Only qualified and properly trained persons may work on electric circuit parts or equipment. Such persons shall be capable of working safely and shall be familiar with the proper use of special precautionary techniques, PPE, insulating and shielding materials, and insulated tools. Electrical panels and equipment need to be de-energized prior to being serviced following proper lockout/tag out procedures, whenever possible. If it is not possible to de-energize the electrical panel or equipment, proper safety procedures must be in place following NFPA 70E: Standard for Electrical Safety in the Workplace.

ALWAYS READ AND FOLLOW INSTRUCTION MANUALS AND SAFETY WARNINGS.

This program and checklist does not purport to set forth all hazards nor to indicate that other hazards do not exist. They are intended for the purpose of assisting you in loss control and safety procedures. These recommendations do not guarantee compliance with local, State or Federal regulations. Neither Hortica nor any of its employees shall be liable in any manner for any personal injury, bodily injury, property damage or loss of any kind arising from or connected with this program or checklist. No responsibility for implementation, management, or operation of loss control and safety procedures is assumed by Hortica.
Hazard Identification: Electrical Preventive Maintenance (EPM) Program

Electrical related fires are a common occurrence. Property damage and/or physical injuries due to electrical fires can be devastating. Every year, electrical fires result in hundreds of deaths, thousands of injuries and hundreds of millions of dollars in property damage. While some fires are caused by faulty products, many more are caused by the misuse and poor maintenance of electrical equipment, incorrectly installed wiring, overloaded circuits and misapplied extension cords.

Electrical equipment deterioration is normal and equipment failure is inevitable. However, equipment failure can be delayed through appropriate electrical preventive maintenance. In addition to normal deterioration, other potential causes of equipment degradation can be detected and corrected through EPM. Among these are load charges or additions, circuit alterations, improperly set or improperly selected protective devices, and changing voltage conditions.
An effective Electrical Preventive Maintenance Program should consist of the following essentials elements:

- Management commitment
- Responsible and qualified personnel – employee training
- Regularly scheduled inspection
- Survey and analysis of electrical equipment and systems to determine maintenance requirements and priorities
- Programmed routine inspections and suitable test
- Accurate analysis of the inspection so proper corrective measures can be prescribed
- Performance of necessary work
- Concise but complete records
- Evaluation of repairs and failures to predict future problem areas
- Inventory of spare parts for critical components

During the development of your plan, you should take these basic steps:

- Compile a listing of all equipment and systems
- Determine which equipment and system are most critical
- Develop a system for monitoring
- Determine the internal and/or external personnel needed to implement and maintain the EPM Program
- Develop a Contingency Plan to deal with outages, equipment failures, etc.

An electrical distribution system is typically comprised of a network of circuits, including wiring, circuit breakers, fuses and possibly transformers. The electrical distribution equipment should be periodically thermally imaged as well as physically inspected. This inspection should include:

**Hazard Identification**

- Switchgear, switchboards, and panel boards
- Circuit breakers
- Fuses
- Disconnect switches
- Contactors and relays
- Protective relays
- Fans, motors and motor controls
- Busway and bus duct circuit breakers
- Transformers (if outdoor, it may be owned and the responsibility of the utility company)
Please keep an eye out for

- Corroded wiring, deteriorated wiring and deteriorated sheathing
- Frequently blown or tripped fuses and circuits
- Hot spots

Other areas

- Lighting
  - Unprotected light bulbs can be hit and broken, and may create sparks, potentially causing a fire.
  - Flickering or dimming lights may indicate a short in the wiring, dangerous arcing, or an over-extension of the electrical systems.
  - Multiple dimmed lights can also be a symptom of an overloaded circuit.

- Extension Cords
  - Check for missing prongs
  - Damaged cords
  - Overload
  - Spliced or unprotected
  - Running through walls and ceilings
  - Self-inspection program of extension cords
  - Replace, not repair, damaged cords
  - Minimize use through installation of permanent wiring
  - Use GFCI adapters in wet areas

Housekeeping

Good housekeeping greatly reduces fire risks. When electrical distribution equipment is in a separate dedicated room, the room should be temperature-controlled, well ventilated, clean, and dry to prevent moisture and excessive room temperatures that can degrade electrical materials. Additionally, keeping the room properly sealed will keep it free of dirt, dust, rodents, and pesky bugs that can get into the cabinets and degrade the equipment and potentially start a fire.

It is also important to keep combustible material away from electrical distribution systems. Keep in mind that electricity can arc or jump through the air as a path to the ground and ignite combustible material in the vicinity.

Implementing an effective EPM Program will provide tangible and intangible benefits including improved safety, lower repair cost and less equipment downtime. Additionally, as part of an established written Electrical Safety Program, OSHA’s Lockout/Tagout Standard Operating Procedures should be consistently followed by employees and contractors to help ensure personal safety.
**ELECTRICAL PREVENTIVE MAINTENANCE CHECKLIST**

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<th>COMPONENT</th>
<th>ITEM #</th>
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Responsible for the Inspection: ________________________________________________________________

Date of Inspection:_____/_____/______
ELECTRICAL PREVENTIVE MAINTENANCE CHECKLIST

Electrical equipment room #:______________

Check
1  Access door is marked and in working order
2  Free of excessive dust, dirt and debris
3  No storage. Clearance of at least 36 inches from panels
4  Adequate lighting
5  Free of water or potential sources of water
6  Check for burning or “ozone” odors
7  Room is well ventilated

Recommendations
- Vacuum the panels and room to remove dust, dirt and debris
- Wipe down with lint free rags and solvents if needed, nonflammable solvents only
- Check for signs of moisture or contamination
- If present, check that windows are in working order
- Verify that surface mounted wiring is labeled UF-B, UV resistant and is located in areas not subject to abrasion or physical damage
- For conduit wiring, verify Schedule 40 PVC is used and wire is for wet locations i.e. THWN.
- Verify that electrical raceways and cable trays are used exclusively for electrical conductors
ELECTRICAL PREVENTIVE MAINTENANCE CHECKLIST

Electrical Panel #: __________

Check

8  Panel doors in working order
9  Front panel is present and no open slots are present
10 Free of excessive dust and dirt
11 Seal and gaskets are installed
12 All the wiring is reaching completely into the box and properly secured
13 No punch-out missing
14 All the breakers are labeled
15 If present, check for heater elements
16 If present, check for fans
17 Check for arc flash protection warning signs
18 Check for identification of disconnecting means and circuit directories for panelboards, switchboards, switchgears and similar equipment

Switchgears (Insulators, Supports and Connectors)

19 Check for signs of cracking, broken pieces or any sign of physical damage
20 Free of dirt and debris
21 Check for evidence of moisture
22 Check for evidence of tracking, arching or overheating
23 Check for bolts and connecting devices for signs of physical damage
24 Ensure bolts have proper tightness
25 If present, copper and aluminum conductors, check for galvanic action
26 Check for insulation: deterioration, cracking, flaking or overheating
27 Inspect for missing parts

Recommendations

• If exposed to the environment, increase the frequency or maintenance
• Clean all ceramic materials
• Vacuum dirt and debris
• Exercise circuit breakers annually
• Bi-annual interior inspection/cleaning of distribution panels by licensed electrician
ELECTRICAL PREVENTIVE MAINTENANCE CHECKLIST

Battery Station/Chargers # ________________________

**Batteries**
28 Battery surface clean of dust and dirt accumulation
29 Check for all terminals and connections being tight and clean
30 Check for corrosion on battery terminals
31 Check for stranded cables, corroded or separated
32 Check electrolyte levels and specific gravity.

**Charger**
33 Free of dirt and debris
34 Check for terminal connections
35 Check that all relays, lights, and other indicating devices are working properly

**Recommendations**
Batteries emit explosive gases while charging, allow no open flames or sparks
Battery room should be ventilated using a “rated” fan
No smoking should be permitted

Electric Motor # ____________________________________

**Electric Motors**
36 Check for damage caused by dirt, loose parts or foreign objects
37 Check air inlets are not blocked
38 Check for evidence of moisture and/or dirt build-up
39 Check for unusual noises, leaking seals or high vibration
40 If present, check oil level gages
41 Check for degradation of foundation, bed plates, anchor bolts
42 If present, check for oil ring turning
43 Check for evidence of leaking oil and water from piping and connections
44 Check for scheduled lubrication according to manufacturer's instructions
45 For critical motors, check bearings daily using a stethoscope or infrared scanner (or camera, if appropriate)
46 Check bearing surface temperature with a thermometer, electronic temperature sensing devices, or stick-on temperature indicating labels
47 Check belt tension; belts should have about 1 in. of play; sheaves should be seated firmly with little or no play
## ELECTRICAL PREVENTIVE MAINTENANCE CHECKLIST

**Additional Check**

| 48 | Verify that wiring methods are securely fastened in place, supported independently |
| 49 | Verify that boxes are installed at junction, splice, outlet, switch, and pull points |
| 50 | Identify wet and damp locations and the suitability of boxes and fittings |
| 51 | Verify that cabinets or cutout boxes are suitable and properly installed in any wet or damp locations |
| 52 | Verify that cables are secured to cabinets and cutout boxes or that the conditions for cables with nonmetallic sheaths are met |
| 53 | Verify that any switches in wet locations are properly installed in waterproof enclosures |
| 54 | Verify that the point of attachment for an overhead service drop is adequate and will provide minimum clearances |
| 55 | Verify that GFCI protection is provided for receptacles in bathrooms, near sinks, outdoors, on rooftops, indoor wet areas, outdoor areas and in garages |
| 56 | Check transformer installations for adequate ventilation and spacing from walls and obstructions |
| 57 | Periodic transformer oil testing |