

Arc-Flash Hazards – Standards and Regulations

The following arc-flash hazard industry standards are intended to increase employees' protection from dangers associated with the release of energy caused by an electrical arc. These standards and regulations are key elements of an effective arc-flash safety program⁴.

NFPA 70[®], National Electrical Code 2011

Flash protection – product safety signs, personal protective equipment and clothing

110.16 Arc-Flash Hazard Warning:

“Electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers, that are in other than dwelling units, and are likely to require examination, adjustment, servicing, or maintenance while energized shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.”

Informational Note No. 1:

“NFPA 70E[®]-2009, *Standard for Electrical Safety in the Workplace*, provides assistance in determining severity of potential exposure, planning safe work practices, and selecting personal protective equipment.”

Informational Note No. 2:

“ANSI Z535.4-1998, *Product Safety Signs and Labels*, provides guidelines for the design of safety signs and labels for application to products.”

[Note: Informational Notes are not requirements of the NEC and are not enforceable.]

From NEC 2011 Handbook²:

“Exhibit 110.8, shows an electrical employee working inside the arc flash boundary and in front of a panelboard that has not been de-energized. The worker is wearing personal protective equipment (PPE) considered appropriate flash protection clothing for the flash hazard involved. Suitable PPE appropriate to a particular hazard is described in NFPA 70E[®], *Standard for Electrical Safety In the Workplace*[®].”

Institute of Electrical and Electronics Engineers (IEEE) Standard

Arc-Flash hazard calculations

From IEEE Standard 1584-2002 (*IEEE Guide for Performing Arc-Flash Hazard Calculations*) and IEEE Standard 1584a-2004, Amendment 1 and IEEE Standard 1584b-2011 Amendment 2:

This standard provides the necessary equations and methods to calculate the expected arc-flash protection boundary and the incident energy to which workers could be exposed while working on or near exposed energized electrical equipment.

From NFPA 70E[®], *Standard for Electrical Safety in the Workplace*[®] 2012 Edition³:

130.5(B) Protective Clothing and Other Personal Protective Equipment (PPE) for Application with an Arc Flash Hazard Analysis.

“Where it has been determined that work will be performed within the arc flash boundary, one of the following methods shall be used for the selection of protective clothing and other personal protective equipment (PPE):

- 1) Incident Energy Analysis
- 2) Hazard/Risk Categories



Exhibit 110.8 Electrical worker clothed in personal protective equipment (PPE) appropriate for the hazard involved.²



Example of a GE Arc-Flash and Shock Hazards equipment label.



Occupational Safety and Health Administration (OSHA) Regulations

Workplace safety requirements

OSHA does not specifically address arc-flash hazards but does recognize hazards (through the General Duty Clause) that are identified by other industry codes and standards such as the NEC and *NFPA 70E*[®].

OSHA 29 CFR 1910.269(l)(6)(iii):

“The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee.”

OSHA 1910.132(d)(1):

“The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, or likely to be present, the employer shall:

1910.132(d)(1)(i): Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;

1910.132(d)(1)(ii): Communicate selection decisions to each affected employee; and,

1910.132(d)(1)(iii): Select PPE that properly fits each affected employee. Note: Non-mandatory Appendix B contains an example of procedures that would comply with the requirement for a hazard assessment.

OSHA Supports NFPA Standards:

In response to an inquiry about OSHA's stand on arc-flash hazard, Dean Y. Ikeda, the Regional Administrator for Occupational Safety and Health, US Department of Labor for Region X in Seattle, concluded as follows:

“Although OSHA does not, per se, enforce the NFPA standard, 2012 Edition, OSHA considers NFPA standard a recognized industry practice. The employer is required to conduct assessment in accordance with CFR 1910.132(d)(1). If an arc-flash hazard is present, or likely to be present, then the employer must select and require employees to use the protective apparel. Employers who conduct the hazard/risk assessment, and select and require their employees to use protective clothing and other PPE appropriate for the task, as stated in the *NFPA 70E*[®] standard, 2012 Edition, are deemed in compliance with the Hazard Assessment and Equipment Selection OSHA standard.”

For more information, contact your local GE Energy office or call 1-888-GE4-Serv or 540-378-3280 or see the Arc-Flash Hazard Study Fact Sheet (GEA-13752F)

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⁴GE makes no representation that the quoted standards constitute an exclusive list of guidance or standards potentially applicable to customer equipment or Arc-Flash hazards.

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