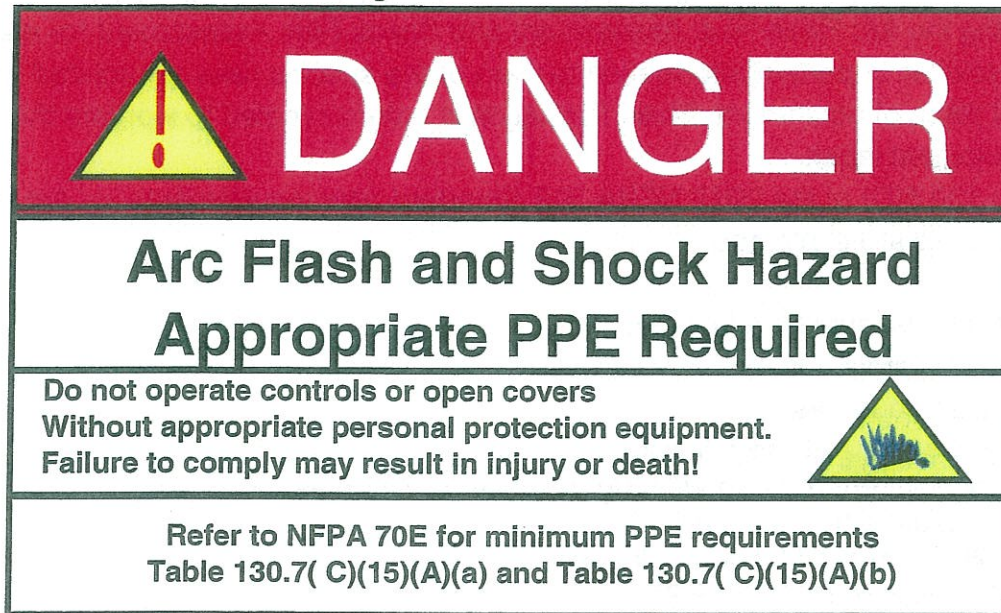


Sample Label



How do I determine what level of protection I need for my job task?

There are 2 basic methods that can be used to determine level of protection:

1. Table

- A. Refer to NFPA 70E-2015 Article 130, tables 130.4(D) (a) or (b) for shock risk assessment*
- B. 130.7(C) (15) (A) (b) or (B) for arc-flash assessment

2. Incident Energy Analysis

- A. Use an industry accepted software program
- B. Use a consulting firm to complete the risk assessment

*This method can only be used if the specific job task appears in table and meets the parameters listed. Otherwise, the incident energy must be calculated for that job task using Annex D or completing an incident energy analysis.

We recommend that when a District has major work performed on electrical main switch gear, included in RFP the electrical contractor complete the equipment labeling per NFPA 70 E 2015(See below).

NFPA 70 E 2015


Determining the Arc Flash Risk Assessment and Shock Risk Assessment for electrical devices provides important information to warn of the specific risks associated with an energized piece of equipment. This information is communicated to workers through the use of equipment labels.

In Section 130.5(D) of the 2015 NFPA 70E Standard new requirements for Arc Flash Warning Labels are explained.

Equipment labels must now include:

- Nominal system voltage
- Arc Flash boundary
- And at least one of the following:
 - Incident energy and working distance, or Arc Flash PPE Category, **but not both**
 - Minimum Arc Rating of clothing
 - Site specific level of PPE

Equipment Labels in compliance with the updated NFPA 70E would take this form:

 WARNING	
Arc Flash and Shock Hazard Appropriate PPE Required	
25.1 9 ft 7 in	Cal/cm² at 18 inches Flash Hazard Boundary
208 VAC 42 in 0 in	Nominal System Voltage Limited Approach Boundary Restricted Approach Boundary
Bus: MSB Prot.: Max Trip Time @ 2 sec.	
Equipment Name:	

2015 NFPA 70E Table 130.7(C)(15)(A)(a)

Table 130.7(C)(15)(A)(a) Arc Flash Hazard Identification for Alternating Current (ac) and Direct Current (dc) Systems

Task	Equipment Condition*	Arc Flash PPE Required
Reading a panel meter while operating a meter switch	Any	No
Normal operation of a circuit breaker (CB), switch, contactor or starter	All of the following: The equipment is properly installed The equipment is properly maintained All equipment doors are closed and secured All equipment covers are in place and secured There is no evidence of impending failure	No
	One or more of the following: The equipment is not properly installed The equipment is not properly maintained Equipment doors are open or not secured Equipment covers are off or not secured There is evidence of impending failure	Yes
For ac systems: Work on energized electrical conductors and circuit parts, including voltage testing	Any	Yes
For dc systems: Work on energized electrical conductors and circuit parts of series-connected battery cells, including voltage testing	Any	Yes
Voltage testing on individual battery cells or individual multi-cell units	All of the following: The equipment is properly installed The equipment is properly maintained Covers for all other equipment are in place and secured There is no evidence of impending failure	No
	One or more of the following: The equipment is not properly installed The equipment is not properly maintained Equipment doors are open or not secured Equipment covers are off or not secured There is evidence of impending failure	Yes
Removal or installation of CBs or switches	Any	Yes
Removal or installation of covers for equipment such as wireways, junction boxes, and cable trays that does not expose bare energized electrical conductors and circuit parts	All of the following: The equipment is properly installed The equipment is properly maintained There is no evidence of impending failure	No
	Any of the following: The equipment is not properly installed The equipment is not properly maintained There is evidence of impending failure	Yes
Removal of bolted covers (to expose bare energized electrical conductors and circuit parts). For dc systems, this includes bolted covers, such as battery terminal covers.	Any	Yes

2015 NFPA 70E Table 130.7(C)(15)(A)(a)

Table 130.7(C)(15)(A)(a) Arc Flash Hazard Identification for Alternating Current (ac) and Direct Current (dc) Systems		
Task	Equipment Condition*	Arc Flash PPE Required
Removal of battery intercell connector covers	All of the following: The equipment is properly installed The equipment is properly maintained Covers for all other equipment are in place and secure There is no evidence of impending failure	No
	One or more of the following: The equipment is not properly installed The equipment is not properly maintained Equipment doors are open or not secured Equipment covers are off or not secured There is evidence of impending failure	Yes
Opening hinged door(s) or cover(s) (to expose bare energized electrical conductors and circuit parts)	Any	Yes
Perform infrared thermography and other noncontact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers.	Any	No
Application of temporary protective grounding equipment after voltage test	Any	Yes
Work on control circuits with exposed electrical conductors and circuit parts, 120 volts or below without any other exposed energized equipment over 120 volts including opening of hinged covers to gain access	Any	No
Work on control circuits with exposed energized electrical conductors and circuit parts, greater than 120 V	Any	Yes
Insertion or removal (racking) of CBs or starters from cubicles, doors open or closed	Any	Yes
Insertion or removal of plug-in devices into or from busways	Any	Yes
Insulated cable examination with no manipulation of cable	Any	No
Insulated cable examination with manipulation of cable	Any	Yes
Work on exposed energized electrical conductors and circuit parts of equipment directly supplied by a panelboard or motor control center	Any	Yes
Insertion and removal of revenue meters (kW-hour at primary voltage and current)	Any	Yes
For dc systems, insertion or removal of individual cells or multi-cell units of a battery system in an enclosure	Any	Yes
For dc systems, insertion or removal of individual cells or multi-cell units of a battery system in an open rack	Any	No

2015 NFPA 70E Table 130.7(C)(15)(A)(a)

Table 130.7(C)(15)(A)(a) Arc Flash Hazard Identification for Alternating Current (ac) and Direct Current (dc) Systems		
Task	Equipment Condition*	Arc Flash PPE Required
For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack	Any	No
For dc systems, work on exposed energized electrical conductors and circuit parts or utilization equipment directly supplied by a dc source	Any	Yes
Arc-resistance switchgear Type 1 or 2 (for cleaning times of <0.5 sec with a prospective fault current not to exceed the arc-resistant rating of the equipment) and metal enclosed interrupter switchgear, fused or unfused of arc resistant type construction tested in accordance with IEEE C37.20.7: <ul style="list-style-type: none"> • Insertion or removal (racking) of CBs from cubicles • Insertion or removal (racking) of ground and test device • Insertion or removal (racking) of voltage transformers: on or off the bus 	All of the following: The equipment is properly installed The equipment is properly maintained All equipment doors are closed and secured All equipment covers are in place and secured There is no evidence of impending failure	No
	One or more of the following: The equipment is not properly installed The equipment is not properly maintained Equipment doors are open or not secured Equipment covers are off or not secured There is evidence of impending failure	Yes
Opening voltage transformer or control power transformer compartments	Any	Yes
Outdoor disconnect switch operation (hookstick operated) at 1 kV through 15 kV	Any	Yes
Outdoor disconnect switch operation (gang-operated, from grade) at 1 kV through 15 kV	Any	Yes
<p>Note: Hazard identification is one component of risk assessment. Risk assessment involves a determination of the likelihood of occurrence of an incident, resulting from a hazard that could cause injury or damage to health. The assessment of the likelihood of occurrence contained in this table does not cover every possible condition or situation. Where the table indicates that arc flash PPE is not required, an arc flash is not likely to occur.</p> <p>*The phrase <i>properly installed</i>, as used in this table, means that the equipment is installed in accordance with applicable industry codes and standards and the manufacturer's recommendations. The phrase <i>properly maintained</i>, as used in this table, means that the equipment has been maintained in accordance with the manufacturer's recommendations and applicable industry codes and standards. The phrase <i>evidence of impending failure</i>, as used in this table, means that there is evidence of arcing, overheating, loose or bound equipment parts, visible damage, deterioration, or other damage.</p>		

Table 130.7(C)(15)(A)(b)

Table 130.7(C)(15)(A)(b) Arc-Flash Hazard PPE Categories for Alternating Current (ac) Systems		
Equipment	Arc Flash PPE Category	Arc Flash Boundary
Panelboards or other equipment rated 240V and below Parameters: Maximum of 25 kA short-circuit current available; maximum of 0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)	1	485 mm (19 in.)
Panelboards or other equipment rated >240V and up to 600V Parameters: Maximum of 25 kA short-circuit current available; maximum 0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)	2	900 mm (3ft.)
600-V class motor control centers (MCCs) Parameters: Maximum of 65 kA short-circuit current available; maximum of 0.03 sec (2 cycles) fault clearing time; working distance 455 (18 in.)	2	1.5m (5 ft)
600-V class motor control centers (MCCs) Parameters: Maximum of 42 kA short-circuit current available; maximum of 0.33 sec (20 cycles) fault clearing time; working distance 455 mm (18 in.)	4	4.3 m (14 ft)
600-V class switchgear (with power circuit breakers or fused switches) and 600 V class switchboards Parameters: Maximum of 35 kA short-circuit current available; maximum of up to 0.5 sec (30 cycles) fault clearing time; working distance 455 mm (18 in.)	4	6 m (20 ft)
Other 600-V class (277 V through 600 V, nominal) equipment Parameters: Maximum of 65 kA short circuit current available; maximum of 0.03 sec (2 cycles) fault clearing time; working distance 455 mm (18 in.)	2	1.5 m (5 ft)
NEMA E2 (fused contactor) motor starters, 2.3 kV through 7.2 kV Parameters: Maximum of 35 kA short-circuit current available; maximum of up to 0.24 sec (15 cycles) fault clearing time; working distance 910 mm (36 in.)	4	12m (40 ft)
Metal-clad switchgear, 1 kV through 15 kV Parameters: Maximum of 35 kA sort-circuit current available; maximum of up to 0.24 sec (15 cycles) fault clearing time; working distance 910 mm (36 in.)	4	12m (40 ft)
Arc-resistant switchgear Type 1 or 2 [for clearing times of <0.5 sec (30 cycles) with a perspective fault current not to exceed the arc-resistant rating of the equipment], and metal-enclosed interrupter switchgear, fused or unfused of arc-resistant-type construction, tested in accordance with IEEE C37.20.7, 1 kV through 15 kV	N/A (doors closed)	N/A (doors closed)
Parameters: Maximum of 35 kA short-circuit current available; maximum of up to 0.24 sec (15 cycles) fault clearing time; working distance 910 mm (36 in.)	4 (doors open)	12 m (40 ft)
Other equipment 1 kV through 15 kV Parameters: Maximum of 35 kA short-circuit current available; maximum of up to 0.24 sec (15 cycles) fault clearing time; working distance 910 mm (36 in.)	4	12m (40 ft)
Note: for equipment rated 600 volts and below, and protected by upstream current-limiting fuses or current-limiting circuit breakers sized at 200 amperes or less, the arc flash PPE category can be reduced by one number but not below arc flash PPE category 1.		

Hazard/Risk Category
4 cal/cm²

1

Arc-rated long-sleeve shirt
Arc-rated pants or overall
Arc-rated face shield with hard hat
Safety glasses
Hearing protection
Leather & voltage rated gloves (as needed)
Leather work shoes



Hazard/Risk Category
8 cal/cm²

2

Arc-rated long-sleeve shirt
Arc-rated pants or overall
Arc-rated face shield & balaclava or
Arc flash suit with hard hat
Safety glasses, Hearing protection
Leather & voltage rated gloves (as needed)
Leather work shoes



Hazard/Risk Category
25 cal/cm²

3

Arc-rated long-sleeve jacket
Arc-rated pants
Arc-rated flash hood with hard hat
Safety glasses, Hearing protection
Leather & voltage rated gloves (as needed)
Leather work shoes



Hazard/Risk Category
40 cal/cm²

4

Arc-rated long-sleeve jacket
Arc-rated pants
Arc-rated flash hood with hard hat
Safety glasses, Hearing protection
Leather & voltage rated gloves (as needed)
Leather work shoes



Live Electrical Work Permit

Work Request (To be completed by the person requesting the review.)			
Work site location: (Building & room number)		Work order/project no.:	
Planned start date/time:		Planned end date/time:	
Description of the work to be performed:			
Equipment requested to be shut down: (specify how long)			
<input type="checkbox"/> Until work is complete <input type="checkbox"/> Temporarily, while barriers are being placed			
Requested by:	Signature:	Title:	Date:
Hazard Analysis (To be completed by the Electrically Qualified Persons doing the work.)			
Arc Flash Approach Boundaries:			
Determined by: __ Labels __ NFPA 70E Tables __ Voltage			
Arc Flash approach boundary-	_____ft _____in		
Limited approach boundary-	_____ft _____in <input type="checkbox"/> Work will be conducted within this boundary.		
Restricted approach boundary-	_____ft _____in <input type="checkbox"/> Work will be conducted within this boundary.		
System / Equipment Voltage	<input type="checkbox"/> 120 <input type="checkbox"/> 240 <input type="checkbox"/> 480 <input type="checkbox"/> 600 <input type="checkbox"/> _____		
Hazard/risk category for the task:	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4		
ATPV rating (in cal/cm ²) for FR clothing:	<input type="checkbox"/> 4 (Cat 1) <input type="checkbox"/> 8 (Cat 2) <input type="checkbox"/> 25 (Cat 3) <input type="checkbox"/> 40 (Cat 4)		
Additional personal protective equipment (PPE) required for each Hazard/risk (Category is listed on back.)			
Means employed to restrict the access of unqualified persons from the work area:	<input type="checkbox"/> Signs/tags <input type="checkbox"/> Barricades <input type="checkbox"/> Attendants		
Has a documented job briefing with detailed procedures been conducted?	<input type="checkbox"/> Yes, see attached <input type="checkbox"/> No		
Do you agree that the work described above can be done safely? (signatures required from two trained persons - <i>minimum</i>).	Electrically Qualified Person(s) 1) 2) 3) 4)	Date	
Justification for the live work request:	<input type="checkbox"/> Shut down creates an increased/additional hazard (specify): _____ _____ _____		
	<input type="checkbox"/> Shut down is infeasible due to design or operational limitations (specify): _____ _____		
The next available date for shutdown is:			
Request for energized electrical work:	Electrical qualified person:	Date:	
Proposed Energized Electrical Work Permit Review (To be completed by Management.)			
Proposed energized electrical work has been reviewed and approved by:		Supervisor:	Date:
		Safety Representative:	Date:
		General Manager:	Date: