Comply with New Regulations, Increase Safety and Save Costs with Proper Arc Flash Labeling

By Chris Rutter, Product Manager, Safety and Facility ID, Brady Corporation

OSHA is now citing and fining employers for failure to protect employees from the dangers of arc flash. For guidelines on best practices for protecting employees, OSHA refers employers to the NFPA 70E standard, "Standard For Electrical Safety In the Workplace."

NFPA 70E instructs employers to 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 flame-resistant apparel and other personal protection equipment required when employees cross the boundary while they work on or near exposed live parts.

In addition, the National Electric Code® (known as NFPA 70, which is different than NFPA 70E) added a requirement in 2002 mandating that potential arc flash hazards be labeled to warn of the hazard. The requirement, covered under Article 110.16, was updated and expanded in the 2005 version of the NEC.

What Needs to be Labeled, By Whom

The NEC states that any of the following types of electrical equipment located in manufacturing and commercial establishments (other than dwelling occupancies) must be field marked with a warning label if subject to examination, adjustment, service or maintenance while energized:

- Switchboards
- Panelboards
- Industrial control panels
- Meter socket enclosures
- Motor control centers

The labeling requirement is the responsibility of the employer, not the manufacturer or installer of the equipment.

Since the provision took effect in 2002, equipment installed before then *technically* does not need to be labeled. However, labeling does need to be applied if the equipment is ever modified or upgraded in any way. At least one OSHA representative has stated that he considers changing a fuse or a breaker to be a modification that would require labeling. More importantly, from a safety standpoint, the hazard is the same regardless of when the equipment was installed. Consequently, most employers are simply labeling all the appropriate equipment, regardless of when it was installed.

Many employers are also labeling bus ducts and other electrical equipment not specifically called out in 110.16. Again, the logic is the same. If live electrical work may be performed on these systems, the risk of accident and injury exists. Clearly it is better to properly warn workers of the hazard.

The NEC requirement states that the marking must be located so that it's clearly visible to qualified persons before they begin work. Typically, the label is placed outside the panel or enclosure door. In some cases, however, companies choose to put the label inside the door (e.g., to protect it from harsh environments), but this should only be done if the door must first be opened (allowing the label to be seen) before the panel face or enclosure can be removed. The key point is that the label be easily noticeable by workers before they may be exposed to any potentially dangerous live parts.

What Needs to Appear on the Label?

The current NEC requirement states only that the label must warn qualified persons of the potential arc flash hazard.

A fine-print, information-only note in the NEC requirement refers the reader to ANSIZ535.4-1998, Product Safety Signs and Labels, for guidelines on the design of warning labels. Thus, it is recommended that the header, message and pictogram, if used, be formatted according to the ANSI standard.

The NEC does not specify whether to use a Danger or Warning header, leaving this up to the employer. Some companies use Warning, some Danger. Some use Danger when the voltage is over 600v or when the incident energy is over 40 cals/cm^2, and Warning when it is under that threshold. This should be decided by the employer and used consistently throughout the plant.

In addition to warning of an arc flash hazard, most arc flash labels at least instruct employees to wear the proper personal protection equipment. Many also take the opportunity to warn of electrical shock. The 2" x 4" Brady label shown below meets all NEC requirements and is available in 10-packs or economical 100-label rolls.

2" x 4" generic arc flash label

Some companies prefer to include additional information identifying 1) when the hazard is present and 2) the potential magnitude of risk to the employee. Although not required, they may also choose to include a symbol or pictogram. There are no standards for how an arc flash pictogram should appear. The examples below show the pictogram used by Brady on its arc flash labels.

3.5" x 5" arc flash labels with pictogram

Labels must be able to withstand their usage environment. This means that the print should not fade, and adhesive should be aggressive enough to avoid peeling. The arc flash labels above are printed on a durable polyester base that is over-laminated to protect the text and graphics. The back of the labels also employ an acrylic adhesive, which allows the labels to be securely and permanently affixed to a wide range of surfaces.

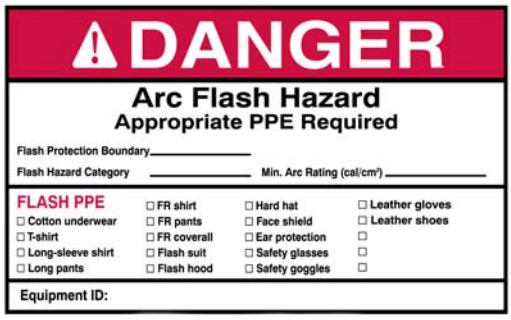
Write-on Labels

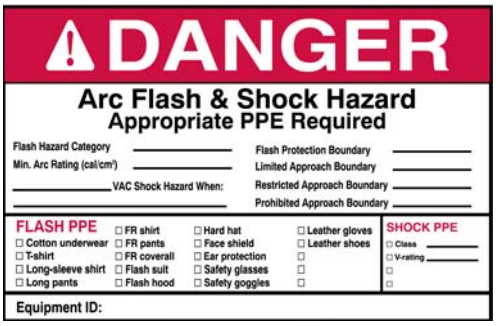
While the NEC requirement currently requires only a generic warning, many believe that future updates of the standard will mandate that more detailed information be printed on the label. In fact, some municipalities have already adopted these more strict requirements. Thus many employers are going the extra mile now to avoid having to re-label later, and to gain the safety advantages. After all, common sense dictates that employers not only inform employees that there is a hazard, but also clearly explain what they should do to protect themselves from that hazard.

Since the degree of hazard may vary for even similar types of electrical equipment, the label must be customized for each piece of equipment. The information is derived from a detailed arc flash analysis conducted by the company (or a contractor selected by the company) that takes into account such factors as the maximum available short circuit current and the over current protection scheme. Typically the labels will show the arc flash protection boundary, hazard category, as well as the required flame-resistant apparel and other personal protection equipment (such as hard hat, face shield, leather gloves, etc.)

Brady provides several stock labels that can display this information. The vinyl checkbox label shown below can be easily written on with pen or marker. An over-laminate can then be applied to protect the printing from harsh environmental conditions.

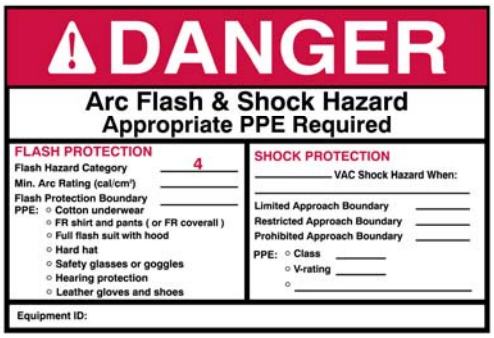
In addition to providing information on arc flash hazards, it may make sense for the label to also display similar information to help protect against shock. This can include information such as voltage, approach boundaries, and insulated glove and tool classes on the label.





Write-on arc flash labels with checkboxes

Brady also provides arc flash labels preprinted with the hazard category and PPE requirements, relieving the employer from having to hand-write this information. As with the checkbox labels, a version that covers both arc flash and shock hazards is available.

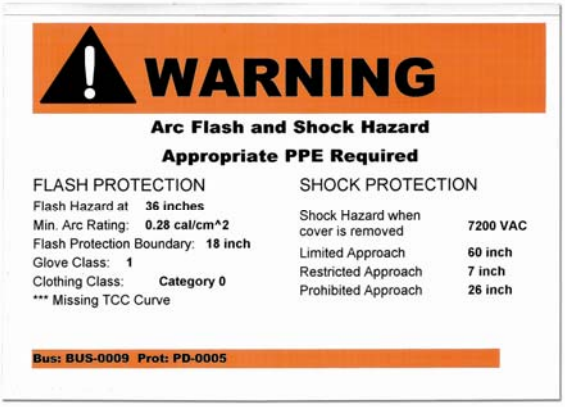


Write-on arc flash labels with preprinted hazard categories and PPE

Make-it-Yourself Arc Flash Labels

Large facilities may need to create hundreds if not thousands of customized arc flash labels. In this case, Brady's industrial printing systems are the ideal solution. This option avoids the time and trouble associated with handwriting many labels and will allow labels to be printed in batches as the project transitions from one area of the plant to another.

Brady's Make-it-Yourself printing systems are designed as a convenient, flexible and cost-effective way to create, modify and print labels on demand. Printer options for creating arc flash labels include the 300 MVP Plus, Tagus™ T300, and GlobalMark® and MiniMark™ printers. Brady printers and label materials are designed for industrial use, and employ thermal-transfer printing to provide the optimum in UV, chemical and abrasion resistance. For single-color printers, label materials with a preprinted Danger or Warning header are available, allowing users to print only the black text while still creating a color label that meets the ANSIZ525 standard for safety signs and labels. If you want to print multiple colors or even process color (i.e., photos), Brady has printer models with that capability, too.



GlobalMark® Printer and custom arc flash label

In addition, Markware™, BradySoft™ and LabelMark™ software applications include preformatted arc flash templates that allow users to quickly fill in the blanks and print. The templates can also be easily customized to include a logo or other company-specific information.
When large quantities of labels need to be created and managed, users often prefer to store the label information in a spreadsheet. Brady software allows this data to be downloaded and merged into the label for output to the Brady printer.

Finally, many companies have begun using commercially available power management software such as SKM products, EasyPower®, and ETAP® to assist in mapping out their electrical system and creating one-line diagrams. In recent years, many of these third-party applications have added arc flash analysis modules which use the one-line information to calculate incident energy values, flash protection boundaries, and other pertinent arc flash variables.

Brady has partnered with a number of these companies to make it quicker and easier to import this data into labels on a Brady printer. In some cases users can print directly from the software application to the Brady printer. In other cases, the data is imported as a spreadsheet or database into the Brady labeling software, then automatically formatted and printed from there. Either way, the use of third-party power management software greatly simplifies the process of calculating arc flash and converting this data into a label.

Markware™ software

These software and printing systems also find useful application throughout the plant for other forms of safety and facility identification, such as pipemarking, equipment ID, chemical labels, barcode labels and inventory labels. This provides an even greater and faster return on your system investment, since it can have ongoing, beneficial use for a variety of purposes long after the primary arc flash labeling project is complete.

Other Awareness Aids

Arc flash training aids

OSHA is enforcing the labeling requirement because of the critical importance of making workers aware of this dangerous hazard, and because of the need to modify long-established work habits and practices to ensure adequate protection. In addition to labeling, Brady also provides a variety of other training and awareness aids to help keep your message in front of workers.

Brady's "Preventing Arc Flash Injuries" poster highlights the common causes of arc flash and emphasizes safe work practices and PPE requirements when working live. Brady also offers rigid signs, adhesive labels and wallet cards that indicate the PPE required for each arc flash hazard class category. These can be given to employees and posted in the work area to reinforce the company's safety training and ensure that employees remember exactly what is required for each situation.

Your Opportunity to Reduce the Risk

With the rising frequency of reported arc flash accidents, and the potential for serious injury or death, arc flash deserves the concern it is generating within OSHA and the safety industry.

To increase safety and ensure compliance throughout the workplace, it is critical to learn and identify arc flash hazards in your facilities, train employees in safe work practices, and use labels and other awareness aids to keep the message in the forefront and reinforce the desired behavior.
Brady can help you achieve these goals in a variety of ways. For more information on arc flash label solutions, go to www.bradyid.com/arcflash. Or call 1-888-272-3946 to arrange for a Brady salesperson to visit your site.