Appendix E: Arc-Flash PPE Categories for Direct Current (DC) Systems

NFPA 70E 2018 : Table 130.7 (C)(15)(b) – Arc-Flash PPE Categories for Direct Current (DC) Systems

Equipment	Arc-Flash PPE Category	Arc-Flash Boundary
Storage batteries. DC switchboards and other DC supply sources Parameters: Greater than or equal to 100 V and less than or equal to 250 V. Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)		
Available fault current less than 4 kA	2	900 mm (3ft)
Available fault current greater than or equal to 4 kA and less than 7 kA	2	1.3 m (4 ft)
Available fault current greater then or equal to 7 kA and less than 15 kA	3	1.8 m (6 ft)
Storage batteries, DC switchboards and other DC supply sources Parameters: Greater than 250 V and less than or equal to 600 V Maximum arc duration and minimum working distance: 2 sec @ 455 mm (18 in.)		
Available fault current less than 1.5 kA	2	900 mm (3 ft)
Available fault current greater than or equal to 1.5 kA and less than 3 kA	2	1.3 mm (4 ft)
Available fault current greater than or equal to 3 kA and less than 7 kA	3	1.8 mm (6 ft)
Available fault current greater than or equal to 7 kA and less than 10 kA	4	2.5 m (8 ft)

Notes:

(1) Apparel that can be expected to be exposed to electrolyte must meet both of the following conditions:

a. Be evaluated for electrolyte protection
Informational Note: ASTM 1296, *Standard Guide for Evaluating Chemical Protective Clothing,* contains information on evaluating apparel for protection from electrolyte.

b. Be arc-rated
Informational Note: ASTM F1891, *Standard Specifications for Arc Rated and Flame-Resistant Rainwear*, contains information on evaluating arc-rated apparel.

(2) A two-second arc duration is assumed if there is no overcurrent protective device (OCPD) or if the fault clearing time is known and is less than 2 seconds; an incident energy analysis could provide a more representative result.

Informational Note No. 1: When determining available fault current, the effects of cables and any other impedances in the circuit should be included. Power system modeling is the best method to determine the available short-circuit current at the point of the arc. Battery cell short-circuit current can be obtained from the battery manufacturer. See informative Annex D.5 for the basis for table values and alternative methods to determine DC incident energy. Methods should be used with good engineering judgement.

Informational Note No. 2: The methods for estimating the DC arc-flash incident energy that were used to determine the categories for this table are based on open-air incident energy calculations. Open-air calculations were used because many battery systems and other DC process systems are in open areas or rooms. If the specific task is within an enclosure, it would be prudent to consider additional PPE protection beyond the value shown in this table. Research with arc flash has shown a multiplier of as much as 3x for arc-in-a-box [508 mm (20 in.) cube] versus open air. Engineering judgment is necessary when reviewing the specific conditions of the equipment and task to be performed, including the dimensions of the enclosure and the working distance involved.