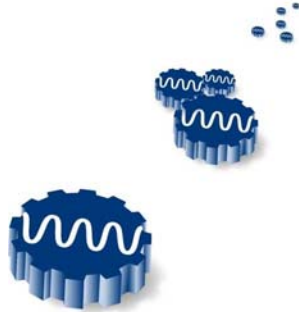


Likely Changes to 2018 NFPA 70E



**Based On First Draft
Meeting Ballot**

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Senior Member IEEE



*Disclaimer: Although Jim White is a member of the NFPA Technical Committee for **NFPA 70E** "Standard for Electrical Safety in the Workplace", **NFPA 70B** "Recommended Practice for Electrical Equipment Maintenance", **NEC CMP-13** and **ASTM F18** "Electrical Protective Equipment For Workers", the views and opinions expressed in this message are purely the author's and shall not be considered an official position of the NFPA, ASTM or any of their Technical Committees and shall not be considered to be, nor be relied upon as, a formal interpretation or promotion of the NFPA or ASTM. The audience is encouraged to refer to the entire text of all referenced documents.*



Legend for Legislative Text

- ~~Any text stricken~~ – text being removed
- Any text underlined – text being added
- Any text not having either – Existing text
- **Any text in color** – My emphasis; not in 70E



Example

~~130.4 Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection~~ Shock Risk Assessment .

(A) ~~Shock Risk Assessment~~ General .

A shock risk assessment shall ~~determine the voltage to which personnel will be exposed, the boundary requirements, and the PPE necessary in order to minimize the possibility of electric shock to personnel.~~ be performed as follows:



110.1 Electrical Safety Program

Job Safety Analysis (JSA) (New Section After 110.1(G))

Before starting each job a qualified electrical person shall complete a detailed job safety analysis. The analysis shall identify, in sequential order, the individual tasks associated with the performance of each job. The specific hazard(s) and, the severity and likelihood of unintentional injury shall be considered for each individual task. Control methods for reducing the likelihood of unintentional injury for each task shall be identified. The results of the job safety analysis shall determine if each task can be safely performed. The job safety analysis shall be documented.

Informational Note: For an example of a Job Safety Analysis (JSA) see Informative Annex XX.



110.1(H)

(H) Risk Assessment Procedure.

(1) An electrical safety program shall include a risk assessment procedure that addresses employee exposure to electrical hazards. The risk assessment procedure shall identify the process to be used by the employee before work is started to carry out the following:

- (1) Identify hazards
- (2) Assess risks
- (3) Implement risk control according to a hierarchy of methods

(2) The risk assessment shall take into consideration the potential for human error and its negative consequences on people, processes, the work environment, and equipment.

Informational Note: The potential for human error will vary with factors such as tasks and the work environment.



110.1(H)

(3) Preventive and protective risk control methods shall be implemented in accordance with the following hierarchy:

- 1) Elimination – Physically removing the hazard (**Turn it off**)
- 2) Substitution – Replacing something that produces a hazard with something that doesn't (**Installing arc-resistant switchgear**)
- 3) Engineering controls – Isolate workers from the hazard (**Using remote racking or operators, instead of local**)
- 4) Awareness – Making workers aware of risks or hazards (**Signs, warning lights, etc**)
- 5) Administrative controls – Changes to the way workers perform tasks (**Procedure changes, training**)
- 6) PPE – Reduces the effects of the hazard in an attempt to make the injury survivable (**Arc-rated clothing and PPE, safety glasses, etc**)



from ANSI Z10



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8



110.1 – New Section After 110.1(H)

(J) Incident Investigations.

The electrical safety program shall include a requirement to investigate electrical incidents.



110.1(I)

(I) Job Safety Planning and Job Briefing.

Before starting each job that involves exposure to electrical hazards , the employee in charge shall complete a job safety plan and conduct a job briefing with the employees involved. ~~The briefing shall cover such subjects as hazards associated with the job, work procedures involved, special precautions, energy source controls, PPE requirements, and the information on the energized electrical work permit, if required. Additional job briefings shall be held if changes that might affect the safety of employees occur during the course of the work.~~



110.1(I)

(1) Job Safety Planning.

The job safety plan shall be in accordance with the following:

(1) Be completed by a qualified person

(2) Be documented

(3) Include the following information:

a. A description of the job and the individual tasks

b. Identification of the electrical hazards associated with each task

c. A shock risk assessment in accordance with 130.4 for tasks involving a shock hazard

d. An arc flash risk assessment in accordance with 130.5 for tasks involving an arc flash hazard

e. Work procedures involved, special precautions, and energy source controls



110.1(I)

(2) Job Briefing.

The job briefing shall cover the job safety plan or the information on the energized electrical work permit.

(3) Change in Scope.

Additional job safety planning and job briefings shall be held if changes occur during the course of the work that might affect the safety of employees.



110.2(C) Emergency Response Training

(2)(d) Refresher training shall occur ~~annually~~ at a frequency that satisfies the requirements of the certifying body.

Informational Note: Employees responsible for responding to medical emergencies might not be first responders or medical professionals. Such employees could be a second person, a safety watch, or a craftsperson.



110.4 Test Instruments and Equipment

(B) Rating.

Test instruments, equipment, and their accessories shall be ~~rated for circuits and equipment where they are utilized~~ as follows:

(1) Rated for circuits and equipment where they are utilized

(2) Approved for the purpose

(3) Used in accordance with any instructions provided by the manufacturer



110.4

(E) Operation Verification.

When test instruments are used for testing, the absence of voltage on conductors or circuit parts operating at ~~50 volts or more~~ voltages equal to or greater than 50 Vac or 100 Vdc , the operation of the test instrument shall be verified on a known voltage source of the same frequency (ac or dc) before and after an absence of voltage test is performed.

Informational Note: Verifying the operation of an auto ranging test instrument rated 1000 V or less can be done on a known voltage source operating at a voltage other than that of the conductors or circuit parts that will be tested for the absence of voltage.



Article 120

- Complete revision and reordering
- No major technical changes
- Revisions made to improve flow and readability
- All training requirements moved to 110.2
- New order:
 - 120.1 LOTO Program
 - 120.2 LOTO Principles
 - 120.3 LOTO Equipment
 - 120.4 Procedure to Establish and Verify an Electrically Safe Work Condition



FR Created for Less Than 100 Vdc

Section	PI #(s)	Agenda Page #(s)	Proposed Action
Global Input	434	21	Create FR
Revise 2015 text: (use track changes)	Table 130.4(D)(a) <u>Less than</u> <50 V Not specified Not specified Not specified		
	Table 130.4(D)(b) <u>Less than</u> <100 V Not specified Not specified Not specified		



Table 130.4(C)(b) Shock Protection Approach Boundaries to Exposed Energized Electrical Conductors or Circuit Parts for Shock Protection, Direct-Current Voltage Systems

(1)	(2)	(3)	(4)
Nominal Potential Difference	Limited Approach Boundary		Restricted Approach Boundary; Includes Inadvertent Movement Adder
	Exposed Movable Conductor *	Exposed Fixed Circuit Part	
<Less than 100 V	Not specified	Not specified	Not specified
100 V–300 V	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	Avoid contact
301 V–1 kV	3.0 m (10 ft 0 in.)	1.0 m (3 ft 6 in.)	0.3 m (1 ft 0 in.)
1.1 kV–5 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.5 m (1 ft 5 in.)
5 kV–15 kV	3.0 m (10 ft 0 in.)	1.5 m (5 ft 0 in.)	0.7 m (2 ft 2 in.)
15.1 kV–45 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	0.8 m (2 ft 9 in.)
45.1 kV– 75 kV	3.0 m (10 ft 0 in.)	2.5 m (8 ft 0 in.)	1.0 m (3 ft 2 in.)
75.1 kV–150 kV	3.3 m (10 ft 8 in.)	3.0 m (10 ft 0 in.)	1.2 m (4 ft 0 in.)
150.1 kV–250 kV	3.6 m (11 ft 8 in.)	3.6 m (11 ft 8 in.)	1.6 m (5 ft 3 in.)
250.1 kV–500 kV	6.0 m (20 ft 0 in.)	6.0 m (20 ft 0 in.)	3.5 m (11 ft 6 in.)
500.1 kV–800 kV	8.0 m (26 ft 0 in.)	8.0 m (26 ft 0 in.)	5.0 m (16 ft 5 in.)



130.2(A)(4) Normal ~~Operation~~ Operating Conditions

(4) Normal ~~Operation~~ Operating Condition .

Normal operation of electric equipment shall be permitted where a normal operating condition exists. A normal operating condition exists when all of the following conditions are satisfied:

- (1) The equipment is properly installed.
- (2) The equipment is properly maintained.
- (3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer's instructions.
- (4) The equipment doors are closed and secured.
- (5) All equipment covers are in place and secured.
- (6) There is no evidence of impending failure.



130.4 Shock Risk Assessment

~~130.4 Approach Boundaries to Energized Electrical Conductors or Circuit Parts for Shock Protection~~ Shock Risk Assessment .

(A) Shock Risk Assessment General .

A shock risk assessment shall ~~determine the voltage to which personnel will be exposed, the boundary requirements, and the PPE necessary in order to minimize the possibility of electric shock to personnel.~~ be performed as follows:

- (1) To identify shock hazards.
- (2) To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health.
- (3) To determine if additional protective measures are required, including the use of PPE. If additional protective measures are required, including the use of PPE, the following shall be identified:
 - a. The voltage to which personnel will be exposed
 - b. The boundary requirements
 - c. The personal and other protective equipment required by this standard to protect against the shock hazard



130.4

(B) Documentation.

The results of the shock risk assessment shall be documented.



130.5 Arc Flash Risk Assessment

An arc flash risk assessment shall be performed and shall comply with 130.5(1) through 130.5(3):

(1) Determine if an arc flash hazard exists. If an arc flash hazard exists, the risk assessment shall determine:
General. An arc flash risk assessment shall be performed as follows:

- a. To identify arc flash hazards
- b. To estimate the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health
- c. To determine if additional protective measures are required, including the use of PPE



130.5

(2) Estimate of Likelihood and Severity. The estimate of the likelihood of occurrence of injury or damage to health and the potential severity of injury or damage to health shall take into consideration the following:

a. The design of the electrical equipment, including its overcurrent protective device and its operating time

b. The electrical equipment operating condition and condition of maintenance. Table 130.5 shall be permitted to be used to estimate the likelihood of occurrence of an arc flash event.

Table 130.5 shall be permitted to be used to estimate the likelihood of occurrence of an arc flash



205.3

(3) Informational Note: Common industry practice is to apply local indication as to the date and overall condition of specific devices that have been tested and maintained in the field. The local indication provides the employee immediate indication of last maintenance date and if the tested device or system was found acceptable on the date of test. This local information can assist the employee in the assessment of overall electrical equipment maintenance status.



Test or Calibration Decal System NFPA 70B 11.27

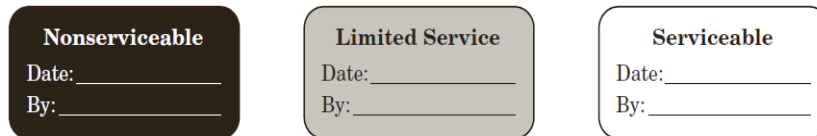


FIGURE 11.27.3 Examples of Service Classification Color Decals.



25



130.5

(3) Additional Protective Measures. If additional protective measures are required they shall be selected and implemented according to the hierarchy of risk control identified in 110.1(G). When the additional protective measures include the use of PPE, the following shall be identified:

- a. Appropriate safety-related work practices
- b. The arc flash boundary
- c. The PPE to be used within the arc flash boundary



Tables Fun

- Table 130.7(C)(15)(A)(a) (estimate of likelihood of arc flash) moved to 130.5
- Table H.3(b) moved to Table 130.5(D)
- Table 130.7(C)(15)(A)(b) (arc flash categories for ac) now Table 130.7(C)(15)(a)
- Table 130.7(C)(15)(B) (arc flash categories for dc) now Table 130.7(C)(15)(b)
- Table 130.7(C)(16) (PPE selection) now Table 130.7(C)(15)(c)



New Table 130.5 (Partial)

Table 130.5 Estimate of the Likelihood of Occurrence of an Arc Flash Incident for ac and dc Systems

<u>Task</u>	<u>Equipment Condition*</u>	<u>Likelihood of Occurrence †</u>
Reading a panel meter while operating a meter switch.		
Performing infrared thermography and other non-contact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers.		
Working on control circuits with exposed energized electrical conductors and circuit parts, nominal 125 volts ac or dc, or below without any other exposed energized equipment over nominal 125 volts ac or dc, including opening of hinged covers to gain access.	Any	No
Examination of insulated cable with no manipulation of cable.		
For dc systems, insertion or removal of individual cells or multi-cell units of a battery system in an open rack.		
For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack.		



<p>Table 130.5(D)</p> <ul style="list-style-type: none"> • 2018 edition NFPA 70E • From Table H.3(b) 	<p><u>Table 130.5(D) Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used</u></p> <hr/> <p>Incident energy exposures equal to 1.2 cal/cm² up to 12 cal/cm²</p> <p>Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy ^a</p> <ul style="list-style-type: none"> • Long-sleeve shirt and pants or coverall or arc flash suit (SR) <p>Arc-rated face shield and arc-rated balaclava or arc flash suit hood (SR) ^b</p> <p>Leather gloves or rubber insulating gloves with leather protectors (SR) ^c</p> <p>Hard hat</p> <p>Safety glasses or safety goggles (SR)</p> <p>Hearing protection</p> <p>Leather footwear</p>
	<p>Incident energy exposures greater than 12 cal/cm²</p> <p>Arc-rated clothing with an arc rating equal to or greater than the estimated incident energy ^a</p> <ul style="list-style-type: none"> • Long-sleeve shirt and pants or coverall or arc flash suit (SR) <p>Arc-rated arc flash suit hood</p> <p>Arc-rated gloves or rubber insulating gloves with leather protectors (SR) ^c</p> <p>Hard hat</p> <p>Safety glasses or safety goggles (SR)</p> <p>Hearing protection</p> <p>Leather footwear</p> <hr/> <p>SR: Selection of one in group is required.</p> <p>^a Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system if tested as a combination consisting of an arc-rated shirt and pants, coverall, and arc flash suit.</p>

130.5(E) Equipment Labeling

Exception No. 1: ~~Labels~~ Unless changes in electrical distribution system(s) render the label inaccurate, labels applied prior to September 30, 2011 are acceptable if they contain the available incident energy or required level of PPE. the effective date of this edition of the standard shall be acceptable if they complied with the requirements for equipment labeling in the standard in effect at the time the labels were applied.

Exception No. 2: In supervised industrial installations where conditions of maintenance and engineering supervision ensure that only qualified persons monitor and service the system, the information required in (E)(1) through (E)(3) shall be permitted to be documented in a manner that is readily available to persons likely to perform examination, servicing, maintenance, and operation of the equipment while energized.



Table 130.7(C)(15)(a) Arc-Flash Hazard PPE Categories for Alternating Current (ac) Systems

<u>Equipment</u>	<u>Arc Flash PPE Category</u>	<u>Arc-Flash Boundary</u>
Panelboards or other equipment rated 240 <u>V</u> volts and below Parameters: Maximum of 25 kA <u>short-circuit current available available fault current</u> ; maximum of 0.03 <u>secs</u> (2 cycles) fault clearing time; <u>minimum</u> working distance 455 mm (18 in.)	1	485 mm (19 in.)
Panelboards or other equipment rated <u>>greater than 240 V</u> volts and up to 600 <u>V</u> volts Parameters: Maximum of 25 kA <u>short-circuit current available available fault current</u> ; maximum of 0.03 <u>secs</u> (2 cycles) fault clearing time; <u>minimum</u> working distance 455 mm (18 in.)	2	900 mm (3 ft)
600- <u>V</u> volt class motor control centers (MCCs) Parameters: Maximum of 65 kA <u>short-circuit current available available fault current</u> ; maximum of 0.03 <u>secs</u> (2 cycles) fault clearing time; <u>minimum</u> working distance 455 mm (18 in.)	2	1.5 m (5 ft)



Table 130.7(C)(15)(a) New Note

(2) The following are typical fault clearing times of overcurrent protective devices:

(a) 0.5 cycle fault clearing time is typical for current limiting fuses.

(b) 1.5 cycle fault clearing time is typical for molded case circuit breakers rated less than 1000 volts with an instantaneous integral trip.

(c) 3.0 cycle fault clearing time is typical for insulated case circuit breakers rated less than 1000 volts with an instantaneous integral trip or relay operated trip.

(d) 5.0 cycle fault clearing time is typical for relay operated circuit breakers rated 1 kV to 35 kV.

(e) 20 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay for motor inrush.

(f) 30 cycle fault clearing time is typical for low-voltage power and insulated case circuit breakers with a short time fault clearing delay without instantaneous trip.



Table 130.7(C)(15)(c)

	Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm ² (33.5 J/cm ²) ^a (see Note 1)
	Arc-rated long-sleeve shirt and pants or arc-rated coverall
	Arc-rated flash suit hood or arc-rated face shield ^b (see Note 2) and arc-rated balaclava
	Arc-rated jacket, parka, rainwear, or hard hat liner (AN)
2	Protective Equipment
	Hard hat
	Safety glasses or safety goggles (SR)
	Hearing protection (ear canal inserts)
	Heavy-duty leather gloves ^c (see Note 3)
	Leather footwear



New Note To Table 130.7(C)(15)(c)

c. Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provided increased arc flash protection.



130.7(C)(15) Arc Flash PPE Category Method

(a) Alternating Current (ac) Equipment. When selected the arc flash risk assessment performed in accordance with 130.5 indicates that arc flash PPE is required and the arc flash PPE category method is used for the selection of PPE for ac systems in lieu of the incident energy analysis of 130.5(B)(1) , ~~Table 130.7(C)(16)~~ Table 130.7(C)(15)(a) shall be used to identify when arc flash PPE is required. When arc flash PPE is required, ~~Table 130.7(C)(15) (A)(b)~~ shall be used to determine the arc flash PPE category. The estimated maximum available short-circuit current, maximum fault clearing times, and minimum working distances for various ac equipment types or classifications are listed in ~~Table 130.7(C)(15)(A)(b)~~ Table 130.7(C)(15)(a) . An incident energy analysis shall be required in accordance with 130.5 for the following:



130.7(C)(16) Personal Protective Equipment Conformity Assessment

(16) Personal Protective Equipment Conformity Assessment.

(a) All personal protective equipment referenced in Table 130.7(C)(14) shall comply with the associated referenced standard.

(b) Effective January 1, 2018, all personal protective equipment shall comply with ANSI/ISEA 125, *American National Standard for Conformity Assessment of Safety and Personal Protective Equipment* , conformity assessment Level 1, 2, or 3 in its entirety, and shall be marked in accordance with Section 9 of ANSI/ISEA 125.




6oz double-layer
Nomex III

Single layer on
arms

No arc rating

No 70E compliance


No ASTM F1506
compliance



Obsolete

Polycarbonate face
shield

Melts at about 1.5
cal/cm²

37 



PROOF TO USE OF THIS GARMENT A HAZARD ASSESSMENT MUST BE MADE BY A TRAINED SAFETY PROFESSIONAL

FH31RB
Arc Flash Hood

THIS GARMENT MEETS OR EXCEEDS THE REQUIREMENTS OF NFPA 70E(2004) ASTM F1506-02a. VISOR MEETS OR EXCEEDS THE REQUIREMENTS OF ASTM F2178 & ANSI Z87.1

ARC RATING (ATPV 31) HAZARD RISK CAT III
SHELL: 9 OZ INDURA ULTRA SOFT
LINER: 7 OZ INDURA ULTRA SOFT

FABRIC CONTENT: 96% Cotton / 12% High Tenacity Nylon

CARE: Inspect garment before each use for damage or contaminants that impair the protective qualities of the garment

Clean Garment Thoroughly Detergent Only * Dry Cleanable * Wash Up to 165 F (74 C) No Chlorine Bleach or Hydrogen Peroxide No Softeners or Starch
Failure to Launder Properly Could Adversely Affect the Flame Resistance of the Fabric

Barcode: FH31RB

ID #14977 2 089 03/15/05 Made in USA

DO NOT REMOVE LABEL



ITEM FGNX 8572-50

SIZE LARGE

ORDER

CAUTION

Flammable contaminants can reduce the thermal performance of any flame resistant garment.

For maximum protection:

- Wash your new garment before wearing and after each subsequent wearing to thoroughly remove potentially flammable fabric processing aids/finishes/greases, oily soil and other flammable contaminants.
- Wearing undergarments is recommended with all flame resistant garments.

See reverse side for garment care

NOMEX III

38 

NFPA 2112 is Not Arc Rated




Right-Priced Insulated Tools



Looks Good

POWER TOOLS | AIR TOOLS | HAND TOOLS | TOOL STORAGE | AUTOMOTIVE & MOTORCYCLE | ENGINES & GENERATORS | WELDING | LAWN & GARDEN | MAINTENANCE

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