

NFPA
70E[®]

**Standard for
Electrical
Safety in the
Workplace**[®]

**2018
Significant Changes**

Elimination
Substitution
Engineering Controls
Awareness

EFCOG Electrical Safety Task Group Workshop, July 2017

Appreciation

Thanks to:

- ✓ Paul Dobrowsky creating the base PPT program
- ✓ Chair, Dave Dini for leading the Committee through the process during the last three cycles!
- ✓ NFPA Staff Chris Coache and Gil Moniz
- ✓ NFPA 70E Committee members
- ✓ All those that participated

Logistics

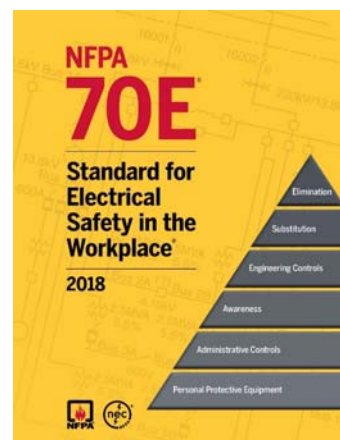
- PI = Public Input
- FR = First Revision
- PC = Public Comment
- SR = Second Revision
- CC = Correlating Committee Note
- NL = Submitted by a National Laboratory
- Underlining – new text
- ~~Strikethrough~~ – removed text
- **Red font** – key words

3



General

- Approximately
- 430 Public Inputs
 - ✓ 170 First Revisions
- 170 Public Comments
 - ✓ 70 Second Revisions



4



Global

- Replace the term "accident" with "incident"
- "accidental" is replaced with "unintentional"
- "accidentally" is replaced with "unintentionally"

FR 79, 80

5



Global

- The restricted approach boundary distances were adjusted for consistency throughout the tables.
- DC 100 volt Threshold changed to **50 volts**
 - ✓ Chapter 3 has provisions for higher DC applications

SR 70

6



Global

- Replace "short circuit current" with "available fault current"

FR 82 CC 1

7



Global

- Mandatory References
- PPE shall conform to ~~the standards listed in Table XXX~~ applicable state, federal, or local codes and standards.

PI 332, CC 16, SR 40, SR 43

8



90.2(A)

- Covered.

- ✓ This standard addresses electrical safety-related work practices, safety-related maintenance requirements, and other administrative controls ... during activities such as the installation, removal, inspection, operation, maintenance, and demolition



90.4 Organization - Deleted

- Section 90.4 is eliminated in its entirety

- ✓ The list of informative annexes is redundant with the table of contents which appear just a few pages prior.



Article 100

Definitions

11



Accessible, Readily (Readily Accessible)

- Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys) , to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth.
[70:100]

SR 3

12



Arc Flash Hazard

- A ~~dangerous condition~~ source of possible injury or damage to health associated with the ~~possible~~ release of energy caused by an **electric arc**.

FR 4, CC 2, SR 2

13



Arc Flash Hazard, Cont.

- Informational Note No. 1: ~~An~~ The likelihood of occurrence of an arc flash hazard may exist ~~incident~~ increases when energized electrical conductors or circuit parts are exposed or when they are within equipment in a guarded or enclosed condition, provided a person is interacting with the equipment in such a manner that could cause an electric arc. ~~Under~~ An arc flash incident is not likely to occur under normal operating conditions ~~when~~ enclosed energized equipment that has been properly installed and maintained ~~is not likely to pose an arc flash hazard~~.

FR 4, CC 2, SR2

14



Arc Flash Hazard, Cont.

- Informational Note No. 2: See ~~Table 130.7(C)(15)(A)(a)~~ Table 130.5(C) for examples of ~~activities that could pose~~ tasks that increase the likelihood of an arc flash hazard incident occurring



Boundary, Arc Flash

- **When** an arc flash hazard exists, an **approach limit** ~~at a distance from a prospective an arc source within which a person could receive a second degree burn if an electrical arc flash were to occur at which incident energy equals~~ **1.2 cal/cm² (5 J/cm²)** .
- Informational Note: ~~A~~ According to the Stoll skin burn injury model, the **onset of a second degree burn** ~~is possible by an exposure of on~~ unprotected skin is likely to occur at an exposure of an electric arc flash above the incident energy level of ~~5 J/cm² (1.2 cal/cm²)~~ **1.2 cal/cm² (5 J/cm²)** for **one second** .



Electrical Safety

- Recognizing Identifying hazards associated with the use of electrical energy and taking precautions ~~so that hazards do not cause injury or death~~ to reduce the risk associated with those hazards

FR 10

17



Electrical Safety Program- New

- A documented system consisting of electrical safety principles, policies, procedures, and processes that directs activities appropriate for the risk associated with electrical hazards.

FR 13

(NL)

18



Electrically Safe Working Condition

- A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ~~ensure~~ verify the absence of voltage, and, if necessary, ~~temporary protective grounding equipment has been applied~~ temporarily grounded for personnel protection.

FR 14

19



Fault Current

- 100, Fault Current. The amount of current delivered at a point on the system during a short circuit condition.
- Fault Current, Available. The largest amount of current capable of being delivered at a point on the system during a short-circuit condition.

SR 8

20



Fault Current, cont.

- Informational Note No. 1:
A short circuit can occur during abnormal conditions such as a fault between circuit conductors or a ground fault. See Figure 100-AFC.
- Informational Note No. 2:
If the dc supply is a battery system, the term "available fault current" refers to the prospective short-circuit current.

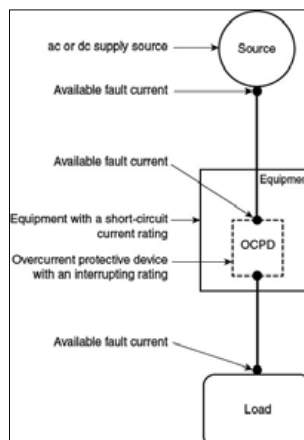


Figure 100.X Available Fault Current.

SR 8

21



Maintenance, Condition of

- The state of the electrical equipment considering the manufacturers' instructions, manufacturers' recommendations, applicable industry codes, standards and recommended practices.

FR 20, SR 5

22



Qualified Person

- One who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and ~~avoid~~ reduce the hazards involved associated risk

FR 12

23



Risk Assessment

- An overall process that identifies hazards, estimates the ~~potential severity~~ likelihood of occurrence of injury or damage to health, estimates the ~~likelihood of occurrence~~ potential severity of injury or damage to health, and determines if protective measures are required.
- Informational Note: As used in this standard, arc flash risk assessment and shock risk assessment are types of risk assessments

FR 7

24



Shock Hazard

- A dangerous condition source of possible injury or damage to health associated with the possible release of energy **current through the body** caused by contact or approach to energized electrical conductors or circuit parts.
- Informational Note: Injury and damage resulting from shock is a function of the magnitude, frequency, path, and time the current flows through the body. The physiological reaction ranges from perception, muscular contractions, inability to let go, ventricular fibrillation, tissue burns, and death.

FR 78

25



Working Distance - New

- The distance between a person's face and chest area and a prospective arc source
- Informational Note: Incident energy increases as the distance from the arc source decreases. See 130.5(C)(1) for further information.

FR 15, CC 4, SR 7

26



Application of Safety-Related Work Practices

Article 105

27



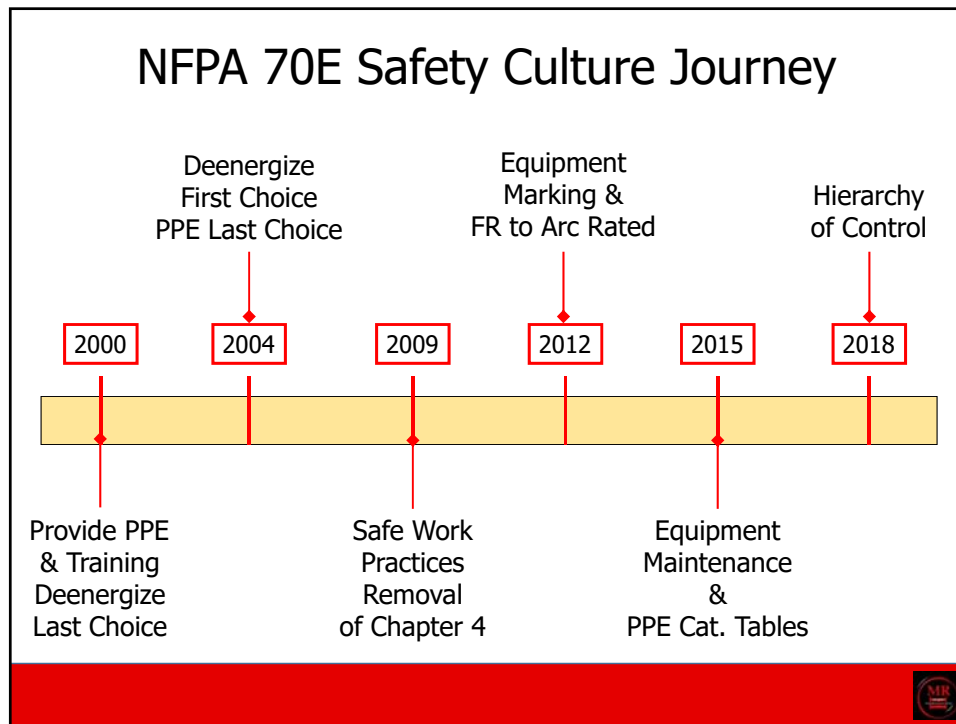
105.4 Priority - New

- Hazard **elimination** shall be the **first priority** in implementation of safety-related work practices.
- Informational Note: Elimination is the first risk control method listed in the hierarchy of risk control identified in 110.1(H)

FR 17, CC 5, SR 10

28





General Requirements for Electrical Safety-Related Work Practices

Article 110

30

110.1 Electrical Safety Program

- (B) Inspection.
- The electrical safety program shall include elements to **verify** that **newly installed or modified** electrical equipment or systems have been inspected to comply with applicable installation codes and standards prior to being placed into service

FR 21, CC6, SR 11

31



ELECTRICAL INSTALLATION REQUEST
(includes new, existing modifications and temporary installations)

1. Request No.: _____

2. Issue Date: _____ 3. Close Date (if applicable): _____

4. Issued By: Print Name: _____ Signature: _____

5. Location Area: _____ 6. Building: _____ 7. Room: _____

8. Project or Work Package No: _____

9. Description of Electrical Installation including designated NEC inspection points:

10. Job Supervisor: Print Name: _____
Signature: _____ Phone No.: _____

11. Point of Contact: Print Name: _____ Phone No.: _____

12. TO BE COMPLETED BY DESIGNATED NEC INSPECTOR ONLY

The following inspection areas shall not be concealed until inspected.

Inspection Type (Rough)	Inspected By		Field Report		Inspection Type	Inspected By		Field Report	
	Initials	Date	Yes	No		Initials	Date	Yes	No
Walls					Transformer				
Ceiling					Generator				
Grounding					Feeder/Subpanel				
Trench					Mobile Office Service				
Slab					Final				
Underground									
Raceway									

13. Notes:



 ELECTRICAL INSTALLATION REQUEST <small>(Includes new, existing modifications and temporary installations)</small>			
14. Actions (s):			
15. NEC Inspector <small>(print name and signature)</small>		Date Completed:	

110.1 Electrical Safety Program

- (H) Risk Assessment Procedure
 - ✓ (2) The risk assessment procedure shall address the potential for human error and its negative consequences on people, processes, the work environment, and equipment.
 - ✓ Informational Note: The potential for human error varies with factors such as tasks and the work environment. See Informative Annex Q

110.1 Electrical Safety Program

• (H) Risk Assessment Procedure, Cont.

- ✓ (3) The risk assessment procedure shall require that preventive and protective risk control methods be implemented in accordance with the following hierarchy:

- (1) Elimination
- (2) Substitution
- (3) Engineering controls
- (4) Awareness
- (5) Administrative controls
- (6) PPE

FR 24, SR 12

35



110.1 Electrical Safety Program

• (H) Risk Assessment Procedure, Cont.

- ✓ Informational Note No. 1: Elimination, substitution, and engineering controls are the most effective methods to reduce risk as they are usually applied at the source of possible injury or damage to health and they are less likely to be affected by human error.
- ✓ Awareness, administrative controls, and PPE are the least effective methods to reduce risk as they are not applied at the source and they are more likely to be affected by human error.

FR 24, SR 12

36



110.1 Electrical Safety Program

- (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.
 - ✓ (1) Job Safety Planning
 - ✓ (2) Job Briefing
 - ✓ (3) Change in Scope.
- Correlating changes made to Annex I

FR 25, SR 18

37



110.1 Electrical Safety Program

- (J) Incident Investigations.
- The electrical safety program shall include a requirement to investigate electrical incidents(J) Incident Investigations.
- The electrical safety program shall include elements to investigate electrical incidents
- Informational Note: Electrical incidents include events or occurrences that result in, or could have resulted in, a fatality, an injury or damage to health. Incidents that do not result in fatality, injury or damage to health are commonly referred to as a "close call" or "near miss."

FR 26, SR 13

38



110.1 Electrical Safety Program

- (K) ~~Electrical Safety~~ Auditing
 - ✓ (1) Electrical Safety Program Audit
 - ✓ (2) Field Work Audit
 - ✓ (3) Lockout/Tagout Program and Procedure Audit
 - ✓ (4) Documentation

FR 27

39



110.2 Training Requirements

- (B) Lockout/Tagout Procedure Training
- (1) Initial Training.
- Employees that could be involved in or affected by the lockout/tagout procedures required by 120.2 shall be trained in the following:
 - ✓ (1) The lockout/tagout procedures
 - ✓ (2) Their responsibility in the execution of the procedures

FR 29, CC 7, 8, SR 19

40



110.2(C) Emergency Response Training

- (1) Contact Release.
- Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of safe release. Refresher training shall occur annually

FR 35, SR 16

41



110.2(C) Emergency Response Training

- (2) First Aid, Emergency Response, and Resuscitation
- ~~Refresher training shall occur annually~~
- (d) Training shall occur at a frequency that satisfies the requirements of the certifying body

FR 35, SR 16

42



110.2(C) Emergency Response Training

- (2) First Aid, Emergency Response, and Resuscitation

✓ 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](#).



Establishing an Electrically Safe Working Condition

Article 120



Article 120

- Reorganized and revised to clarify and use consistent terms
 - ✓ “Practice” to do something customarily (e.g. “work practice”)
 - ✓ “Procedure” – a series of steps followed in a regular definite order (e.g. “lockout/tagout procedure”)
 - ✓ “Process” – a series of actions or operations conducting to an end (e.g. “Risk Assessment – an overall process that...”)
 - ✓ “Program” – a plan or system under which action may be taken toward a goal (e.g. “electrical safety program”)



Article 120

- Lockout/Tagout Auditing moved to 110.1
- Lockout/Tagout Training moved to 110.2



Article 120

- 120.1 Lockout/Tagout Program (120.2)
- 120.2 Lockout/Tagout Principles (120.2(B))
- 120.3 Lockout/Tagout Equipment (120.2(E))
- 120.4 Lockout/Tagout Procedures (120.2(F))
- 120.5 Process for establishing and verifying
..ESWC (120.1)

FR 30, SR 25

47



Article 120

- 120.4 Lockout/Tagout Procedures
- (4) Simple Lockout/Tagout. Procedure
- (A) Planning
- Exception: Lockout/tagout is not required for work on cord- and plug-connected equipment for which exposure to the hazards of unexpected energization of the equipment is controlled by the unplugging of the equipment from the energy source, provided that the plug is under the exclusive control of the employee performing the servicing and maintenance for the duration of the work.

FR 30, SR 25

48



Article 120

- 120.5 Elements of Establishing and Verifying an Electrically Safe Work Condition
- Establishing and verifying an electrically safe work condition shall include all of the following steps, which shall be performed in the order presented, if feasible:
 - (4) Release stored electrical energy.
 - (5) Release or block stored mechanical energy

FR 30, FR 80, SR 25

49



Article 120

- 120.5
- (7) Use an adequately rated portable test instrument to test each phase conductor or circuit part to verify it is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on any known voltage source) Use an adequately rated portable test instrument to test each phase conductor or circuit part to verify it is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on any known voltage source

FR 30, SR 25

50



Article 120

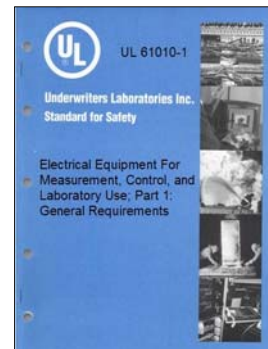
- 120.5
- (7) "Test & Verify"
- Exception No. 1 : An adequately rated permanently mounted test device shall be permitted to be used to verify the absence of voltage of the conductors or circuit parts at the work location, provided it meets the all following requirements:
 - (1) It is **permanently mounted** and installed in accordance with the manufacturer's instructions and tests the conductors and circuit parts at the point of work
 - (2) It is **listed and labeled** for the purpose of **verifying the absence of voltage**
 - (3) It tests each phase conductor or circuit part both phase-to-phase and phase-to-ground
 - (4) The test device is verified as operating satisfactorily on any known voltage source before and after verifying the absence of voltage.

FR 30, SR 25

51



Example that may meet this new permitted application



Article 120

- 120.5
- (7) "Test & Verify"
- Exception No. 2: On electrical systems **over 1000 volts, noncontact** test instruments shall be permitted to be used to test each phase conductor



Work Involving Electrical Hazards

Article 130



130.2 Electrically Safe Working Work Conditions

•(A) Energized Work

- ✓ ~~Exception: Where a disconnecting means or isolating element that has been properly installed and maintained is operated, opened, closed, removed, or inserted to achieve an electrically safe work condition for connected equipment or to return connected equipment to service that has been placed in an electrically safe work condition, the equipment supplying the disconnecting means or isolating element shall not be required to be placed in an electrically safe work condition provided a risk assessment is performed and does not identify unacceptable risks for the task.~~

SR 27

55



130.2(A) Energized Work

- (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) ...properly installed.
 - ✓ (2) ...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) ...doors are closed and secured.
 - ✓ (5) ...covers are in place and secured.
 - ✓ (6) ...no evidence of impending failure.

FR 47, CC 19

56



Shock Risk Assessment

- (B) 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(H)**. When the additional protective measures include the use of PPE, the following shall be determined:
 - ✓1 exposure voltage
 - ✓2 boundary requirements
 - ✓3 protective equipment to protect against the shock hazard

PC 9, 46, SR 29

57



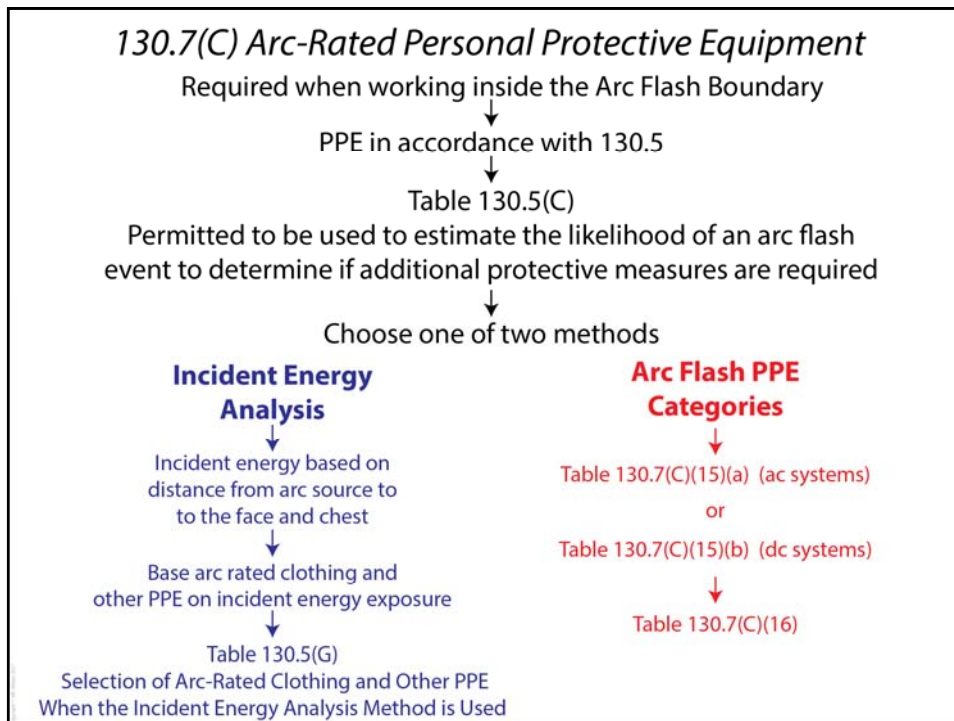
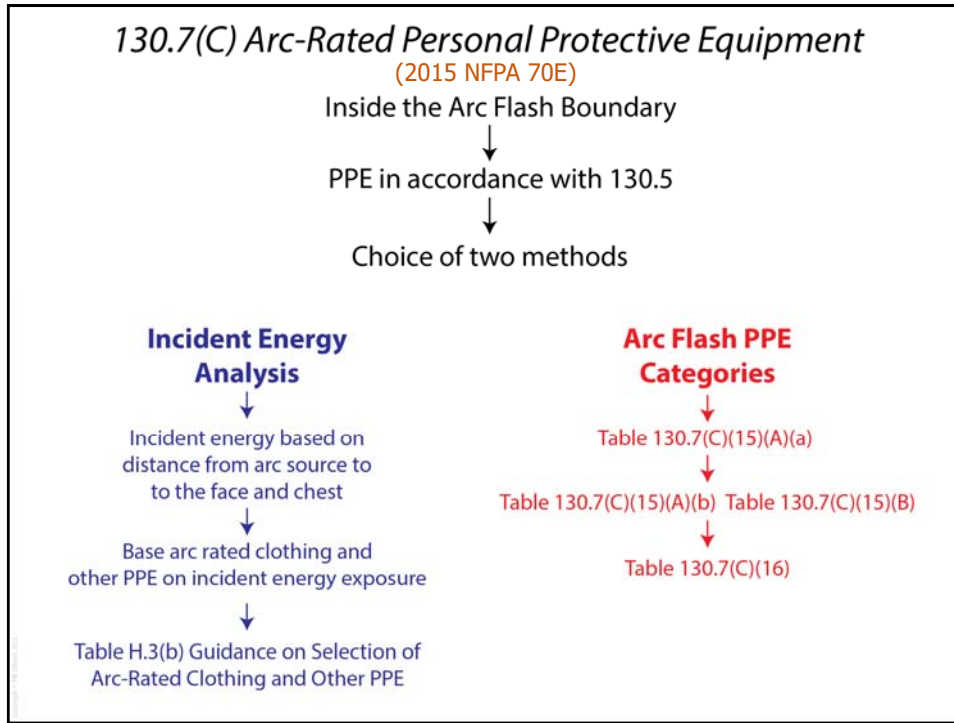
130.5 Arc Flash Risk Assessment

- (A) General
- (B) Estimate of Likelihood and Severity
- (C) Additional Protective Measures
- Table 130.5(C) shall be permitted to be used to estimate the likelihood of occurrence of an arc flash event to determine if additional protective measures are required.
 - ✓Was Table 130.7(C)(15)(A)(a) (yes/no Table)
- Can be used with both methods:
 - ✓Incident energy
 - ✓PPE Category

FR 60, CC 12, SR 31

58





130.5 Arc Flash Risk Assessment

- (C) 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(H)



130.5 Arc Flash Risk Assessment

- Table 130.5(G) NEW
 - ✓ Selection of Arc-Rated Clothing and Other PPE When the Incident Energy Analysis Method Is Used
- Table H.3(b) [Annex H] relocated here
 - ✓ 1.2 cal/cm² to 12
 - ✓ Greater than 12 cal/cm²



130.5 Arc Flash Risk Assessment

- (H) Equipment Labeling
 - ✓ Shall be field-marked
- Ex 1. existing accurate labels allowed to remain
- Ex 2. in supervised industrial installations
 - ✓ With qualified persons
 - ✓ Label information can be documented in a readily available manner

FR 60, CC 12

63



Electrical Task Risk Assessment Check List				
Section A, Task Identification <i>(To Be Completed by the Initiator)</i>				
Facility:	Equipment:		Work Order No.:	
JHA No.:				
Task:				
Location:				
Submitter:	Submitter Signature:			Date:
Section B, General <i>(To be Completed by the Work Planner)</i>				
Mark "Y" or "N" as appropriate				
No.	Item	Yes	No	Instructions
1.	Is the equipment operating at 50 volts or more or is a shock hazard present?			If No, hazard analysis is not required. If Yes, proceed to Line 2.
2.	Is the required working distance available?			If Yes, proceed to Line 3. If No, do not proceed. Additional risk assessment is required before any work is performed.
3.	Is the working space is clear?			If Yes, proceed to Line 4. If No, do not proceed. Additional risk assessment is required before any work is performed.
4.	Was an incident energy analysis performed?			If Yes, proceed to Section C If No, proceed to Line 5
5.	Is the equipment properly installed and maintained and there is no evidence of impending failure?			If Yes, arc flash PPE may not be required if doors are, and will remain, closed and secured and if covers are, and will remain, secured in place. If No, arc flash PPE is required, proceed to Section C.
Planner:	Planner Signature:			Date:
Section C, Shock Information – All Methods <i>(To be Completed by Engineering if Unknown or Not Previously Analyzed)</i> <i>Section 130.4(D) and Tables 130.4(D)(a) or 130.4(D)(b) as applicable</i>				
6.	Voltage between phases: Limited Approach Boundary: Restricted Approach Boundary:			Establish the shock boundaries Proceed to Lines 7 and 8.
7.	Are rubber insulating gloves required for the task?			Proceed to Section D if an incident energy analysis has been or needs to be performed.
8.	Are insulated or insulating hand tools required for the task?			Proceed to Section E if using the Arc Flash PPE Category (Table) method.
Completed By:	Signature:			Date:



Section D, Arc Flash Information – Incident Energy Analysis Method (Default Method) (To Be Completed by Engineering if Unknown or Not Previously Analyzed)			
9.	Incident energy:	Working Distance:	Include at least one and establish the arc flash boundary. Working Distance must be provided with incident energy marking.
	Level of PPE		
	Minimum Arc-Rating of Clothing		
	Arc Flash Boundary		
Document No.:		Provide Engineering Evaluation or DAC Number and proceed to Section F.	
Completed By:	Signature:	Date:	
Section E, Arc Flash Information – Arc Flash PPE Category Method (To Be Completed by Engineering if Unknown or Not Previously Analyzed) Use Table 130.7(C)(15)(A)(b) or 130.7(C)(15)(B) as applicable			
10. Determine the available fault current and clearing times for the task.			
Available Fault Current:	Overcurrent Device Clearing Time:		
Mark "Y" or "N" as appropriate			
11.	Do the available fault current and clearing times for the task exceed the maximum allowed by Table 130.7(15)(A)(a) or 130.7(15)(B)?		If Yes, an incident energy analysis is required. Complete Section D. If No, proceed to Line 12
	Arc Flash Boundary		
12.	Arc Flash PPE Category	Working Distance	Establish the PPE Category & Working Distance Proceed to Section F
	Completed By:		Date:
Section F, Arc-rated Clothing and Other PPE Information – All methods (To Be Completed by Industrial Safety)			
13.	Minimum arc rating in cal/cm ² for protective clothing and other PPE	Establish the required arc-rated clothing and other PPE.	
14.	In the block to the left, list the required arc-rated clothing and other PPE. PPE Category Method: use 130.7(C)(16) & Table 130.7(C)(16) Incident Energy Analysis Method: Use Informative Annex H, H.3 (Tables H.3(a) & H.3(b))		
	Return to Initiator or Planner Upon Completion.		
Completed By:	Signature:	Date:	

Electrical Task Risk Assessment Form				
Section A, Task Identification (To Be Completed by the Initiator)				
Facility:	Electrical			
Work Order No.:	Equipment:			
Electrical Task:				
Location:				
Submitter:	Submitter Signature:	Date:		
Section B, General (To Be Completed by the Work Planner) Mark "Y" or "N" as appropriate				
No.	Item	Yes	No	Instructions
1.	Does the task result in the presence of a shock or arc flash hazard?			If No, hazard analysis is not required. If Yes, proceed to Line 2.
2.	Does Engineering Evaluation EVAL-DE-2013-0269 (Working on 120-240 VAC Energized Equipment) apply?			If No, proceed to Line 3. If Yes, use the applicable shock protection mitigation according to EVAL-DE-2013-0269.
3.	Is there an existing Engineering Evaluation that applies?			If Yes, use the incident energy and applicable boundary data according to the work location from the existing Evaluation. Proceed to Line 4.
4.	What is the available working space measured from the front of the equipment?	Please note any restrictions in the working space and proceed to Section C.		
Section C, Shock Information (To Be Completed by the Work Planner) NFPA 70E Section 130.4(D) and Tables 130.4(D)(a) or 130.4(D)(b) as applicable Mark "Y" or "N" as appropriate				
No.	Item	Yes	No	Instructions
5.	Will there be exposed live parts?			If Yes, proceed to line 6. If No, sign and submit to engineering.
6.	Will work be performed inside the restricted approach boundary?			If Yes, shock protection is required. Proceed to Line 7.
7.	Item	Instructions		
	Voltage between phases:	Establish the shock boundaries.		
	Limited Approach Boundary: Restricted Approach Boundary:	Sign and submit to engineering.		
Planner:	Planner Signature:	Date:		

Section D, Arc Flash Information – Incident Energy Analysis Method (To Be Completed by Engineering if Unknown or Not Previously Analyzed)			
	Item	Instructions	
8.	Incident energy:	Working Distance:	Establish the incident energy, working distance and arc flash boundary.
	Arc Flash Boundary:		
	Document No.:		Provide Engineering Evaluation or Design Analysis Calculation (DAC) Number.
Completed By:	Signature:	Date:	
Section E, Arc-rated Clothing and Other PPE Information (To Be Completed by Industrial Safety)			
	Item	Instructions	
9.	Minimum level for shock protection:		
10.	Minimum level of arc flash PPE required:	Establish the required arc-rated clothing and other PPE.	
Site-Specific PPE Levels			
11.	Level 0 (Less than or Equal to 1.2 cal/cm ² incident energy)	Level 2 (Greater than 1.2 cal/cm ² up to 8.0 cal/cm ² incident energy)	Level 4 (Greater than 8.0 cal/cm ² up to 40 cal/cm ² incident energy)
	Shirt (Long Sleeve) and Pants (Long) or Coveralls (made from non-melting fibers or untreated natural fibers)	Minimum 8 cal/cm ² Arc-rated Long Sleeve Shirt and Pants or Arc-rated Coveralls	Minimum 40 cal/cm ² Arc-rated Flash Suit Pants and Jacket FR Coveralls
	Protective Leather Footwear Safety Glasses Ear Canal Inserts Voltage-Rated Gloves with Leather Protectors or Heavy Duty Leather Gloves	Class E Hard Hat w/Arc-rated Wraparound Face Shields and Arc-rated Balaclava or Arc-rated Flash Suit Hood Protective Leather Footwear Safety Glasses Ear Canal Inserts Voltage-Rated Gloves w/Leather Protectors or Heavy Duty Leather Gloves	Class E Hard Hat w/Arc-rated Flash Suit Hood Protective Leather Footwear Safety Glasses Ear Canal Inserts Voltage-Rated Gloves w/Leather Protectors or Arc-Rated Gloves
JHA No.:			
Completed By:	Signature:	Date:	
Return to Initiator or Planner Upon Completion.			

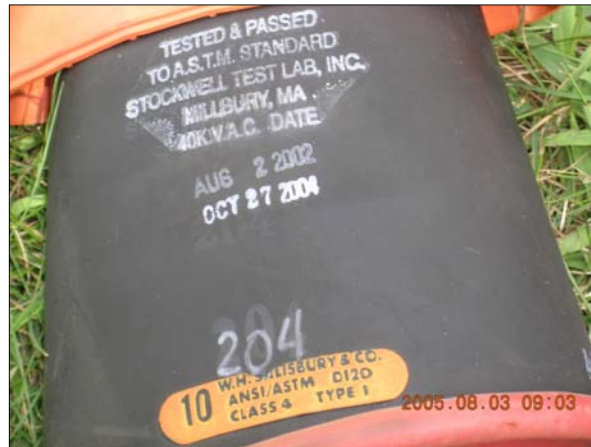
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Page 2 of 2

130.7(C) Personal and Other Protective Equipment

- Table 130.7(C)(7)(c) Rubber Insulating Equipment, Maximum Test Intervals
- * **New** insulating equipment is not permitted to be placed into service unless it has been electrically tested within the previous 12 months. Insulating equipment that has been issued for service is **not new** and is required to be retested in accordance with the intervals in this table.

Insulated Glove Testing



69



130.7(C) Personal and Other Protective Equipment

- Table 130.7(C)(15)(c) Personal Protective Equipment (PPE)
- (c) Other types of hearing protection are permitted to be used in lieu of or in addition to ear canal inserts provided they are worn under an arc-rated arc flash suit hood



FR 48, CC 15, PC 88, SR 35

70



130.7(C) Personal and Other Protective Equipment

- (E) Alerting Techniques
- (4) Cutting, Removing, or Rerouting of Conductors
- Where conductors are de-energized in order to cut, remove, or reroute them and conductor terminations are not within sight, ..., additional steps to verify absence of voltage or identify the conductors shall be taken prior to ...

✓ *Informational Note: Additional steps ...include, ... remotely spiking the conductors and pulling the conductors to visually verify movement. Nonshielded conductors could be additionally verified with a noncontact test instrument, and shielded conductors could be verified with devices to identify the conductors.*



Safety Requirements for Special Equipment

Chapter 3



Article 330 Safety-Related Work Practices for Use of Lasers

- Entire Article revised to better focus on **electrical** hazards.

FR 54, SR 51

(NL)

73



Article 330 Safety-Related Work Practices for Use of Lasers

- 330.2 Definitions
- Field Evaluated. A thorough evaluation of nonlisted or modified equipment in the field that is performed by persons or parties acceptable to the authority having jurisdiction. The evaluation approval ensures that the equipment meets appropriate codes and standards or is similarly found suitable for a specified purpose.

FR 54, SR 51

74



Article 330 Safety-Related Work Practices for Use of Lasers

- 330.5
- (F) Listing. Laser system electrical equipment shall be **listed or field evaluated** prior to use

FR 54, SR 51

(NL)

75



Article 340 Safety-Related Work Practices: Power Electronic Equipment

- ~~340.5 Effects of Electricity on the Human Body.~~
- The content of 340.5 is primarily informational in nature and more accurate information may be found in other scientific works

FR 55

76



Safety-Related Work Requirements Research and Development Laboratories

- ~~350.4 Specific Measures and Controls for Personnel~~ Electrical Safety Authority (ESA)
- Each laboratory or R&D system application shall be assigned ~~permitted~~ permitted to assign an ESA to ensure the use of appropriate electrical safety-related work practices and controls. ... permitted to be electrical safety committee, engineer, or equivalent qualified individual. ... ESA permitted to delegate authority to an individual or organization within their control.

FR 89, CC 18

(NL)

77



Safety-Related Work Requirements Research and Development Laboratories

- 350.4 Electrical Safety Authority (ESA), cont.
- (A) Responsibility.
 - ✓ The ESA shall act in a manner similar to an authority having jurisdiction for R&D electrical systems and electrical safe work practices.
- (B) Qualifications.
 - The ESA shall be competent in the following:
 - ✓ (1) The requirements of this standard
 - ✓ (2) Electrical system requirements applicable to the R&D laboratories

FR 89, CC 18

(NL)

78



Safety-Related Work Requirements Research and Development Laboratories

- 350.5 Specific Measures and Controls for Personnel Safety
- 350.6 Listing Approval Requirements
- 350.7 Custom Built, Non-Listed Research Equipment, <1000 V AC or DC
- 350.8 Custom Built, Unlisted Research Equipment, >1000 V AC or DC
- 350.9 Energy Thresholds (100 volts)
- 350.10 Establishing an Electrically Safe Work Condition

FR 89

(NL)

79



Informative Annex F Risk Assessment Procedure and Risk Control

- Completely revised
- F.2 Relationship to Occupational Health and Safety Management System (OHSMS)
- F.6
- Figure F.6 Example of a Qualitative Two-by-Two Risk Assessment Matrix

FR 64, SR 54, SR61

80



H.4 Conformity Assessment of Personal Protective Equipment

- Level 1 conformity - supplier or manufacturer self-declaration
-
- Level 2 conformity - ISO registered supplier or manufacturer self-declaration
-
- Level 3 conformity - ISO accredited independent third party certification - products have mark or label
-
- ANSI/ISEA – 125 detailed information ...on the conformity assessment levels...
ISEA@Safetyequipment.org

FR 71, PC 117, SR 55

81



PPE Conformity



Informative Annex K General Categories of Electrical Hazards

- Annex K has been updated to reflect current information and data for electrical shock and arc flash injuries

FR 72, SR 58

83



Informative Annex O Safety-Related Design Requirements

- O.2.3 Incident Energy Reduction Methods
- (8) Shunt-trip. Adding a shunt-trip that is signaled to open from an open-fuse relay to switches 800 amperes and greater reduces incident energy by opening the switch immediately when the first fuse opens. The reduced clearing time reduces incident energy. This is especially helpful for arcing currents that are not within the current-limiting threshold of the three current-limiting fuses

FR 73

84



Informative Annex O Safety-Related Design Requirements

• ~~O.2.4 Other Methods~~ Safety-by-Design Methods

- ✓ 1 finger-safe components - reduces exposure
- ✓ 2 disconnects within sight of each motor or driven machine
- ✓ 3 cable limiters - reduce the incident energy
- ✓ 4 inspection windows
- ✓ 5 single service disconnect – provides bus protection

FR 73 SR 59

85



NEW

• Informative Annex Q Human Performance and Workplace Electrical Safety

FR 74 SR 69

86



Thank You!

Questions?

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87

