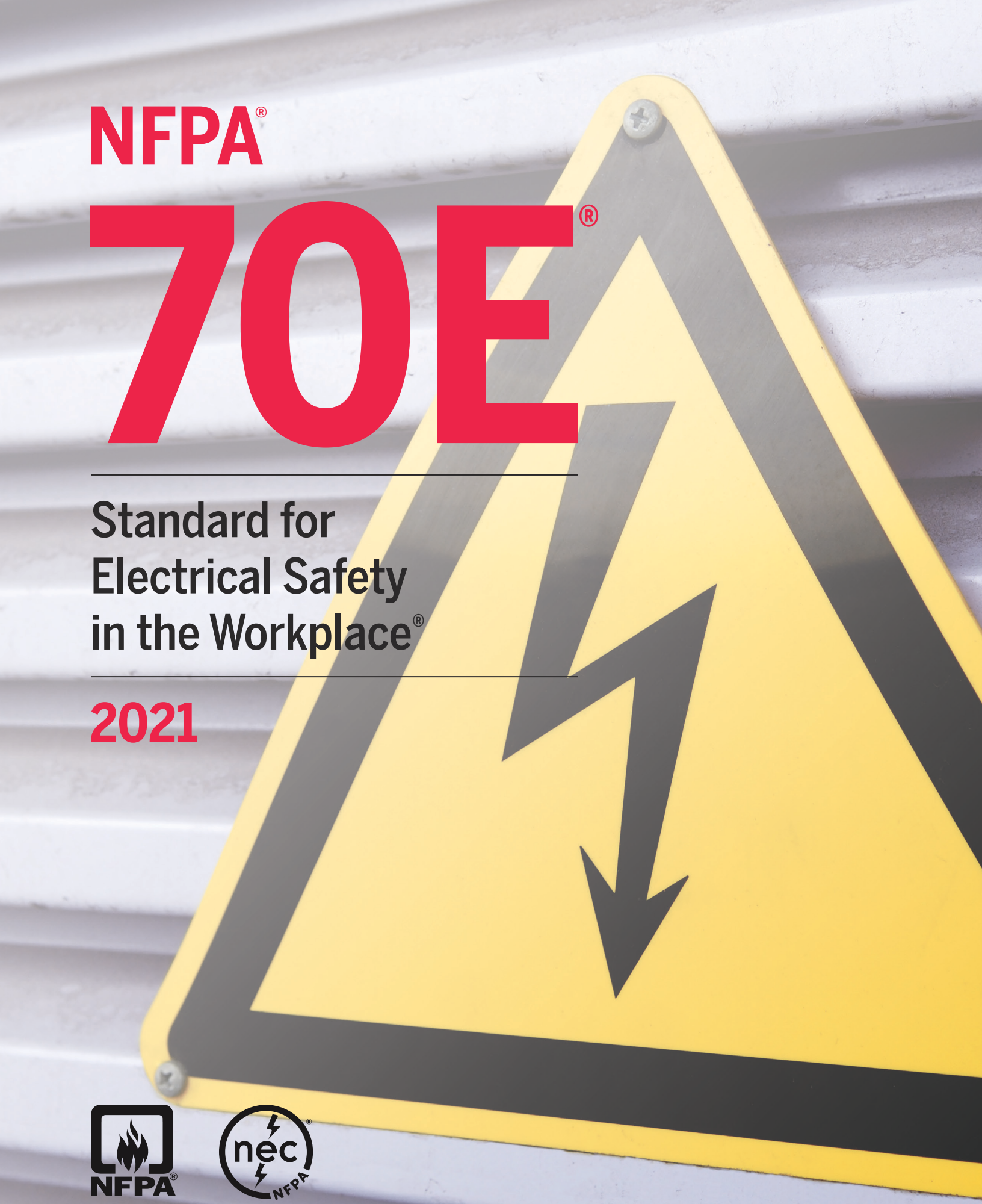
NFPA® 70E®

Standard for Electrical Safety in the Workplace®

2021



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NFPA 70E®

Standard for

Electrical Safety in the Workplace®

2021 Edition

This edition of *NFPA 70E®*, *Standard for Electrical Safety in the Workplace®*, was prepared by the Technical Committee on Electrical Safety in the Workplace and released by the Correlating Committee on National Electrical Code®. It was issued by the Standards Council on June 1, 2020, with an effective date of June 21, 2020, and supersedes all previous editions.

This edition of *NFPA 70E* was approved as an American National Standard on June 21, 2020.

Foreword to *NFPA 70E*

The Standards Council of the National Fire Protection Association announced the formal appointment of a new electrical standards development committee on January 7, 1976. The Committee on Electrical Safety Requirements for Employee Workplaces reported to the association through the Technical Correlating Committee on *National Electrical Code® (NEC®)*. The committee was formed to assist OSHA in preparing an electrical safety standard that would serve OSHA's needs and that could be expeditiously promulgated through the provisions of Section 6(b) of the Occupational Safety and Health Act. OSHA found that in attempting to utilize the latest edition of the *NEC*, it was confronted with the following problems:

(1) OSHA could only adopt or modify a standard through procedures that provide for public notice, opportunity for public comment, and public hearings. The adoption of a new *NEC* edition by these procedures would require extensive effort and application of resources by OSHA and others. Going through the procedures might result in requirements substantially different from those of the *NEC*, thereby creating a conflict between the two standards.

(2) The *NEC* is intended for use primarily by those who design, install, and inspect electrical installations. Most of the *NEC* requirements are not electrical safety–related work practices, electrical system maintenance, or directly related to employee safety. However, OSHA electrical regulations, which address employers and employees in their workplaces, needed to consider and develop these safety areas.

It became apparent that a need existed for a new standard tailored to fulfill OSHA's responsibilities that would still be fully consistent with the *NEC*. This led to the concept of a new document that would extract suitable portions from the *NEC* and from other documents applicable to electrical safety. This concept and an offer of assistance was submitted in May 1975 to the Assistant Secretary of Labor for OSHA, who responded as follows: "The concept, procedures, and scope of the effort discussed with my staff for preparing the subject standard appear to have great merit, and an apparent need exists for this proposed consensus document which OSHA could consider for promulgation under the provisions of Section 6(b) of the Act. OSHA does have an interest in this effort and believes the proposed standard would serve a useful purpose." With this positive encouragement from OSHA, the NFPA Electrical Section unanimously supported a recommendation that the *NEC* Correlating Committee examine the feasibility of developing a document for evaluating electrical safety in the workplace. With recommendations from the Electrical Section and Correlating Committee, the Standards Council authorized the establishment of a committee to carry out this examination.

The committee would develop a standard for electrical installations that would be compatible with the OSHA requirements for employee safety in locations covered by the *NEC*. The standard was visualized as consisting of four major parts: Part I, Installation Safety Requirements; Part II, Safety-Related Work Practices; Part III, Safety-Related Maintenance Requirements; and Part IV, Safety Requirements for Special Equipment. It was not considered essential for all of the parts to be completed before the standard was published and made available. Each part was recognized as being

an important aspect of electrical safety in the workplace, but the parts were sufficiently independent of each other to permit their separate publication. The first edition of NFPA *70E, Standard for Electrical Safety Requirements for Employee Workplaces*, was published in 1979 and included only Part I, Installation Safety Requirements.

The second edition published in 1981 included a new Part II, Safety-Related Work Practices. In 1983, the third edition added a new Part III, Safety-Related Maintenance Requirements. In 1988, the fourth edition was published with only minor revisions.

The 1995 edition included major revisions to Part I to conform to the 1993 edition of the *NEC*. The concepts of "limits of approach" and establishment of an "arc" were introduced in Part II. In 2000, the sixth edition included an update of Part I to the 1999 *NEC*, as well as a new Part IV, Safety Requirements for Special Equipment. Part II continued to focus on establishing flash protection boundaries and the use of personal protective equipment (PPE). Also, charts were added to Part II to assist in applying appropriate protective clothing and personal protective equipment for common tasks.

The 2004 edition presented several significant changes. The major changes emphasized safe work practices. Clarity and usability of the document were also enhanced. The title was changed to *Standard for Electrical Safety in the Workplace*. The document was reformatted to comply with the *National Electrical Code Style Manual*. The existing parts were renamed as chapters and were reorganized with the safety-related work practices relocated to the front of the document to highlight the emphasis, followed by safety-related maintenance requirements, safety requirements for special equipment, and safety-related installation requirements. The chapter on safety-related work practices also was reorganized to emphasize that working on live parts is the last alternative work practice. An energized electrical work permit and related requirements were incorporated into the document.

This standard is compatible with the *NEC* but is not intended to be used, nor can it be used, in lieu of the *NEC*. Chapter 4, Specific Purpose Equipment and Installations, was intended to serve a very specific need of OSHA. It was not intended to be applied as a design, installation, modification, or construction standard for an electrical installation or system. Its content was intentionally limited in comparison to the *NEC* in order to apply to an electrical installation or a system as part of an employee's workplace. Chapter 4 was updated to correlate with the 2002 edition of the *NEC*, but requirements not directly associated with employee safety were not included. Omission of *NEC* requirements did not affect the *NEC*, nor were omitted requirements considered as unimportant. They are essential to the *NEC* and its intended application — that is, its use by those who design, install, and inspect electrical installations. NFPA *70E*, on the other hand, is intended for use by employers, employees, and OSHA.

Requirements were upgraded throughout the 2009 edition. Chapter 4 was deleted because it was a duplicate of *NEC* installation requirements. Article 350 was added for R&D facilities. Other changes included significant revisions to Annex D, Annex F, and Annex J and the addition of Annex M, Annex N, and Annex O.

The 2012 edition marked another waypoint as this standard continued to evolve to meet the electrical safety needs of employers and employees. New research, new technology, and technical input from users provided the foundation for new and revised requirements that addressed the electrical hazards encountered by employees in current workplaces. Expanded or clarified requirements, inclusion of technical material not previously covered, and removal of requirements related to the safe installation of electrical equipment rather than being safe electrical work practices were some of the major actions undertaken during the revision cycle. In addition, requirements covering the separate but directly related concepts of hazard identification and risk assessment were revised to clarify the concepts. A significant revision to Annex F provided extensive coverage of this topic to assist users with implementing effective hazard identification and risk assessment procedures. Annex P on aligning NFPA *70E* implementation with occupational health and safety management standards was added.

The majority of changes occurred in Chapter 1. Article 105, Application of Safety-Related Work Practices, and a requirement for hearing protection when working within an arc flash boundary were added, as were work practice requirements on the use of GFCIs to protect employees. Clarification was made that Article 130 applies whether incident energy analysis or the hazard/risk table was used to determine use and level of PPE. Short-circuit current, fault clearing time, and arc flash boundary information were included in the hazard/risk category tables. Another major revision included changing "flame-resistant (FR)" to "arc-rated (AR)" in regard to PPE.

The 2015 edition incorporated a major shift in how stakeholders evaluate electrical risk. In support of this, new definitions for *hazard*, *hazardous*, *risk*, and *risk assessment* were added to Article 100. Throughout the document, changes were made to provide clarity to users, such as changing *hazard analysis* to *risk assessment*. These global changes ensured consistent use of these terms throughout the document and provided consistency between *NFPA 70E* and other standards that address hazards and risk. Other major revisions included the following:

(1) The definition of a qualified person was revised to correlate with the OSHA definition.

(2) Safety-related maintenance requirements and other administrative controls were added to the scope statement to clarify that training and auditing are equally important safety-related work practices.

(3) An electrical safety program must consider condition of maintenance.

(4) Clarification was provided that the equipment owner or the owner's designated representative is responsible for maintenance of the electrical equipment and documentation.

(5) New maintenance requirements were added for test instruments and associated test leads utilized in the verification of the absence or presence of voltages.

(6) New requirements clarified where normal operation of electric equipment is permitted.

(7) Clarification was made that either the incident energy analysis method or arc flash PPE category method can be used on a piece of equipment for the selection of PPE, but not both. The revision clarified that the results of an incident energy analysis is not permitted to be used to specify an arc flash PPE category.

(8) A new task-based table combined the previously separate ac and dc tables used to determine when arc flash PPE is required and made them consistent, improving usability.

(9) New equipment-based tables were added for determining the arc flash PPE category for ac systems and for dc systems.

(10) Hazard/risk category 0 was removed because the new PPE table only specifies PPE for work within the arc flash boundary. Hazard/risk category was also changed to PPE category.

(11) Prohibited approach boundary was deleted because additional protective equipment was not required when crossing this boundary.

(12) The criterion to use insulated tools or handling equipment was changed from the limited approach boundary to restricted approach boundary.

(13) All references to bare-hand work were removed. This work is considered to be a "utility type" line work technique more appropriately addressed in other standards.

(14) Field-marked equipment labeling requirements were revised to require an updated label when the arc flash hazard risk assessment identifies a change that renders the label inaccurate.

(15) A risk assessment is required prior to any work on a battery system to identify the chemical, electrical shock, and arc flash hazards and assess the risks associated with the type of tasks to be performed.

The 2018 edition continued to evolve to address risk assessment and introduce human factors, such as human error, as part of that assessment. Annex Q, Human Performance and Workplace Electrical Safety, was included to provide guidance in this area. This edition emphasized the need to use the hierarchy of risk controls by moving it from an informational note into the text of the standard. *NFPA 70E* explicitly stated that the first priority must be the elimination of the hazard.

The previous arc flash hazard identification table [Table 130.7(C)(15)(A)(a)] was modified to determine the likelihood that an arc flash could occur and renumbered as Table 130.5(C). This modified table could be used with either method of arc flash risk assessment.

The most notable change for the 2018 edition was that tables and text that specified PPE standards were moved to informational tables or notes. In previous editions employers were, and still are, required to verify that appropriate PPE is given to employees. Section 130.7(C)(14)(b) was added to provide guidance on conformity assessment of PPE. These changes did not alter the employer's responsibility for determining the validity of the PPE manufacturer's claims.

Definitions for *fault current* and *available fault current* were added, and other terms used throughout the standard for this current were changed for consistency. Article 120 was rearranged to present the requirements for establishing an electrically safe work condition in a logical order of application of the program. Article 320 introduced voltage thresholds of 50 Vac and 100 Vdc specifically for batteries and battery rooms to address the unique situations in these locations. Article 330 addressing lasers was extensively revised to address safety-related maintenance issues rather than issues associated with laser use. Article 350 introduced an Electrical Safety Authority as a possible authority having jurisdiction for laboratories.

For the 2021 edition, Article 110 was revised to incorporate the general requirements for electrical safety-related work programs, practices, and procedures from other articles. The reference to arc-resistant switchgear has been changed to arc-resistant equipment in Tables 130.5(C) and 130.7(C)(15)(a) to address the use of other types of arc-resistant equipment. Article 360, Safety-Related Requirements for Capacitors, and Annex R, Working with Capacitors, were added to address specific electrical safety requirements unique to capacitors. Annex D, Incident Energy and Arc Flash Boundary Calculation Methods, was revised to reference IEEE-1584-2018 as a method of calculation.

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Committee Scope: This Committee shall have primary responsibility for documents on minimizing the risk of electricity as a source of electric shock and as a potential ignition source of fires and explosions. It shall also be responsible for text to minimize the propagation of fire and explosions due to electrical installations.

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