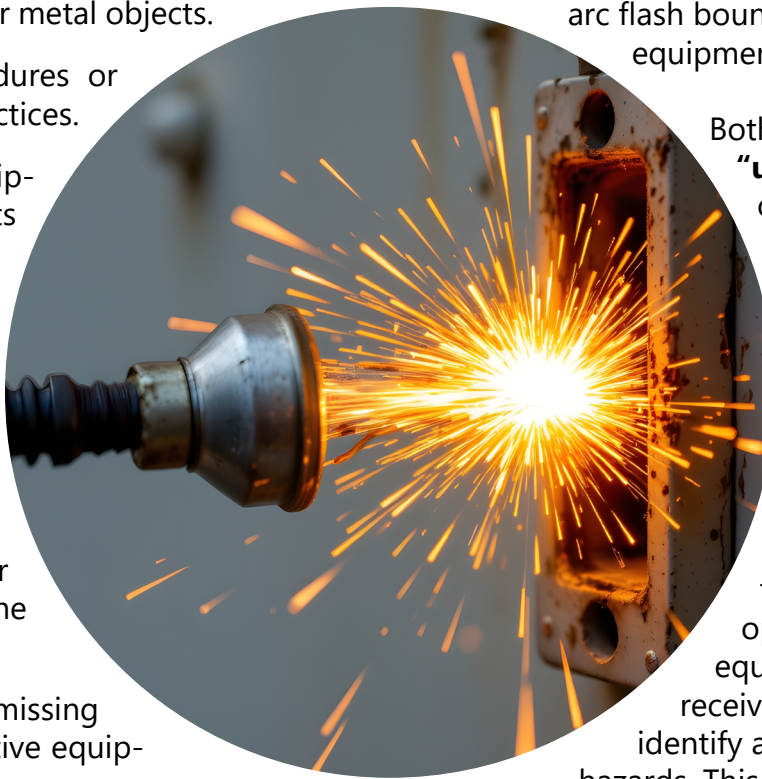
Most arc flash burn injuries happen when the heat from the arc ignites flammable clothing, not from direct contact with the arc itself.<sup>3</sup>

## What causes arc flash incidents?

Arc flashes can occur in any workplace with electrical equipment rated 50 volts or higher.<sup>4</sup> Common causes include:

- Working on or near energized equipment.
- Accidental contact with electrical parts using tools or equipment.

- Dust, corrosion, or moisture buildup on electrical components.
- Improperly maintained equipment.
- Dropped tools or metal objects.
- Incorrect procedures or unsafe work practices.
- Operating equipment beyond its rated capacity.
- Lack of proper warning labels on electrical panels and equipment.
- Using the wrong tools or equipment for the job.
- Inadequate or missing personal protective equipment (PPE).



- Facility and plant workers.
- Construction workers.
- Anyone performing tasks within the arc flash boundary of energized equipment.

Both “**qualified**” and “**unqualified**” workers can be exposed to arc flash hazards when they are near energized electrical equipment. A qualified person is someone who has demonstrated the skills and knowledge related to the construction and operation of electrical equipment and has received safety training to identify and avoid electrical hazards. This includes understanding

shock and arc flash risks, knowing the applicable approach and arc flash boundaries, determining safe work distances, and selecting and using appropriate PPE and safe work practices.<sup>7</sup>

An unqualified person has not received this level of electrical safety training and is not permitted to work on or near exposed energized parts.<sup>8</sup> Under **National Fire Protection Association (NFPA) 70E**, unqualified workers must remain outside the **limited approach boundary** unless they are escorted by a qualified person and properly protected. The limited approach boundary varies based on the system voltage. For example, for systems rated 50 to 750 volts to ground, the limited approach boundary is typically 3 feet, 6 inches — but greater distances apply at higher voltages.<sup>9</sup>

Even low-voltage systems (such as 120/208V) can produce dangerous arc flashes.<sup>5</sup>

## Who is at risk?

Any worker who performs tasks on or near energized electrical equipment may be exposed to arc flash hazards. This includes:

- Electricians and electrical technicians.
- Maintenance and repair workers.
- Heating, ventilation, and air conditioning technicians.
- Machine operators who adjust or troubleshoot equipment.

# How can employers and workers prevent arc flash incidents?

## De-energize equipment whenever possible

The best protection is to work on equipment that is completely de-energized. Employers should:

- Establish a written electrical safety program that prioritizes de-energizing equipment before any work begins.
- Require [lockout/tagout](#) (LOTO) procedures for all electrical work to prevent accidental re-energization of equipment
- Verify that equipment is de-energized using proper testing tools before starting work.
- Control stored energy (capacitors, batteries) even after equipment is locked out.



- Ensure only qualified workers perform electrical work on or near energized equipment.
- Keep unqualified workers at a safe distance, unless under direct supervision of a qualified person.

## Develop and follow safe work practices

When energized work is necessary:

- Require an energized electrical work permit for all tasks on live equipment rated 50 volts or higher.<sup>10</sup>
- Conduct a job briefing before starting work to review hazards, boundaries, PPE, and emergency procedures.
- Establish and enforce arc flash boundaries. Do not allow anyone to cross the boundary without proper authorization, training, and PPE.
- Use insulated tools rated for the voltage level of the equipment.

## Perform arc flash hazard assessments and label equipment

Employers must:

- Conduct an arc flash risk assessment for each piece of electrical equipment rated 50 volts or higher.<sup>11</sup>
- Calculate the incident energy level at potential work locations.
- Determine arc flash boundaries and shock protection boundaries.
- Install warning labels on electrical panels, switchgear, and other equipment. Labels should clearly show:
  - Arc flash boundary distance.
  - Incident energy level, measured in calories per square centimeter (cal/cm<sup>2</sup>).

- Required PPE and clothing arc rating.
- Limited and restricted approach boundaries for shock protection.

## Provide proper training

Employers must ensure:

- All employees exposed to electrical hazards receive training on recognizing those hazards and how to avoid them.
- Qualified workers receive specialized training on safe work practices, hazard identification, risk assessment, and proper use of PPE and insulated tools.
- Authorized lockout/tagout employees understand energy control procedures and can apply locks and tags correctly.
- Refresher training is provided at least annually or whenever job assignments change.

## Maintain electrical equipment

Regular inspections and maintenance reduce the likelihood of arc flash incidents. Employers should:

- Inspect electrical equipment regularly for signs of wear, damage, corrosion, or overheating.
- Keep electrical panels and equipment clean and free of dust, moisture, and debris.
- Replace worn or damaged components promptly.
- Ensure all electrical equipment is properly grounded.
- Keep equipment within its rated capacity, and never overload circuits or panels.

## What PPE is required?

When work on or near energized equipment cannot be avoided, workers must wear arc-rated PPE. Regular work clothing — even heavy denim or cotton — will ignite in an arc flash and cause severe burns.

## Arc-rated PPE includes:

- **Arc-rated clothing:** Long-sleeve shirts, pants, coveralls, or [arc flash suits \(PDF\)](#) with an arc rating equal to or greater than the incident energy level (measured in cal/cm<sup>2</sup>). If the calculated incident energy exceeds 2.0 cal/cm<sup>2</sup>, employees must wear arc-rated protective clothing that covers the entire body, with specific exceptions for hands, feet, and head.<sup>12</sup>
- **Arc-rated face shield or hood:** Protects face and neck from heat and flying debris.
- **Safety glasses:** Worn under face shields to protect against impact.





- **Hard hat (non-conductive):** Protects the head from impact and electrical shock.
- **Hearing protection:** Reduces damage from the intense noise of an arc blast.
- **Leather or arc-rated gloves:** Protects hands. Rubber insulating gloves may also be required for shock protection.
- **Leather work boots:** Non-conductive footwear to protect feet from heat and electrical hazards.

**Important:** Ordinary work clothes — including synthetic fabrics, cotton and polyester blends, and flammable materials — can melt or ignite during an arc flash, causing serious burns. Only arc-rated clothing provides adequate protection.

### All PPE must be:

- **Inspected** before each use for damage or wear.
- **Maintained** and stored properly.
- **Replaced** if damaged or contaminated.

## What standards apply to arc flash safety?

Employers and workers should review and follow:

- **OSHA 1910 Subpart S:** Covers electrical safety-related general industry work practices, including safeguards for employees exposed to electrical hazards.
- **OSHA 1926 Subpart K:** Electrical safety requirements for construction work.
- **OSHA 1910.269 — (Electric Power Generation, Transmission, and Distribution):** Includes specific requirements for flame and electric arc protection for utility workers.
- **NFPA 70E — (Standard for Electrical Safety in the Workplace):** Provides comprehensive guidance on safe work practices, risk assessment, PPE selection, boundaries, and training. Originally developed at OSHA's request, NFPA 70E helps employers comply with OSHA regulations.

### Additional resources:

- OSHA Electrical Safety webpage: [www.osha.gov/electrical](http://www.osha.gov/electrical).
- OSHA Electric-Arc Flash Hazards: [www.osha.gov/electrical/flash-hazards](http://www.osha.gov/electrical/flash-hazards).
- NFPA 70E (Standard for Electrical Safety in the Workplace): Available at [www.nfpa.org](http://www.nfpa.org) (viewable for free with account registration).
- Partnership for Electrical Safety: <https://partnershipforelectricalsafety.org/>.

### Where can I learn more?

For more information about arc flash hazards or to schedule workplace electrical safety or OSHA training, contact a DWC Safety Training Specialist at [SafetyTraining@tdi.texas.gov](mailto:SafetyTraining@tdi.texas.gov) or **512-804-4610**.

To explore additional workplace safety resources and training opportunities, visit [www.txsafetyatwork.com](http://www.txsafetyatwork.com).



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**800-252-7031, option 2**

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