

Arc Flash Safety

What is arc flash and what causes it?

An arc flash is a short circuit through air that flashes from one exposed live conductor to another conductor or ground. This electrical fault can create a dangerous release of energy, including thermal energy, acoustical energy, pressure wave or debris.

There are many ways an arc flash can occur, including:

- Close proximity of a high-amp source to a conductive object
- Dropping a tool or creating a spark
- Breaks or gaps in insulation
- Failing equipment due to use of substandard parts, improper installation or even normal wear and tear
- Dust, corrosion or other impurities on the surface of the conductor

What impacts the size of an arc flash event?

Common variables that impact the size and energy of an arc flash include:

- Amperage
- Voltage
- Arc gap
- Closure time
- Distance from arc
- Three phase vs. single phase
- Confined space



Did You Know?

Anything above 50V that could be worked on while energized, resulting in exposure to electrical hazards, requires an arc flash label.

Examples include, but are not limited to:

- Switchboards
- Panel boards
- Motor control centers
- Industrial control panels
- Meter socket enclosures

NFPA 70E Standard for Electrical Safety in the Workplace

OSHA cites and fines employers for failure to protect employees from the dangers of arc flash under regulation 29 CFR 1910.333(a). The National Fire Protection Association (NFPA) details how to comply with this regulation through the NFPA 70E standard.

According to the NFPA 70E standard, there are six primary responsibilities that facilities must meet, including:

1. Training for employees
2. Written safety program in place that is actionable
3. Personal protective equipment (PPE) available for employees
4. Insulated tools
5. Arc flash hazard degree calculations
6. Properly labeled equipment

Most recent updates (2018)

The NFPA 70E gets updated every three years. Some of the most recent updates include:

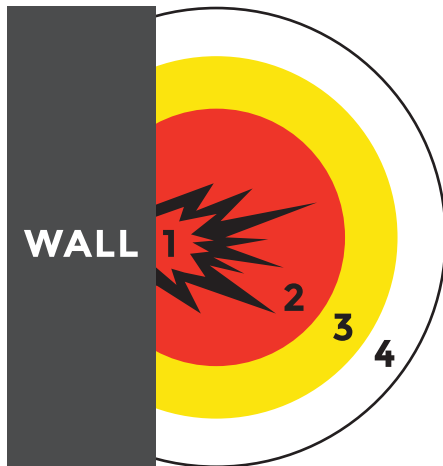
- Updated training and retraining requirements
- Revision to arc flash warning label content
- Elimination of the PPE hazard category 0
- Elimination of prohibited approach boundary
- Additional boundary requirements
- Revisions to selecting appropriate PPE
- Minor terminology changes (such as work shoes now referred to as footwear)

What is an arc flash boundary?

An arc flash boundary is the distance at which an electrical arc can flash outward and endanger employees working on electrical equipment.

Additional boundary requirements include:

- Conductive articles of jewelry and clothing: Watchbands, bracelets, rings, key chains, necklaces, metal frame glasses, etc. shall not be worn within the restricted approach boundary
- Working space: Space shall be kept clear and not used for storage to permit safe operation and maintenance
- Barricades: When the arc flash boundary is greater than the limited approach boundary, barricades shall not be placed closer than the arc flash boundary
- Insulated tools: Employees shall use insulated tools when working inside the restricted approach boundary of exposed energized electrical conductors.



1. Exposed / energized conductor or circuit part

2. Restricted approach boundary

Distance where there is an increased likelihood of electric shock

3. Limited approach boundary

Distance where a shock hazard exists

4. Arc flash boundary

Distance from an arc source where the thermal energy exposure could cause 2nd degree burns on unprotected skin

Arc Flash Risk Assessment

The NFPA 70E 2015 edition requires employers to conduct an arc flash risk assessment to determine the amount of thermal energy that could be generated from 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 arc-rated apparel and other personal protection equipment required when employees cross the boundary while they work on or near explosive live parts.

- ▶ **At minimum, the safety program needs to be audited at intervals not to exceed three years and arc flash risk assessments shall be periodically reviewed at intervals not to exceed five years.**

Who should perform arc flash risk assessments?

Completing a best-in-class arc flash risk assessment in-house requires time, resources and analysis software to accurately calculate arc flash risk. In addition, simple miscalculations can lead to incorrect incident energy levels resulting in the improper use of PPE.

Brady's **Arc Flash Risk Assessment Service**, performed by a licensed electrical engineer using power system analysis software, enables you to not only reach compliance, but maintain compliance. Additional services also include Arc Flash Audits and Arc Flash Safety Training.

Arc Flash Labeling

Who's responsible for labeling?

Arc flash labeling is the responsibility of the employer, not the manufacturer or installer of the equipment.

What needs to be labeled?

Labeling is required for any piece of electrical equipment that is likely to require examination, adjustment, service or maintenance while energized, creating the potential for an arc flash incident to occur.

Any modifications or renovations to electrical equipment that changes data on the label requires an updated arc flash risk assessment and label.

Where should the label be placed?

Markings must be in a location that is clearly visible to workers before they may be exposed to any potentially dangerous live parts. Typically, the label is placed outside the panel or enclosure door.



What needs to appear on the label?

Once an arc flash risk assessment has been conducted, in which the arc flash boundary, the incident energy at the working distance and the personal protective equipment required has been determined, Article 130.5 (C) in the 2015 edition of NFPA 70E further dictates that the label must contain these important elements.

Incident energy and corresponding working distance

Min. arc rating of clothes

Arc flash boundary

Site specific PPE

FLASH PROTECTION		SHOCK PROTECTION	
Incident Energy at:	18 in.	Shock Risk When Cover is Removed	480 VAC
Min. Arc Rating:	0.45 cal/cm ²	Limited Approach	42 in.
Arc Flash Boundary:	10 in.	Restricted Approach	12 in.
Glove Class:	00	Bus Name:	
PPE: Shirt and pants or coverall, Nonmelting (ASTM F1506) or Untreated Fiber) + hard hat + safety glasses + hearing protection		PNL_P-5	
		Prot Dev: 100/3 BS-18 LAB PNL	

Header

Shock hazard information

Brady Arc Flash Solutions



Arc flash services

Brady understands the importance of electrical safety as a whole and has licensed engineers who understand not only arc flash safety, but also the firsthand impact of arc flash risk. We work with your team to best protect your employees based on your custom facility and program requirements.

- **Arc Flash Risk Assessment**
A Brady safety electrical engineer completes your assessment, provides you with a detailed assessment report, including your single-line diagram, and installs the correct arc flash labels.
- **Arc Flash Audit**
Let our electrical engineer perform your arc flash audit and ensure your assessment is up to date and compliant.
- **Arc Flash Safety Training**
This custom approach to training incorporates both the NFPA regulation and your company-specific arc flash requirements to ensure participating employees can apply their knowledge.



Print your own labels

Create and print customized arc flash labels when and where you need them with an on-demand label printer. When you're working on a project, you can stop handwriting your labels, and print all the labels you need in batches. You also avoid the hassle of having to select, order and wait for pre-printed labels to arrive.



Pre-printed die-cut labels

Pre-printed arc flash labels with the arc flash PPE category and a list of the required PPE relieve the employer from having to hand-write this information. As with the check box labels, a version for both arc flash and shock hazards is available.

Arc Flash Labels

Pre-Printed Arc Flash Labels

- Labels come with the hazard category and PPE requirements preprinted
- Write in specifics such as minimum arc rating, protection boundary, etc.
- B-7569 vinyl can be written on with pen or marker



Catalog #	Header	Hazard	Size	Qty
121085	Warning	1	5 in. x 7 in.	5/pk.
121087	Warning	2	5 in. x 7 in.	5/pk.
121091	Warning	3	5 in. x 7 in.	5/pk.
121093	Warning	4	5 in. x 7 in.	5/pk.
121086	Danger	1	5 in. x 7 in.	5/pk.
121088	Danger	2	5 in. x 7 in.	5/pk.
121092	Danger	3	5 in. x 7 in.	5/pk.
121094	Danger	4	5 in. x 7 in.	5/pk.

Catalog #	Header	Hazard	Size	Qty
121097	Warning	1	4 in. x 6 in.	5/pk.
121099	Warning	2	4 in. x 6 in.	5/pk.
121101	Warning	3	4 in. x 6 in.	5/pk.
121103	Warning	4	4 in. x 6 in.	5/pk.
121098	Danger	1	4 in. x 6 in.	5/pk.
121100	Danger	2	4 in. x 6 in.	5/pk.
121102	Danger	3	4 in. x 6 in.	5/pk.
121104	Danger	4	4 in. x 6 in.	5/pk.

Write-On Arc Flash Labels

- Write in specifics such as minimum arc rating, protection boundary, etc.
- B-7569 vinyl can be written on with pen or marker



Catalog #	Header	Size	Qty
121077	Warning	5 in. x 7 in.	5/pk.
121078	Danger	5 in. x 7 in.	5/pk.

Catalog #	Header	Size	Qty
121079	Warning	4 in. x 6 in.	5/pk.
121080	Danger	4 in. x 6 in.	5/pk.



Catalog #	Header	Size	Qty
145975	Danger	5 in. x 7 in.	5/pk.
145974	Danger	4 in. x 6 in.	5/pk.
145973	Warning	5 in. x 7 in.	5/pk.
145972	Warning	4 in. x 6 in.	5/pk.

Arc flash hazard categories and PPE requirements

Required Flash Protection Equipment*	
Hazard Category 1 Incident energy 4 cal/cm ²	Arc-rated long-sleeve shirt and long pants (or arc-rated coverall)
	Arc-rated face shield or arc flash hood
	Arc-rated jacket, parka, rainwear or hard hat liner (as needed)
	Hard hat
	Safety glasses or safety goggles Hearing protection (ear canal inserts) Leather gloves Leather footwear (as needed)
Hazard Category 2 Incident energy 8 cal/cm ²	Arc-rated long-sleeve shirt and long pants (or arc-rated coverall)
	Arc-rated face shield or arc flash hood
	Arc-rated jacket, parka, rainwear or hard hat liner (as needed)
	Hard hat
	Safety glasses or safety goggles Hearing protection (ear canal inserts) Leather gloves Leather footwear
Hazard Category 3 Incident energy 25 cal/cm ²	Arc-rated long-sleeve shirt and long pants (or arc-rated coverall)
	Arc-rated arc flash suit jacket and pants
	Arc-rated arc flash hood
	Arc-rated jacket, parka or rainwear (as needed)
	Hard hat and arc-rated hard hat liner Safety glasses or safety goggles Hearing protection (ear canal inserts) Leather footwear Arc-rated gloves
Hazard Category 4 Incident energy 40 cal/cm ²	Arc-rated long-sleeve shirt and long pants (or arc-rated coverall)
	Arc-rated arc flash suit jacket and pants
	Arc-rated arc flash hood
	Arc-rated jacket, parka or rainwear (as needed)
	Hard hat and arc-rated hard hat liner Safety glasses or safety goggles Hearing protection (ear canal inserts) Leather footwear Arc-rated gloves

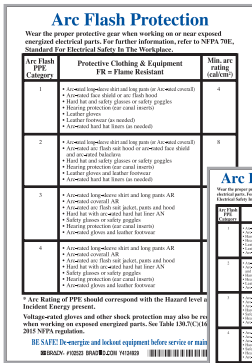
* Arc rating of PPE should correspond with the Hazard Category and Incident Energy present. Voltage-rated gloves and other shock protection may also be required when working on exposed energized electrical parts.



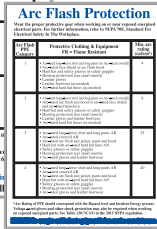
Poster

- Highlights the common causes of arc flash and provides safe work practices and personal protection equipment requirements
- Laminated on both sides to stand up to industrial environments
- Full-color printing and eye-catching graphics for optimum visual impact
- Poster reflects all changes from NFPA 70E-2015 regulation

Catalog #	Description	Quantity
104571	18 in. x 24 in. poster	1 each



Sign

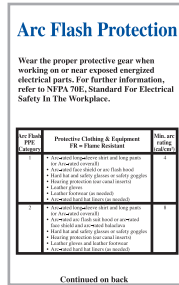


Label

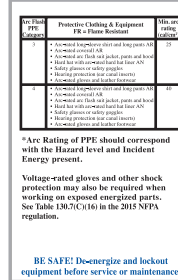
Sign and Label

- Post signs and labels in the work area and near electrical equipment to boost awareness and compliance
- Signs and labels specify the personal protection equipment required for each arc flash hazard category
- Sign and label reflects all changes from NFPA 70E-2015 regulation
- Sign: B-401 rigid plastic with laminated graphics
- Label: B-302 self-sticking polyester with overlaminates

Catalog #	Description	Quantity
102523	7 in. x 10 in. sign	1 each
102524	3.5 in. x 5 in. label	5/pack



Front



Back

Wallet Card

- Ensure compliance and safety by providing each employee with their own arc flash wallet card
- Card specifies the personal protection equipment required for each arc flash hazard category
- Made of laminated cardstock
- Reflects all changes from NFPA 70E-2015 regulation

Catalog #	Description	Quantity
102525	2.1 in. x 3.4 in. card	25/pack



On-Site Arc Flash Training Service

Under the NFPA 70E standard, arc flash training must be completed every three years.

Brady's Arc Flash Safety Training is a custom approach to training that includes:

- Custom training materials with NFPA regulations and your company-specific arc flash information
- On-site interactive training session
- Attendees receive a workbook and a certificate of completion

Training topics include:

- What is an arc flash and related information, such as boundaries, labeling, work permits and PPE requirements
- OSHA regulations, responsibilities, training and PPE
- NFPA updates, compliance and PPE tables
- The difference between qualified and unqualified employees
- And more