

## 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 <b>Note 1</b>	Likelihood of Occurrence <b>Note 2</b>	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 <b>Note 3</b> .	Any	No	No	No
4	Work on control circuits with exposed energized electrical conductors and circuit parts, greater than <b>120 volts</b> 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, <b>work on (e.g.physical alterations)</b> energized electrical conductors and circuit parts, including electrical testing.	Any	Yes	Yes	Yes
9	For dc systems, <b>working on</b> 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 ( <b>Physical alteration on energized circuit</b> )	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	<b>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:</b> · Insertion or removal of individual starter buckets	Normal	No	No	No

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25	<ul style="list-style-type: none"> <li>· Insertion or removal (racking) of CBs from cubicles;</li> <li>· Insertion or removal (racking) of ground and test device; or</li> <li>· Insertion or removal (racking) of voltage transformers on or off the bus</li> </ul>	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. <b>*Example: Batteries arcing, leaking or smoking</b>	Normal	Yes	Yes	No
44		<b>*Abnormal</b>	Yes	Yes	Yes
	Mosaic Examples				
45	Operation of an Enclosed15 kV disconnect switch	Normal	No	No	No
46		Abnormal	Yes	Yes	Yes
47	Moving energized typical mining trailing cables	<b>*Normal</b>	No	No	No
48	<b>*Note: Applicable when following required cable handling procedure.</b>	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 <b>Note 3.</b>	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.