

Feature

Do I Have to Comply with NFPA 70E?

Much information and guidance is being provided, from a variety of sources, with respect to NFPA 70E compliance. This narrative provides background information on the evolution of NFPA 70E and the current regulatory activities associated with this standard. Additionally, it simplifies and condenses the available information into viable recommendations for implementing applicable requirements.

Does OSHA Require compliance to NFPA 70E-2004?

When discussing NFPA 70E with personnel at industrial facilities, one of the first questions they ask is, "Does OSHA require compliance to this standard?" In answering this question, one must first consider some background information associated with existing OSHA standards and this particular standard.

Following the Occupational Health and Safety Act of 1970, OSHA adopted the 1968, and then the 1971, edition of NFPA 70, *National Electric Code*, under Section 6(a) of the Act. Subsequent changes or additions to the OSHA requirements would require performing the process outlined in Section 6(b) of the Act, which requires a public notice or an opportunity for public comment and public hearings. This is an expensive and lengthy process at best. Unfortunately, OSHA found that the *NEC* was lacking in many aspects of electrical safety. The *NEC* primarily deals with the design and construction of electrical installations. However, OSHA's responsibilities include the employers and employees in the workplace, and the *NEC* does not address the requirements for electrical safety-related work practices associated with the operation and maintenance of electrical systems. Realizing this difference, the National Fire Protection Association (NFPA) offered its assistance in preparing a document "to assist OSHA in preparing electrical safety standards that would serve



by Lynn Hamrick
ESCO Energy Services
Company

OSHA's needs and that could be expeditiously promulgated through the provisions of Section 6(b) of the Occupational Safety and Health Act." The resulting *Standard for Electrical Safety Requirements for Employee Workplaces*, NFPA 70E, was first issued in 1979 with the specific purpose of being a companion document to the *NEC*.

Subsequent to the initial versions of NFPA 70E, OSHA standard 29CFR1910.331-335, commonly referred to as Subpart S — Electrical Standards, was issued in 1990. This standard deals with requirements associated with electrical safety-related work practices for

industrial facilities. In general, this OSHA standard only addresses the electrical shock hazard and does not specifically address electrical arc flash or arc blast hazards. It includes a description of the application of the standard (Section 1910.331), employee training requirements (Section 1910.332), safety-related work practices (Section 1910.333), limitations in the use of equipment (Section 1910.334), and required personnel protection safeguards (Section 1910.335). This standard delineates requirements for qualified persons which include being familiar with the standard as well as being trained and familiar with the work being performed. It also requires appropriate safety signage to warn employees of electrical hazards and states that “employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.” Unfortunately, it does not specifically define what the appropriate electrical protective equipment is for the potential electrical hazard. However, this requirement does imply that the magnitude of the electrical hazard should be known and that the protective equipment should be selected accordingly.

In an effort to further define the requirements for electrical safety, the fifth edition of NFPA 70E was published in 1995. This standard introduced the concept of limits of approach, and the establishment of a flash protection boundary was introduced. In the sixth edition, published in 2000, further focus on flash protection and the use of personal protective equipment (PPE) was expanded with charts being added to assist the user in applying PPE for common tasks. With the most recent seventh edition, published in 2004, the standard was rearranged to be consistent with the *NEC* and was renamed *Standard for Electrical Safety in the Workplace*.

Another OSHA requirement, NFPA 70, the *National Electric Code*, further amplifies these requirements in its 2002 edition. It defines a qualified person as, “One who has skills and knowledge related to the construction and operations of the electrical equipment and installations and has received safety training on the hazards involved.” *NEC - 2002* also provides specific language associated with arc flash hazards:

“Section 110.16 Flash Protection. Switchboards, panelboards, industrial control panels, and motor control centers in other than dwelling occupancies, that 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.

FPN No. 1: NFPA 70E-2000, *Electrical Safety Requirements for Employee Workplaces*, provides assistance in determining severity of potential exposure, planning safe work practices, and selecting personal protective equipment.”^[4]

With the 2002 edition of the *NEC*, arc flash protection has been introduced into the requirements. Further, NFPA 70E-2004 has been provided as a source document for determining the magnitude of the hazard and the appropriate protective measures to be taken to safeguard employees.

What should be derived from the above discussion is that NFPA 70E is considered an industrial consensus standard and is intended for use by employers, employees, and OSHA. OSHA has not adopted NFPA 70E as it did earlier versions of the *NEC* simply because adoption would require the lengthy and expensive process outlined in Section 6(b) of the Act. OSHA has instead referenced compliance to NFPA 70E in a recent citation using Section 5(a)(1) of the Occupational Safety and Health Act of 1970, commonly referred to as the “general duty clause,” as their basis for this citation. The general duty clause states that employers “shall furnish to each of its employees employment and a place of employment which are free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees.”

This methodology for implementing potentially new requirements through the use of industrial consensus standards, like NFPA 70E, is common practice by OSHA. In a recent standard interpretation letter dated 7/25/03, OSHA’s Russell Swanson stated, “Industry consensus standards, such as NFPA 70E, can be used by employers as guides to making the assessments and equipment selections required by the standard. Similarly, in OSHA enforcement actions, they can be used as evidence of whether the employer acted reasonably.” Further indications from OSHA’s website state that proposed changes to OSHA’s general industry electrical installation standard (1910 Subpart S) focus on safety in the design and installation of electric equipment in the workplace. The changes draw heavily from the 2000 edition of the National Fire Protection Association’s (NFPA) *Electrical Safety Requirements for Employee Workplaces* (NFPA 70E), and the 2002 edition of the *National Electrical Code* (*NEC*).”

It is clear from the above evidence that OSHA is using NFPA 70E as an industrial consensus standard. Further, OSHA expects employers and employees to comply with the provisions of NFPA 70E regardless of whether or not it has been adopted as an OSHA requirement.

What Does NFPA 70E-2000 Compliance Mean for My Facility?

The next question one has to ask is, "How will NFPA 70E compliance affect me?" NFPA 70E – 2004 and the *NEC* - 2002 require and/or recommend that facilities provide:

- A safety program with defined responsibilities
- Electrical hazards analyses
- Personal protective equipment (PPE) for workers
- Training for workers
- Tools for safe work
- Warning labels on equipment

NFPA 70E further requires that safety-related work practices shall be used to safeguard employees from injury while they are working on or near exposed electric conductors or circuit parts that are or can become energized. The specific safety-related work practice shall be consistent with the nature and extent of the associated electric hazards. These work practices shall include wearing protective clothing and other personal protective equipment (PPE) when working within the flash protection boundary.

With regard to arc flash hazards, a "flash hazard analysis shall be done in order to protect personnel from the possibility of being injured by an arc flash. The flash hazard analysis shall determine the Flash Protection Boundary and the personal protective equipment that people within the Flash Protection Boundary shall use."

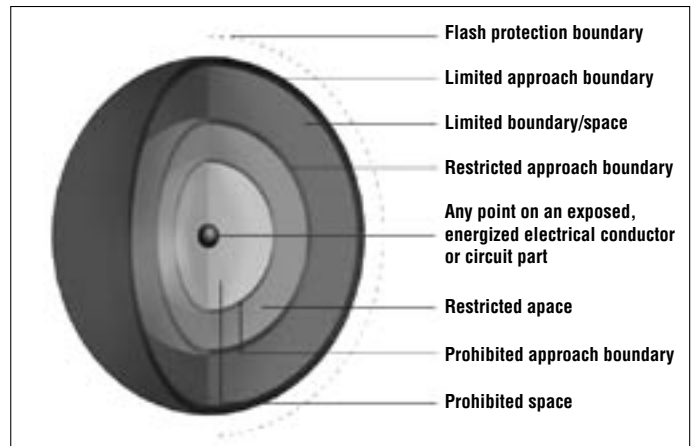
This standard also provides some descriptions associated with working distances, or boundaries, with respect to being a qualified versus unqualified person. These boundaries are as follows:

- **Flash Protection Boundary** — The distance at which the incident energy from the live part is equal to 1.2 cal/cm², the limit for a second-degree burn on bare skin. Persons must not cross this boundary unless they are wearing appropriate personal protective clothing and are under close supervision of a qualified person.
- **Limited Approach** — The distance at which barriers should be placed to protect unqualified personnel from an electrical hazard. Only qualified persons and escorted unqualified persons are allowed to enter a limited space.
- **Restricted Approach** — The distance at which only qualified personnel are allowed with appropriate protective clothing and personal protective equipment for the associated hazard. No unauthorized conductive material and no unqualified persons are permitted to cross a restricted boundary. Further,

a documented and management-approved plan is required to enter a restricted space.

- **Prohibited Approach** — The distance at which qualified personnel should not introduce grounded equipment or material not insulated for the voltage rating due to the possibility of flashover. A documented and management-approved risk analysis and plan are required to enter a prohibited space.

A pictorial representation of these boundaries is provided in figure C.1.2.4 from NFPA 70E, reproduced below.



To accommodate the work practices stated above for many common tasks, NFPA 70E Table 130.7(C)(9)(a) has been provided for use. However, specific fault currents and fault clearing times were assumed in the preparation of those tables. The assumed short circuit current capacities and fault clearing times are listed in the notes of the table. If the fault currents or fault clearing time are different than those used in generating the recommendations in the table, the incident energy can be very different. These tables are suitable for their intended use, providing an immediate answer, but are not a substitute for performing a more detailed arc flash hazard analysis specific to the facility. Analyses that take into consideration the true operating conditions of a specific facility can be performed using the methods outlined in either NFPA 70E or IEEE Standard 1584-2002. The IEEE 1584-2002 guidelines have been derived as a result of extensive testing and, therefore, are typically considered to be more accurate. Use of either methodology should be considered acceptable.

With regard to determining appropriate work practices and PPE, the magnitude of the potential arc flash hazard is first determined based on work being performed, the exposure to the employee, and the potential incident energy of an arc flash. The appropriate PPE is then selected with guidance provided in

the PPE Matrix, NFPA 70E Table 130.7(C)(10). Further guidance on protective clothing characteristics is provided in NFPA 70E Table 130.7(C)(11).

With regard to what an employer should already be doing to minimize the exposure of employees to energized circuits, the NEC has provided guidance:

“110.27 Guarding of Live Parts.

(A) Live Parts Guarded Against Accidental Contact.

Except as elsewhere required or permitted by this Code, live parts of electrical equipment operating at 50 volts or more shall be guarded against accidental contact by approved enclosures or by any of the following means:


1. By location in a room, vault, or similar enclosure that is accessible only to qualified persons.
2. By suitable permanent, substantial partitions or screens arranged so that only qualified persons have access to the space within reach of the live parts. Any openings in such partitions or screens shall be sized and located so that persons are not likely to come into accidental contact with the live parts or bring conducting objects into contact with them.
3. By location on a suitable balcony, gallery, or platform elevated and arranged so as to exclude unqualified persons.
4. By elevation of 2.5 m (8 ft) or more above the floor or other working service.

(B) **Prevent Physical Damage.** In locations where electric equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

(C) **Warning Signs.** Entrances to rooms and other guarded locations that contain exposed live parts shall be marked with conspicuous warning signs forbidding unqualified persons to enter.”

For the employer, this requires that guards be provided for all exposed circuitry, even within commonly opened switchboards, panelboards and industrial control panels, to ensure that the risk to employees is minimized. A logical inference from the *NEC* requirements stated above is that the provided guards should also accommodate and safeguard employee’s exposure to an associated arc flash hazard.

In summary, OSHA expects employers and employees to comply with the provisions of NFPA 70E regardless of whether or not it has been adopted as an OSHA requirement.

NFPA 70E compliance for a facility involves putting an electrical safety program in place, which will identify and analyze electrical hazards in the workplace, educate the workforce on those hazards, require the use of appropriate PPE, and implement warning labels and guards to protect the workers. 

References

- [1] NFPA 70E, *Standard for Electrical Safety in the Workplace* – 2004 Edition, Forward to NFPA 70E.
- [2] OSHA Standard 29CFR1910, Section.335(a)(1)(i).
- [3] NFPA 70, *National Electric Code* – 2002 Edition, Section 100, Definitions.
- [4] NFPA 70, *National Electric Code* – 2002 Edition, Section 110.16, Flash Protection.
- [5] Occupational Safety Health Act of 1970, Section 5(a)(1).
- [6] OSHA Standard Interpretations dated July 25, 2003, “General Duty Clause (5(a)(1)) citations on multi-employer worksites; NFPA 70E electrical safety requirements and personal protective equipment.”
- [7] OSHA Trade Release dated April 2, 2004, “OSHA Proposes Revisions to Electrical Installation Standard.”
- [8] NFPA 70E, *Standard for Electrical Safety in the Workplace* – 2004 Edition, Section 110.8(A).
- [9] NFPA 70E, *Standard for Electrical Safety in the Workplace* – 2004 Edition, Section 130.3.
- [10] NFPA 70E, *Standard for Electrical Safety in the Workplace* – 2004 Edition, Section 130.7(C)(9)(a).

As Operations Manager of ESCO Energy Services Company, Lynn brings over 25 years of working knowledge in design, permitting, construction, and startup of mechanical, electrical, and instrumentation and controls projects as well as experience in the operation and maintenance of facilities.

Lynn is a Professional Engineer, Certified Energy Manager and has a BS in Nuclear Engineering from the University of Tennessee.