

PERSONNEL PROTECTIVE EQUIPMENT MATRIX TABLE
(DATA FROM 2018 EDITIONS OF NFPA 70E TABLE 130.5(G) AND CSA Z462 TABLE 3)

Incident Energy Exposure	Protective Clothing and PPE	PPE Clothing Characteristics and Descriptions
<p>Equal to or Greater than 1.2 cal/cm² to 12 cal/cm²</p> <p>Arc-rated clothing and equipment with an arc rating equal to or greater than the incidental energy determined in the (IEEE 1584) arc flash risk assessment. (See note a)</p> <p>Other Personal Protective Equipment</p>	<p>Arc-rated long-sleeve shirt and Arc-rated pants (Note a) and/or Arc-rated coverall (Note a) and/or Arc-rated flash suit (SR) (Note a) Arc-rated face shield and arc-rated balaclava hood or arc flash suit hood (SR) (Note b) Arc-rated jacket, parka, or rainwear (AN)</p> <p>Hard hat Arc-rated hard hat liner (AN) Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Heavy-Duty Leather gloves or rubber insulation gloves with leather protectors (SR) (See Note c) Leather footwear</p>	<p>Arc-rated shirt and pants or arc-rated coverall or arc-rated flash suit</p>
<p>Greater than 12 cal/cm² to 40 cal/cm²</p> <p>Arc-rated Clothing and equipment with an arc rating equal to or greater than the incidental energy determined in the (IEEE 1584) arc flash risk assessment. (See Note a)</p> <p>Other Personal Protective Equipment</p>	<p>Arc-rated long-sleeve shirt and Arc-rated pants and/or Arc-rated coverall and/or Arc-rated flash suit (SR) Arc-rated flash suit hood (SR) Arc-rated gloves Arc-rated jacket, parka, or rainwear (AN)</p> <p>Hard hat Arc-rated hard hat liner (AN) Safety glasses or safety goggles (SR) Hearing protection (ear canal inserts) Arc-rated gloves or rubber insulating gloves with leather protectors (SR) (See Note c) Leather footwear</p>	<p>Arc-rated shirt and pants or arc-rated coverall or arc-rated flash suit</p>
<p>*Greater than 40 cal/cm²</p>	<p>Danger!</p> <p>*PowerStudies, Inc. does not recommend working or interacting with equipment in locations where the arc flash energy is greater than 40 cal/cm².</p>	

SR: Selection of one in group is required.

AN: As needed.

^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.

^b Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area are required by 130.7(C)(10)(c). Where the back of the head is inside the arc flash boundary, a balaclava or an arc flash hood shall be required for full head and neck protection.

^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, provide increased arc flash protection.

APPROACH BOUNDARIES TO ENERGIZED ELECTRICAL CONDUCTORS TABLE FOR AC SYSTEMS
(DATA FROM 2018 EDITIONS OF NFPA 70E TABLE 130.4 (D)(A) AND CSA Z462 TABLE 1A)

(1) Nominal System Voltage Range, Phase to Phase	(2) Limited Approach Boundary – Exposed Movable Conductor		(3) Limited Approach Boundary – Exposed Fixed Circuit Part		(4) Restricted Approach Boundary – Includes Inadvertent Movement Adder	
	Not Specified		Not Specified		Not Specified	
Less than 50	Not Specified		Not Specified		Not Specified	
50 to 300	10 ft 0 in.	3.0 m	3 ft 6in	1.0 m	Avoid Contact	
301 to 750	10 ft 0 in.	3.0 m	3 ft 6in.	1.0 m	1 ft 0 in.	0.3 m
751 to 15 kV	10 ft 0 in.	3.0 m	5 ft 0 in.	1.5 m	2 ft 2 in.	0.7 m
15.1 kV to 36 kV	10 ft 0 in.	3.0 m	6 ft 0 in.	1.8 m	2 ft 9 in.	0.8 m
36.1 kV to 46 kV	10 ft 0 in.	3.0 m	8 ft 0 in.	2.5 m	2 ft 9 in.	0.8 m
46.1 kV to 72.5 kV	10 ft 0 in.	3.0 m	8 ft 0 in	2.5 m	3 ft 6 in.	1 m
72.6 kV to 121 kV	10 ft 8 in.	3.3 m	8 ft 0 in.	2.5 m	3 ft 6 in.	1.0 m
138 kV to 145 kV	11 ft 0 in.	3.4 m	10 ft 0 in.	3.0 m	3 ft 10 in.	1.2 m
161 kV to 169 kV	11 ft 8 in.	3.6 m	11 ft 8 in.	3.6 m	4 ft 3 in.	1.3 m
230 kV to 242 kV	13 ft 0 in.	4.0 m	13 ft 0 in.	4.0 m	5 ft 8 in.	1.7 m
345 kV to 362 kV	15 ft 4 in.	4.7 m	15 ft 4 in.	4.7 m	9 ft 2 in.	2.8 m
500 kV to 550 kV	19 ft 0 in.	5.8 m	19 ft 0 in.	5.8 m	11 ft 8 in.	3.6 m
765 kV to 800 kV	23 ft 9 in.	7.2 m	23 ft 9 in.	7.2 m	15 ft 11 in.	4.9 m

Energized Electrical Equipment



RESTRICTED APPROACH BOUNDARY:
Only Qualified Persons wearing appropriate PPE for the Restricted Approach Boundary, as determined by the Shock Risk Assessment, may enter. Must have Energized Electrical Work Permit. (EEWP)

LIMITED APPROACH BOUNDARY:
An unqualified person MAY enter the Limited Approach Boundary, but ONLY if continuously escorted by a Qualified Person, and advised of the potential hazards. Both must be wearing appropriate PPE as determined by a Shock Risk Assessment.

ARC FLASH BOUNDARY:
Only Qualified Persons wearing appropriate PPE for the Arc Flash Boundary, as determined by the Incident Energy Risk Assessment, may enter.



Shock Protection Boundary* (Dependent on Voltage Magnitude)

Arc Flash Protection Boundary* (Dependent on Arc Flash Energy Magnitude)

WARNING

Arc Flash and Shock Hazard

11 Ft 5 In
33.0

Flash Hazard Boundary
cal/cm² Flash Hazard at 1 Ft 6 In
Arc Rated Clothing Required (See NFPA 70E-2018 Table 130.5(G) for additional PPE)

208 VAC
00

Shock Hazard when cover is removed
Glove Class

3 Ft 6 In
1 Ft 0 In

Limited Approach (Fixed Circuit)
Restricted Approach

11/15/2018 IEEE 1584-2018 & NFPA 70E-2018
Equipment: SWBD MSB2
Device: MSB2MAIN

Scenario 2 - 50% UTILITY Max Fault Current: 20.0 kA
Study Performed By PowerStudies, Inc. (253) 639-8535

Sample Arc Flash and Shock Hazard Label for NFPA 70E – 2018

PowerStudies INC.

- Electrical Safety Programs and Plans
- Arc Flash Hazard Assessments
- Protective Device Coordination
- Short Circuit Studies
- Harmonics and Load Flow Studies
- ...And More!

For more info, call us at 253-639-8535 or visit our website, www.powerstudies.com

* See Back for Shock Boundaries & Arc Flash PPE Tables

WARNING

Arc Flash and Shock Hazard

7 Ft 5 In
16.0

Flash Hazard Boundary
cal/cm² Flash Hazard at 1 Ft 6 In
Arc Rated Clothing Required (See CSA Z462-2018 Table 3 for additional PPE)

480 VAC
00

Shock Hazard when cover is removed
Glove Class

3 Ft 6 In
1 Ft 0 In

Limited Approach (Fixed Circuit)
Restricted Approach

IEEE 1584-2018 & CSA Z462-2018
Equipment: SWBD-SUB-M1 (SWBD SUB M1)
Device: 9 - TO SWBD-SUB-M1
Line Side: 10 - SWBD-SUB-M1 MAIN
Scenario 4 - ALL GENS - NORMAL MOTORS ON Max Fault Current: 66.0 kA
Study Performed By PowerStudies, Inc. (253) 639-8535

Sample Arc Flash and Shock Hazard Label for CSA Z462 – 2018