

# ELECTRICAL SAFETY COMPLIANCE CHART

## FOR NFPA 70E AND CSA Z462

Energized work shall only be performed when permitted by 70E 130.2(A) / Z462 4.3.2.2. For tasks not listed or for power systems with greater than the assumed maximum short circuit current capacity or with longer than the assumed maximum fault clearing times, an arc flash hazard analysis shall be required in accordance with 70E 130.5 / Z462 4.3.5. This summary table is only for use by **QUALIFIED PERSONNEL** that have been trained in accordance with the most current version of NFPA 70E Articles 110, 120 and 130 / CSA Z462 Clause 4.

### Tasks Performed on Energized Equipment (600 volts or less): 70E 130.7(C)(15)(a) / Z462 Table 4A

| Table A Panelboards or Other Equipment Rated 240 V and Below <i>Note 1</i>   |       |   |
|--|-------|---|
| Perform infrared thermography and other non-contact inspections outside the restricted approach boundary   | LWG   | 0 |
| Circuit breaker (CB) or fused switch operation with covers on  | LWG   | 0 |
| CB or fused switch operation with covers off   | LWG   | 0 |
| Work on energized electrical conductors and circuit parts, including voltage testing   | IG/IT | 1 |
| Remove / Install CBs or fused switches   | IG/IT | 1 |
| Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)   | LWG   | 1 |
| Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)  | LWG   | 0 |
| Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the panelboard                | IG/IT | 1 |
| Table B Panelboards or Switchboards Rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) <i>Note 1</i>                 |       |   |
| Perform infrared thermography and other non-contact inspections outside  | LWG   | 1 |
| CB or fused switch operation with enclosure doors closed   | LWG   | 0 |
| CB or fused switch operation with covers off   | IG    | 1 |
| Work on energized electrical conductors and circuit parts, including voltage testing   | IG/IT | 2 |
| Remove/install CBs or fused switches   | IG/IT | 2 |
| Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)   | LWG   | 1 |
| Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)  | LWG   | 0 |
| Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the panelboard or switchboard | IG/IT | 2 |
| Table C Other 600 V Class (277 V through 600 V nominal) Equipment <i>Note 2 (except as indicated)</i>  |       |   |
| Lighting or small power transformers (600 V maximum)   |       |   |
| Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)   | LWG   | 2 |
| Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)  | LWG   | 1 |
| Application of safety grounds, after voltage test  | IG    | 2 |
| Work on energized electrical conductors and circuit parts, including voltage testing   | IG/IT | 2 |
| Revenue meters (kW-hour, at primary voltage and current) Insertion or removal  | IG    | 2 |
| Cable trough or tray cover removal or installation   | LWG   | 1 |
| Miscellaneous equipment cover removal or installation  | LWG   | 1 |
| Work on energized electrical conductors and circuit parts, including voltage testing   | IG/IT | 2 |
| Application of safety grounds, after voltage test  | IG    | 2 |
| Insertion or removal of plug-in devices into or from busways   | IG    | 2 |

| Table D 600 V Class Motor Control Centers (MCCs) <i>Note 2 (except as indicated)</i>  |       |   |
|---|-------|---|
| Perform infrared thermography and other non-contact inspections outside the restricted approach boundary  | LWG   | 1 |
| CB or fused switch or starter operation with enclosure doors closed   | LWG   | 0 |
| Reading a panel meter while operating a meter switch  | LWG   | 0 |
| CB or fused switch or starter operation with enclosure doors open   | LWG   | 1 |
| Work on energized electrical conductors and circuit parts, including voltage testing  | IG/IT | 2 |
| Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed   | IG/IT | 0 |
| Work on control circuits with energized electrical conductors and circuit parts 120 V or above, exposed   | IG/IT | 2 |
| Insertion or removal of individual starter "buckets" from MCC— <i>Note 3</i>  | IG    | 4 |
| Application of safety grounds, after voltage test   | IG    | 2 |
| Removal of bolted covers — <i>Note 3</i> (to expose bare, energized electrical conductors and circuit parts)                                    | LWG   | 4 |
| Opening hinged covers — <i>Note 3</i> (to expose bare, energized electrical conductors and circuit parts)                                       | LWG   | 1 |
| Work on energized electrical conductors and circuit parts of utilization equipment fed directly by a branch circuit of the motor control center | IG/IT | 2 |
| Table E 600 V Class Switchgear (with power circuit breakers or fused switches) <i>Note 4</i>  |       |   |
| Perform infrared thermography and other non-contact inspections outside the restricted approach boundary  | LWG   | 2 |
| CB or fused switch operation with enclosure doors closed  | LWG   | 0 |
| Reading a panel meter while operating a meter switch  | LWG   | 0 |
| CB or fused switch operation with enclosure doors open  | LWG   | 1 |
| Work on energized electrical conductors and circuit parts, including voltage testing  | IG/IT | 2 |
| Work on control circuits with energized electrical conductors and circuit parts 120 V or below, exposed   | IG/IT | 0 |
| Work on control circuits with energized electrical conductors and circuit parts 120 V or above, exposed   | IG/IT | 2 |
| Insertion or removal (racking) of CBs from cubicles, doors open or closed   | LWG   | 4 |
| Application of safety grounds, after voltage test   | IG    | 2 |
| Removal of bolted covers (to expose bare, energized electrical conductors and circuit parts)  | LWG   | 4 |
| Opening hinged covers (to expose bare, energized electrical conductors and circuit parts)   | LWG   | 2 |

| CLOTHING AND/OR EQUIPMENT<br>70E 130.7 (C)(16) / Z462 Table 5 | HRC | HRC | HRC | HRC | HRC |
|---|-----|-----|-----|-----|-----|
|   | 0   | 1   | 2   | 3   | 4   |
| Arc Thermal Protective Value in Cal/cm <sup>2</sup> (minimum) | 0   | 4   | 8   | 25  | 40  |
| Non-melting/untreated natural fiber long-sleeve shirt         | X   | --  | --  | --  | --  |
| Non-melting/untreated natural fiber long pants                | X   | --  | --  | --  | --  |
| Arc-rated long-sleeve shirt                                   | --  | X   | X   | X   | X   |
| Arc-rated pants   | --  | X   | X   | X   | X   |
| Arc-rated coverall  | --  | X   | X   | X   | X   |
| Arc-rated arc flash suit jacket                               | --  | X   | X   | X   | X   |
| Arc-rated arc flash suit pants                                | --  | X   | X   | X   | X   |
| Arc-rated arc flash suit hood                                 | --  | X   | X   | X   | X   |
| Arc-rated jacket, parka or rainwear                           | --  | AN  | AN  | AN  | AN  |
| Hard hat  | --  | X   | X   | X   | X   |
| Safety glasses or goggles                                     | X   | X   | X   | X   | X   |
| Hearing protection  | X   | X   | X   | X   | X   |
| Leather gloves  | AN  | X   | X   | X   | X   |
| Leather work shoes  | --  | X   | X   | X   | X   |

| Table X*<br>Hazard Risk Categories that are Known to be Extremely Dangerous   |       |    |
|---|-------|----|
| 480V Building Service Entrance Equipment  | IG/IT | 4+ |
| Equipment on 480V/secondary side of an Ind/Comm substation  | IG/IT | 4+ |
| All equipment on the load side of circuit breakers containing a short-time delay setting. Temporary removal of short time-delay is recommended. | IG/IT | 4+ |

**\*The above areas are known to commonly equal or exceed a HRC4; calculations should be done prior to energized work**

**NOTES: 70E 130.7(C)(16) / Z462 Table 5**

- Arc rating for garments is expressed in calories per centimeter squared (cal/cm<sup>2</sup>)
- When rubber insulating gloves (IG) with leather protectors are required by NFPA 70E 130.7(C)(15)(a) / CSA Z462 Table 4A, additional leather gloves or arc-rated gloves shall not be required.
- An alternate to arc rated shirts and pants in HRC 1 or HRC 2 is an arc rated coveralls with minimum of 4 cal/cm<sup>2</sup> for HRC 1 and minimum of 8 cal/cm<sup>2</sup> for HRC 2
- Face shields are required for HRC 1 (4 cal/cm<sup>2</sup>) and HRC 2 (8 cal/cm<sup>2</sup>) requires the use of balaclava/sock and wrap-around guarding to protect face, forehead, ears and neck with a minimum of 8 cal/cm<sup>2</sup>. Alternatively an appropriately arc-rated flash suit hood may be used.
- Minimum arc rating of 25 is required for HRC 3 which can be accomplished using a total FR clothing system [shirt and pants and/or coveralls and/or coat and pant] and hood.
- Minimum arc rating of 40 is required for HRC 4 which can be accomplished using a total FR clothing system [shirt and pants and/or coveralls and/or coat and pant] and hood.

**General Notes : (applicable to the tasks that are 600 volts or less)**

- Insulating rubber gloves are gloves rated for the maximum line-to-line voltage upon which work will be done.
- Insulated tools rated and tested for the maximum line-to-line voltage upon which work will be done, and are manufactured and tested in accordance with ASTM F1505 & CAN/ULC-D60900, Standard Specification for Insulated and Insulating Hand Tools: 1000VAC / 1500VDC
- For systems rated less than 1000 volts, the fault currents and upstream protective device clearing times are based on an 18 in. working distance.
- For equipment protected by upstream current limiting fuses with arcing fault current in their current limiting range (1/2 cycle fault clearing time or less), the hazard/risk category required may be reduced by one number.

**Specific Notes: (as referenced within the tables)**

- Max. of 25 kA short circuit current available; max. of 0.03 sec (2 cycle) fault clearing time: min. 18" working Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 19"
- Max. of 65 kA short circuit current available; max. of 0.03 sec (2 cycle) fault clearing time: min. 18" working Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 53"
- Max. of 42 kA short circuit current available; max. of 0.33 sec (20 cycle) fault clearing time: min. 18" working Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 165"
- Max. of 35 kA short circuit current available; max. of up to 0.5 sec (30 cycle) fault clearing time: min. 18" working Potential arc flash boundary with exposed energized conductors or circuit parts using above parameters: 233"

**Notes:**

- A complete **ARC FLASH HAZARD ANALYSIS** should be done, if fault clearing times vary from those described within the **Specific Notes**, rendering these tables alone **INSUFFICIENT**.
- IG/IT** indicates the required use of insulating rubber gloves, leather protectors & insulated tools.
- IG** indicates a requirement for the use of insulating rubber gloves and leather protectors.
- LWG** indicates a requirement of leather gloves.
- Hazard Risk Category (HRC) is defined in the last column, by one of five categories 0, 1, 2, 3 & 4 (0 being the least dangerous and 4 being the most dangerous)

