

Arc-Flash Hazard Study

Addressing *NFPA 70E[®], Standard for Electrical Safety in the Workplace[®]*

Helping Secure Employee Safety

GE's comprehensive arc-flash hazard study, designed to assist in addressing the recommendations of the National Fire Protection Association's (NFPA) Standard 70E, helps ensure employee safety against dangers associated with the release of energy caused by an electrical arc. Key elements of an arc-flash hazard safety program are:

- Calculating the incident energy exposure and arc flash boundary
- Communicating the incident energy exposure and approach distance from a prospective arc source through a warning label system

Mitigating Arc-Flash Hazard Risk

In addition to risking employee safety, failure to address *NFPA 70E[®]* can lead to significant financial loss through extended litigation, increased insurance costs and regulatory fines. OSHA has cited several companies under the General Duty Clause.

You can help mitigate this risk with a comprehensive arc-flash hazard study by GE Energy.

Equipped with Experience

With over 100 years experience in analyzing power systems, GE has plant knowledge that supports the detection of arc-flash hazards throughout your systems. GE employs only proven data collection methods, detailed calculations and thorough software-based analysis to identify the calculated incident energy and arc-flash boundary for each potential hazard.

Excessive PPE can itself be a safety hazard. To help calculate the precise NFPA-based PPE category, GE recommends concurrently conducting short circuit and protective device coordination studies. This approach enables a more comprehensive analysis

than using the existing protective device settings and short circuit data. Using a single source experienced in performing all three studies helps to ensure consistency in results, identify compound hazards and limit duplication.

Detailed Labeling

Constructing detailed and durable warning labels is critical to fulfilling the National Electrical Code's requirement for field marking potential arc-flash hazards. GE's robust labels include both the arc-flash hazard and shock hazard boundaries as well as the appropriate combined level of PPE.



Arc-Flash Hazard Analysis employs industry standard practices:

- Electric Arc Hazard Exposure (OSHA 29 CFR 1910.269)
- Flash and Shock Hazard Analysis (*NFPA 70E[®]-2012*, 130.3(B)(1))
- Personal Protective Clothing and Equipment for Arc-Flash Hazards (*NFPA 70E[®]-2012*, Table H.3(b))
- Prescribed Equations for Incident Energy and Arc-Flash Boundary Calculations (IEEE Std. 1584-2002, 1584a-2004, and 1584b-2011)
- Field Marking of Arc-Flash Hazards [NFPA 70-2011, 110.16; *NFPA 70E[®]-2012*, 130.5(C)]
- Work Permits to Work on Energized Parts (*NFPA 70E[®]-2012*, 130.1(B)(1))

Benefits Include:

- Improves employee safety against electrical arcs
- Calculates IEEE incident energy values and arc-flash boundaries
- Addresses arc-flash issues within *NFPA 70E[®]*
- Provides required field marking through detailed warning labels to communicate:
 - IEEE incident energy
 - IEEE arc-flash boundary

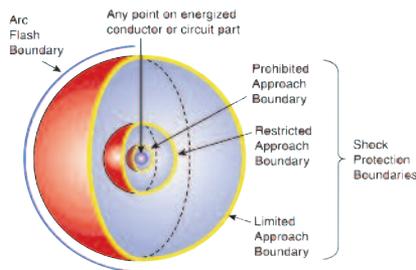


Achieving Results

Results of GE's arc-flash hazard study provide the calculated IEEE-based incident energy and arc-flash boundary for each system location. Warning labels and work permits can be created using these results. The various safe approach boundaries are described in *NFPA 70E*^{®2}:

Arc Flash Boundary

When an arc flash hazard exists, an approach limit, at a distance from a prospective arc source within which a person could receive a second-degree burn if an electrical arc-flash were to occur.



Shock Protection Boundaries:

Limited Approach Boundary

An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.

Restricted Approach Boundary

An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc-over combined with inadvertent movement, for personnel working in close proximity to the energized conductor or circuit part.

Prohibited Approach Boundary

An approach limit at a distance from an exposed energized electrical conductor or circuit part within which work is considered the same as making contact with the electrical conductor or circuit part.

Required PPE

In accordance with *NFPA 70E*[®] guidelines, the calculated incident energy provided by GE's arc-flash hazard study, will identify the appropriate PPE for each system location, through the use of *NFPA 70E*[®] Table H.3(b).

Accurate Results

For consistency of results, limited duplication and lower overall PPE recommendations, GE recommends that the short-circuit and coordination studies be completed concurrently with the arc-flash hazard study:

- Short Circuit Study – Calculates three-phase bolted faults
- Protective Device Coordination Study – Uses equipment settings to determine devices' opening times
- Arc-Flash Hazard Analysis – Calculates arc-flash values under multiple scenarios, when needed, to analyze the effects of low and high fault currents creating worst-case arc-flash hazard conditions. Maximum and minimum utility short-circuit conditions are included.



NEC Handbook Exhibit 110.8 Electrical worker clothed in personal protective equipment (PPE) appropriate for the hazard involved¹.

For more information, contact your local GE Energy office or call 1-888-GE4-Serv or 540-378-3280.

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