

Read the Label – Use as Directed

Jim Phillips, P.E.

Published: September 2009 – Electrical Contractor Magazine

Read the label? Use as directed? It sounds like I'm reading a prescription bottle. However, the warning label produced from an arc flash calculation study contains more than just the words "Warning! Arc Flash and Shock Hazard!" It actually holds a lot of very specific information that can be used when preparing for work where electrical hazards may exist.

What is really required?

Is all the information listed on the label really required? No, only two of the items are. National Fire Protection Association (NFPA) 70, the National Electrical Code (NEC) 110.16 requires an arc flash warning, and NFPA 70E, Electrical Safety in the Workplace, 130.3(C) requires that either the incident energy or the level of personal protective equipment (PPE) must be listed on the label. However, there's a reason for the additional information.

NFPA 70E 110.8(B)(1)(a) and (b) require both an arc flash hazard analysis and shock hazard analysis to be performed before live work can

begin on systems operating at 50 volts and greater. The shock hazard analysis determines the voltage to which personnel will be exposed; the limited, restricted and prohibited approach boundaries; and the required PPE to be used for electrical shock protection. The arc flash hazard analysis determines arc flash protection boundary (AFPB) and required PPE to be used for the protection inside the AFPB.

An arc flash calculation study can be used to determine all of this information with the results posted on the label. This makes compliance with these specific NFPA 70E requirements much easier.

Label format

Both NFPA 70E 130.7(16)(E)(1) and a fine print note in NEC 110.16 reference ANSI Z535, Series of Standards for Safety Signs and Tags. Based on this ANSI standard, the signal word "warning" with an orange background is normally used as part of the label. The signal word "danger" with a red background applies when the situation is considered too dangerous for live work, such as when the incident energy is too great. Most warning labels produced from an arc flash calculation study are based on a format similar to the example shown above.



Jim Phillips, P.E.

Published: September 2009 – Electrical Contractor Magazine

What does it all mean?

More than just another orange background with the word “warning” on it, the label contains 13 different items.

1. Warning

We still need the basic orange background with the word “warning.” Item 1 complies with NEC 110.16 and NFPA 70E 130.7(E)(1) and warns people of the possible arc flash and shock hazard as well as the need to use proper PPE.

2. Arc flash protection boundary

This is the calculated distance from a possible arc source where the incident energy drops to 1.2 calories per square centimeter and is widely recognized as the minimum energy required to produce the onset of a second-degree burn. People working within this boundary when an arc flash hazard exists must wear appropriate flame-resistant clothing and PPE.

3. Incident energy

The incident energy is based on detailed calculations at a specific working distance from the perspective arc source. The arc rating of the flame-resistant clothing and PPE must be equal to or greater than this value.

4. PPE level

This is the category of PPE and flame-resistant clothing to be worn if an arc flash hazard exists while working inside the arc flash protection boundary.

5. PPE selection

A summary of the minimum clothing required for arc flash protection is included based on NFPA 70E Table 130.7(C)(10). It may not always include every required item.

6. Voltage exposure

This is the voltage a worker could be subjected to when energized conductors are exposed.

7. Limited approach boundary

This is the distance where a shock hazard could exist if energized conductors are exposed. The limited, restricted and prohibited approach boundaries are voltage-dependent and defined by NFPA 70E Table 130.2(C).

8. Restricted approach boundary

This distance is where there is an increased risk of electrical shock by either an arc flash or inadvertent movement.

Jim Phillips, P.E.

Published: September 2009 – Electrical Contractor Magazine

9. Prohibited approach boundary

According to NFPA 70E, this distance is considered the same as making contact with the electrical conductors.

10. Shock protection

This is the required PPE, such as voltage-rated gloves, to protect against an electric shock hazard.

11. Date of study/label

NFPA 70E 130.3 requires that the arc flash hazard analysis either be updated when major modifications or renovations take place, or else it should be reviewed periodically at most every five years.

12. Equipment name

Since much of the information from the arc flash study is equipment- and location--specific, an equipment identification should be listed.

13. Study performed by

This should be listed in case you have a question about the study.

JIM PHILLIPS, founder of www.brainfiller.com and www.ArcFlashForum.com, is an internationally known educator on electrical power systems. His experience includes industrial, commercial and utility systems, and he is a member of the IEEE 1584 Arc Flash Working Group. You can reach him at jphillips@brainfiller.com.