

Certification of Personal Protective Equipment for Work within the Limited Approach Boundary of Energized Equipment

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This exhibit is the personal protective equipment (PPE) required for working within the Limited Approach Boundary of energized equipment rated 50 volts and above.

In all cases, personal protective equipment (PPE) from analysis or arc flash calculations must be used as a minimum. In the absence of calculations, PPE from the table Hazard Risk Category Classifications (below) is required.

If the arc-flash incident energy is above 40 cal/cm², the task must not be performed until an electrically safe work condition exists (equipment is de-energized and Locked out/Tagged out).

Clothing Material Characteristics

Flame-resistant (FR) material, such as flame-retardant treated cotton, meta-aramid, para-aramid, and poly-benzimidazole (PBI) fibers provide thermal protection. These materials can ignite, but will not continue to burn after the ignition source is removed. FR fabrics can reduce burn injuries (but not eliminate them) during an arc flash exposure by providing a thermal barrier.

Synthetic materials, such as polyester, nylon, and synthetic-cotton blends will melt into the skin when exposed to high temperatures and aggravate the burn injury. Clothing made from synthetic materials such as acetate, nylon, polyester, either alone or in blends with cotton, should not be worn.

Clothing made from non-melting flammable natural materials, such as cotton and polyester-cotton, silk, wool, rayon, and nylon fabrics are flammable and will burn but will not melt on the skin causing further injury.

Hazard Risk Category Classifications			
Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panelboards rated 240 V and below	—	—	—
CB or fused switch operation with covers off	2	N	N

Remove/install CBs or fused switches	2	Y	Y
Removal of bolted covers (to expose bare, energized parts)	2	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Panelboards or Switchboards rated >240 V and up to 600 V (with molded case or insulated case circuit breakers)	—	—	—
CB or fused switch operation with covers off - less than or equal to 225 Amp	2	N	N
CB or fused switch operation with covers off - greater than 225 Amp	4	N	N
Work on energized parts, including voltage testing - less than or equal to 225 Amp	2*	Y	Y
Work on energized parts, including voltage testing - greater than 225 Amp	4	Y	Y
600-V Class Motor Control Centers (MCCs)	—	—	—
Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch or starter operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120 V exposed	4	Y	Y
Insertion or removal of individual starter "buckets" from MCC — Note 4	4	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
600 V Class Switchgear (with power circuit breakers or fused switches) - Notes 5 and 6	—	—	—
Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120 V exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles,	4	N	N

Insertion or removal (racking) of CBs from cubicles, doors closed – if within arc flash boundary	4	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Other 600 V Class Equipment (277 V through 600 V, nominal)	—	—	—
Lighting or small power transformers (600 V, less than or equal to 225 A)	—	—	—
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue meters (kW-hour, at primary voltage and current)	—	—	—
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	2	N	N
Miscellaneous equipment cover removal or installation	2	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV through 7.2 kV	—	—	—
Reading a panel meter while operating a meter switch	2	N	N
Contactor operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120 V, exposed	4	Y	Y
Insertion or removal (racking) of starters from cubicles, doors open	4	N	N
Insertion or removal (racking) of starters from cubicles, doors closed	4	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Metal Clad Switchgear, 1 kV and above	—	—	—

Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120 V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Opening voltage transformer or control power transformer compartments	4	N	N
Other Equipment 1 kV and above	—	—	—
Metal clad load interrupter switches, fused or unfused	—	—	—
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space Is this true?	4	Y	N
Insulated cable examination, in open area	2	Y	N
<p>Legend: V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done. V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done. 2* means that a double-layer switching hood or Salisbury Model AS1000FS Hard Hat with face shield and chin cup used with 10 cal/cm² AFHOOD 10 Nomex-Lenzing Balaclava/Racing hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of the table below. Y = yes (required) N = no (not required) Notes: 5. 35 kA short circuit current available, up to 0.5 second (30 cycle) fault clearing time. 6. For < 25 kA short circuit current available, the Hazard/Risk Category required may be reduced by</p>			

Protective Clothing and Personal Protective Equipment (PPE) Matrix	
Hazard/Risk Category	Protective Clothing and PPE
Hazard/Risk Category 0 Protective Clothing, Nonmelting or untreated natural fiber Minimum Arc Rating of N/A FR Protective equipment	Shirt (long sleeve) Pants (long) Safety glasses or safety goggles (SR) Hearing Protection (ear canal inserts) Leather gloves
Hazard/Risk Category 1 FR Clothing, Minimum Arc Rating of 4 FR Protective equipment	Arc-Rated long sleeve shirt Arc-Rated pants Arc-Rated coverall (Note 2) Arc-Rated face shield or arc flash suit hood Arc-rated jacket, parka, or rainwear (AN) Hard hat Safety glasses or Safety goggles (SR) Hearing protection (ear canal inserts) Leather gloves (Note 1) Leather work shoes (AN)
Hazard/Risk Category 2 FR Clothing, Minimum Arc Rating of 8 FR Protective equipment	Arc-Rated long sleeve shirt Arc-Rated pants Arc-Rated coverall (Note 2) Arc-Rated face shield or arc flash suit hood Arc-rated jacket, parka, or rainwear (AN) Hard hat Safety glasses or Safety goggles (SR) Hearing protection (ear canal inserts) Leather gloves (Note 1) Leather work shoes (AN)
Hazard/Risk Category 2* FR Clothing, Minimum Arc Rating of 8 FR Protective equipment	Arc-Rated long sleeve shirt Arc-Rated pants Arc-Rated coverall (Note 2) Arc-Rated face shield and balaclava (sock hood) or arc flash suit hood Arc-rated jacket, parka, or rainwear (AN)

	<p>Hard hat Safety glasses or Safety goggles (SR) Hearing protection (ear canal inserts) Leather gloves (Note 1) Leather work shoes (AN)</p>
<p>Hazard/Risk Category 3 FR Clothing, Minimum Arc Rating of 25</p> <p>FR Protective equipment</p>	<p>Arc-Rated long sleeve shirt (AR) (Note 3) Arc-Rated pants (AR) (Note 3) Arc-Rated coverall (AR) (Note 3) Arc-Rated arc flash suit jacket (Note 3) Arc-Rated arc flash suit pants (Note 3) Arc-Rated arc flash suit hood (Note 3) Arc-rated jacket, parka, or rainwear (AN)</p> <p>Hard hat FR hard hat liner (AR) Safety glasses or Safety goggles (SR) Hearing protection (ear canal inserts) Arc-rated gloves (Note 1) Leather work shoes (AN)</p>
<p>Hazard/Risk Category 4 FR Clothing, Minimum Arc Rating of 40</p> <p>FR Protective equipment</p>	<p>Arc-Rated long sleeve shirt (AR) (Note 4) Arc-Rated pants (AR) (Note 4) Arc-Rated coverall (AR) (Note 4) Arc-Rated arc flash suit jacket (Note 4) Arc-Rated arc flash suit pants (Note 4) Arc-Rated arc flash suit hood (Note 4) Arc-rated jacket, parka, or rainwear (AN) (Note 4)</p> <p>Hard hat FR hard hat liner (AR) Safety glasses or Safety goggles (SR) Hearing protection (ear canal inserts) Arc-rated gloves (Note 1) Leather work shoes (AN)</p>

AN = As needed

AR = As required

SR = Selection required

Notes:

1. If rubber insulating gloves with leather protectors are required additional leather or arc-rated gloves are not required.
2. Alternate is to use FR coveralls instead of FR shirt and FR pants.

3. An alternate is to use a total FR clothing system and hood, which shall have a minimum arc rating of 25.