

# ELECTRICAL MAINTENANCE

Critical Design, Operation and Maintenance Checklist



			Yes	No	Don't know	
<b>1-1 DESIGN</b>						
1-1.1	Probabilistic Risk Assessment and Design	1-1.1.1	Has a probabilistic risk assessment (PRA) analysis been performed for the facility? How do the results (predicted failure frequency and outage duration) compare with comparable facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.1.2	Does the facility have and adhere to a design guide/criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.1.3	Are the results of PRA studies routinely used to assess and compare alternative plans for system improvement or retrofit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.1.4	Is there a program in place that ensures the PRA is updated when system or utility supply changes are made?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.1.5	Does system design provide redundancy so all critical equipment can be maintained without a shutdown? Does the design conform to Tier IV criteria per Uptime Institute standards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.1.6	Does the system comply with NFPA 70 (National Electrical Code)? Is all equipment approved per 110.2 and 110.3?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1-1.2	Documentation	1-1.2.1	Do updated as-built drawings exist and are they readily available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.2.2	Are all relevant equipment instruction manuals readily available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.2.3	Is there a process in place that ensures the manuals and drawings are maintained in a current condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1-1.3	Power Quality	1-1.3.1	Is there a load monitoring program in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.3.2	Is there a power quality monitoring program in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.3.3	Is there a process in place that takes appropriate action when overloads or power quality problems develop?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1-1.4	Protective Devices	1-1.4.1	Are the short circuit and coordination studies up to date?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.4.2	Have protective devices been tested/checked to verify performance per study?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1-1.5	Arc Flash	1-1.5.1	Has all electrical equipment been included in the arc flash risk assessment and labeled per NEC 110.16 and NFPA 70E 130.5(D)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.5.2	Is there a procedure in place as required by NFPA 70E 130.5 to assure arc flash risk assessments are updated at least every five years or when system or utility supply changes are made?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		1-1.5.3	Do labels on equipment and at hazardous areas include the type, name/ID, incident energy at working distances, flash protection boundary, hazard/risk category, shock protection information, date of analysis, and the certifying person per NFPA 70E 130.5(D)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# ELECTRICAL MAINTENANCE

			Yes	No	Don't know	
<b>2-1 OPERATIONS</b>						
2-1.1	Work Processes	2-1.1.1	Is there an effective work control process in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.2	Is there an effective training program in place that ensures all participants (employees, contractors, vendors, etc.) are thoroughly familiar with the purpose for and requirements of the work control process?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.3	Does the work control process ensure thorough scripting of each work plan (and review by all involved or potentially affected parties) prior to scheduling of the work?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.4	Does the plan provide for an alternate or recovery plan if failure or other unplanned consequence occurs during the work plan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.5	Is the process effective? Does the process ensure the script is exactly followed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.6	Is there a periodic review (audit) of completed work scripts to identify any lessons learned?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.1.7	Is there a process in place that ensures lessons learned are used to effectively improve operations, facility design, maintenance procedures and personnel training programs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2-1.2	Safety	2-1.2.1	Are electrical work procedures included in the safety manual?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.2.2	Is there a formal and active program for updating the safety manual?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.2.3	Are accidents and near-misses documented and is there a process in place that ensures actions will be taken to update procedures or take other corrective action?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.2.4	Are workers trained on safety manual procedures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.2.5	Do workers comply with manual procedures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.2.6	Is there a periodic audit of workers to confirm compliance with safety manual procedures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2-1.3	Training	2-1.3.1	Is there a formal technical training program in place?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.3.2	Do training records exist?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.3.3	Is there a process in place that ensures training records are maintained in an up to date condition?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.3.4	Is there a process in place that identifies and arranges for needed training?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.3.5	Is there a process in place that ensures the training program is periodically reviewed to identify needed changes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		2-1.3.6	Is there a process in place that ensures personnel have the proper test/monitoring equipment and that it is periodically calibrated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

			Yes	No	Don't know	
<b>3-1 MAINTENANCE</b>						
3-1.1	Event Management Program	3-1.1.1	Are all facility maintenance and operations personnel aware of the real dollar cost of an unplanned outage?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.1.2	Is there a program that defines, documents and trends all unplanned outages and unusual operational events (equipment failures, false alarms, emergency evacuations, and mistakes that produce unplanned consequence)? Is this data periodically compared with data from comparable facilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.1.3	Is there a program in place that ensures root cause is determined for each such unusual event, unplanned shutdown and equipment failure?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.1.4	Is there a process in place that ensures root cause information is used to effectively improve operations, facility design, maintenance procedures and personnel training programs to avoid or minimize future unplanned consequence?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3-1.2	Emergency Response System	3-1.2.1	Do electrical maintenance personnel have an emergency repair plan that identifies or lists the critical electrical equipment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.2.2	Does the plan have emergency phone numbers for management, employees, contractors, repair shops and suppliers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.2.3	Is there a documented identification, control and inventory process for spare parts?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.2.4	Is there a process in place that ensures the spare parts inventory is updated when new equipment is installed or other changes are made to the facility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3-1.3	Electrical Preventive Maintenance Program	3-1.3.1	Is there a documented maintenance program and does it have a valid basis (RCM, NETA, NFPA, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.2	Is the program being followed rigorously?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.3	Is there a procedure in place that updates the program based on changes to plant equipment or processes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.4	Is electrical equipment being maintained per NFPA 70E 205.3?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.5	Is overcurrent protective equipment being maintained and is the maintenance testing being documented as required by NFPA 70E 205.4?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.6	Does the program ensure that maintenance test results are trended, and used to update and improve the maintenance program?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		3-1.3.7	Is there a program in place that ensures periodic evaluation of possible equipment replacement, considering: Maintenance data trends? Availability or obsolescence of replacement parts? Unplanned shutdown costs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Summary**

Electrical power is the pulse of your facility. It's vital to your operations, but can also be dangerous and costly. When your electrical assets fail, profits and people can suffer. By using this checklist, you will better understand if your electrical system is designed to operate safely and efficiently, and if you have a maintenance program in place that ensures reliability.

At Vertiv™, we offer the most complete solutions for electrical system reliability and safety, along with unparalleled industry expertise you can trust. From testing for problems that could disable your system, to complete turnaround execution, you'll quickly understand how we are your single source solution.

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**NOTES**

