

Electrical Hazard Risk Matrix

Estimate of the likelihood of occurrence of an arc flash incident for ac and dc systems:

| | Work Task Description | Equipment Condition Note 1 | Likelihood of Occurrence Note 2 | EJHA Required? | EEWP Needed? |
|----|--|--------------------------------------|---|----------------|-----------------------------------|
| 1 | Reading a panel meter while operating a meter switch. | Any | No | No | No |
| 2 | Performing infrared thermography and other non-contact inspections outside the restricted approach boundary. This activity does not include opening of doors or covers. | Any | No | No | No |
| 3* | Working on control circuits with exposed energized electrical conductors and circuit parts, nominal 125 V ac or dc, or below without any other exposed energized equipment over nominal 125 V ac or dc, including opening of hinged covers to gain access. See Note 3 . | Any | No | No | No |
| 4 | Work on control circuits with exposed energized electrical conductors and circuit parts, greater than 120 volts ac or dc | Any | Yes | Yes | Depends on the specific work task |
| 5 | Examination of insulated cable with no manipulation of cable. | Any | No | No | No |
| 6 | For dc systems, maintenance on a single cell of a battery system or multi-cell units in an open rack. | Any | No | Yes | No |
| 7 | Operation of a circuit breaker or switch for the first time after installation or completion of work or maintenance in the equipment | Any | Yes | Yes | No |
| 8 | For ac systems, work on (e.g.physical alterations) energized electrical conductors and circuit parts, including electrical testing. | Any | Yes | Yes | Yes |
| 9 | For dc systems, working on energized electrical conductors and circuit parts of series-connected battery cells, including electrical testing. | Any | Yes | Yes | Yes |
| 10 | Diagnostic testing and trouble shooting | Any | Yes | Yes | No |

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|----|---|----------|-----|-----|-----------------------------------|
| 11 | Opening hinged door(s) or cover(s) or removal of bolted covers (to expose bare, energized electrical conductors and circuit parts). For dc systems, this includes bolted covers, such as battery terminals. | Any | Yes | Yes | No |
| 12 | Removal or installation of covers for equipment such as wire-ways, junction boxes, and cable trays that does not expose bare, energized electrical conductors, and circuit parts. | Normal | No | No | No |
| 13 | | Abnormal | Yes | Yes | Depends on the specific work task |
| 14 | Application of temporary protective grounding equipment, after voltage test | Any | Yes | Yes | No |
| 15 | Insertion or removal of individual starter buckets from energized MCC | Any | Yes | Yes | Yes |
| 16 | Insertion or removal (racking) of CBs, switches (e.g. – PT's) or starters from cubicles, doors open or closed | Normal | Yes | Yes | No |
| 17 | | Abnormal | Yes | Yes | Yes |
| 18 | Removal or installation of circuit breakers or switches (Physical alteration on energized circuit) | Any | Yes | Yes | Yes |
| 19 | Insertion or removal of plug-in devices into or from busways | Any | Yes | Yes | Yes |
| 20 | Insulated cable examination with manipulation of energized cable using documented cable handling procedures | Normal | No | No | No |
| 21 | | Abnormal | Yes | Yes | Depends on the specific work task |
| 22 | Work on exposed energized electrical conductors and circuit parts of equipment directly supplied by a panel-board or motor control center (e.g. repair or alteration) | Any | Yes | Yes | Yes |
| 23 | Revenue meters (kW-hour, at primary voltage and current)—insertion or removal | Any | Yes | Yes | Yes |
| 24 | Arc-resistant equipment with the doors closed and secured, and where the available fault current and fault clearing time does not exceed that of the arc-resistant rating of the equipment in one of the following conditions: · Insertion or removal of individual starter buckets | Normal | No | No | No |

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|----|--|--|-----|-----|-----------------------------------|
| 25 | <ul style="list-style-type: none"> · Insertion or removal (racking) of CBs from cubicles; · Insertion or removal (racking) of ground and test device; or · Insertion or removal (racking) of voltage transformers on or off the bus | Abnormal | Yes | Yes | Yes |
| 26 | Opening voltage transformer or control power transformer compartments | Any | Yes | Yes | Depends on the specific work task |
| 27 | For dc systems, working on exposed energized electrical conductors and circuit parts of utilization equipment directly supplied by a dc source. | Any | Yes | Yes | Yes |
| 28 | Outdoor disconnect switch operation (hook-stick operated) at 1 kV through 230 kV | Outside restricted approach and arc flash boundary | Yes | Yes | No |
| 29 | | Within the restricted approach or arc flash boundary | Yes | Yes | Yes |
| 30 | Outdoor disconnect switch operation (gang-operated, from grade) at 1 kV through 230 kV | Normal | Yes | Yes | No |
| 31 | | Abnormal | Yes | Yes | Yes |
| 32 | Opening a panelboard hinged door or cover to access dead front overcurrent devices. | Normal | No | No | No |
| 33 | | Abnormal | Yes | Yes | Depends on the specific work task |
| 34 | Removal of battery nonconductive inter-cell connector covers. | Normal | No | No | No |
| 35 | | Abnormal | Yes | Yes | No |
| 36 | Insertion or removal of connector covers or battery intercell connector(s). | Any | Yes | Yes | No |

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|------------------------|---|------------------|-----|-----|-----------------------------------|
| 37 | Voltage testing on individual battery cells or individual multi-cell units. | Normal | No | No | No |
| 38 | | Abnormal | Yes | Yes | Depends on the specific condition |
| 39 | Operation of a CB, switch, contactor or starter. | Normal | No | No | No |
| 40 | | Abnormal | Yes | Yes | Depends on the specific condition |
| 41 | Maintenance and testing on individual battery cells or individual multi-cell units in an open rack. | Normal | No | Yes | No |
| 42 | | Abnormal | Yes | Yes | Yes |
| 43 | Insertion or removal of individual cells or multi-cell units of a battery system in an open rack. *Example: Batteries arcing, leaking or smoking | Normal | Yes | Yes | No |
| 44 | | *Abnormal | Yes | Yes | Yes |
| Mosaic Examples | | | | | |
| 45 | Operation of an Enclosed 15 kV disconnect switch | Normal | No | No | No |
| 46 | | Abnormal | Yes | Yes | Yes |
| 47 | Moving energized typical mining trailing cables | *Normal | No | No | No |
| 48 | *Note: Applicable when following required cable handling procedure. | Abnormal | Yes | Yes | Yes |
| 49 | Resetting overloads with door open with exposed energized conductor | Any | Yes | Yes | No |
| 50* | Changing light bulb while circuit is energized at 277V/480V. See Note 3. | Any | Yes | No | No |
| 51 | Commissioning on live circuits | Any | Yes | Yes | Depends on the specific work task |
| 52 | Phasing circuits – Low Voltage | Any | Yes | Yes | No |
| 53 | Phasing circuits – High Voltage | Any | Yes | Yes | Depends on the specific work task |
| 54 | Changing out mobile equipment or starting batteries | Any | No | No | No |

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Note 1: Equipment condition considered to be “Normal” if all of the following circumstances apply:

- 1) The equipment is properly installed in accordance with the manufacturer’s recommendations and applicable industry codes and standards.
- 2) The equipment is properly maintained in accordance with the manufacturer’s recommendations and applicable industry codes and standards.
- 3) The equipment is used in accordance with instructions included in the listing and labeling and in accordance with manufacturer’s instructions.
- 4) Equipment doors are closed and secured.
- 5) Equipment covers are in place and secured.

There is no evidence of impending failure such as arcing, overheating, loose or bound equipment parts, visible damage, or deterioration

Note 2: The two components of risk are the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard. Risk assessment is an overall process that involves estimating both the likelihood of occurrence and severity to determine if additional protective measures are required. The estimate of the likelihood of occurrence contained in this table does not cover every possible condition or situation, nor does it address severity of injury or damage to health. Where this table identifies “No” as an estimate of likelihood of occurrence, it means that an arc flash incident is not likely to occur. Where this table identifies “Yes” as an estimate of likelihood of occurrence, it means that additional protective measures are required to be selected and implemented according to the hierarchy of risk control.

***Note 3:** This is an exception to 30 volt AC and 50 volt DC definition of energized work. Qualified workers are allowed specific work task above these voltages as stated in the noted line items: 4 and 50.