The Barn Raiser

Mid-South Engineering Company

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Arc Flash Equipment Labels Are You Compliant?

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Introduced in the 2002 Edition of the National Electric Code for the USA

The National Electric Code added a requirement in 2002 mandating that electrical equipment be labeled to warn of Arc Flash hazard. The requirement, covered under Article 110.16, was updated and expanded in the 2005 and 2008 version of the NEC.

Any equipment installed after 2002 shall be labeled with a label that warns of a potential arc flash. For equipment installed before 2002, labeling must be applied if **ANY** modifications or upgrades take place. Proactive employers are taking the safe, efficient approach of labeling all their electrical equipment, regardless of when it was installed.

What Needs to Appear on the Label?

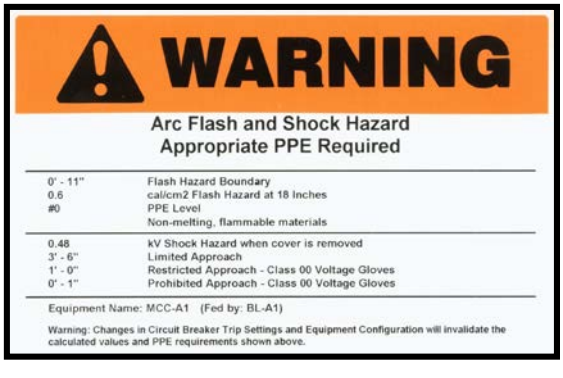
The current NEC requirement states only that the label must warn of the potential arc flash hazard. A fine-print, information-only note in the NEC requirement refers the reader to ANSIZ535.4-1998, Product Safety Signs and Labels, for guidelines on the design of warning labels. Thus, it is recommended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

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 of the equipment.



What is Arc Flash?

Arc Flash is an electrical explosion due to a fault condition (short circuit) when either phase to ground or phase to phase conductors make contact with each other. Arc Flashes cause electrical equipment to explode, resulting in an arc-plasma fireball with temperatures exceeding 35,000° F (the surface of the sun is 9000° F). These high temperatures cause rapid heating of surrounding air and extreme pressures, resulting in an arc blast. An arc blast is vaporized solid metal conductors expanding several thousand times their original volume. The result of this violent event is usually destruction of the equipment involved, fire, and severe injury or death to any nearby people. The explosion takes less than one second and produces a brilliant flash, intense heat, and a pressure blast potentially equivalent to several sticks of dynamite.

Do you need an Arc Flash Study for Compliance?

You may ask why an Arc Flash study should be preformed at your location. Well actually one is not required, but we strongly suggest that you do have one done. If a study has not been performed at your installation, then you are missing out on a detailed study that would include the NEC required labels. We go above and beyond the minimum requirements as per the NEC and include labels that display very important detailed information, for example, Arc Flash Boundaries, level of PPE required with PPE description, Available Fault Energy, and other device specific details.

If you do not have any detailed Arc Flash labels now, the NFPA 70E has several tables that your "qualified personnel" ***should*** be applying to ***ALL*** of your electrical maintenance practices. In most cases personnel do not know what level of PPE is required for each specific task defined in the NFPA 70E tables. In some cases the PPE worn by your "qualified personnel" are oversized for a certain task in a specific location. In other cases where improper equipment is installed or existing equipment is maintained improperly, the Arc Flash energy could be ***MUCH GREATER*** than what their PPE can protect them from. *Continued on page 2*

"The Barn" built in the 1930's to house Welsh ponies, serves as Mid-South's offices.

Arc Flash Equipment Labels

Continued from page 1

There are three ways that Arc Flash energy can be decreased. First, the available short circuit current from the utility is decreased. Second, the impedance (the resistance to the flow of AC current) in the local power distribution system is increased. Third, the trip time of protective devices are decreased. One of the more common suggestions that we have made to reduce Arc Flash energy is circuit breaker trip adjustment coordination. The coordination of circuit breaker tripping devices can decrease the amount of Arc Flash energy that is the result of a fault. The decrease of Arc Flash energy could lower the level of PPE required. A detailed Arc Flash study should provide suggestions on how Arc Flash energy could be decreased as well as the required NEC labels.

An Arc Flash study is not required by the NEC, but the Arc Flash equipment labels are. If you do not have any Arc Flash labels now, you will need to purchase them. So, why not let us give you a quote to perform a detailed study that will include the required labels along with suggestions on how to decrease the available Arc Flash energy?

For our international clients, discussions on the International Electrotechnical Commission (IEC) and how it relates to Arc Flash will be detailed in another article.

Adapted from:

NEC2008, National Electrical Code, Article 110.16 Flash Protection
Standard for Electrical Safety Requirements for Employee Workplaces, NFPA 70E–2004
Guide for Performing Arc Flash Hazard Calculations, IEEE 1584–2002.

Life's Lighter Moments

- *Ever stop to think, and forget to start again?*
- *Wrinkled was not one of the things I wanted when I grew up!*
- *Being "Over the Hill" is much better than being under it!*
- *Don't take life too seriously; No one gets out alive.*

Epoxy Grout

We briefly explained the two types of grout, non-shrink cement-based grout and epoxy grout, in a previous issue. Now we would like to go into a little more detail about epoxy grout. Epoxy grout was developed in 1955 by Robert L. Rowan Sr., an independent engineer who worked closely with Shell Chemical at a time when Shell was attempting to development stronger thermosetting epoxy resins. Epoxy grout was recognized early as potentially having compressive strengths above cement-based grouts, but it was its toughness and ability to stand up to the abuse of vibration and constant impacts that pushed its development and what makes it so valuable in industry today even though its initial cost is typically greater than that of cement-based grout.

Epoxy grouts are recognized as the grout of choice under fan bases, pumps, vibratory conveyors, hammer mills, chippers, debarkers, rock crushers, ball mills, forging hammers and any other machinery which is associated with vibration. As a result epoxy grout is specified in new construction or maintenance repair work. Yet, you should be aware that when your operation creates an environment where the temperature will exceed 140°F and an epoxy grout is warranted for vibration then the specification may need to require a specially formulated epoxy grout. Standard epoxy grouts, having compressive strengths of 15,000 psi at room temperature, can loose their compressive strengths to as low as 4,000 psi at 140°F. There is a similar reduction in the modulus of elasticity and premature deformation can take place when under loads at this or greater temperatures and which should be understood to see if there is a better grout choice to specify or use in your specific application.

If you are interested in reviewing the ASTM guidelines regarding grouts then you may want to look over ASTM C579, dealing with compressive strength, ASTM C580, for compressive strength at elevated temperature, and ASTM C118, review of creep.

There are a number of grout brands and types on the market and understanding the needs and circumstances of your operation is the key to choosing the correct application. No single grout is good in every situation. A thorough review of your needs should be the first step and a good "field experienced" and grout knowledgeable individual is always helpful.

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