

ELECTRICAL

Electrical incidents can cause serious injury, including burns, shock or death. In addition, they can cause fires and damage equipment. It is important not only for employees to work safely around electricity, but also to make sure electrical equipment is sound and used in the correct manner.



ELECTRICAL

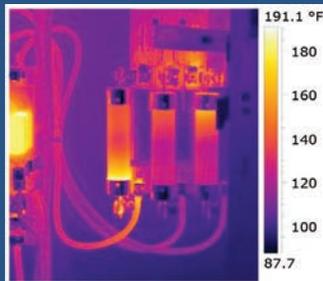


ELECTRICAL WORK

- Ensure that all equipment is de-energized and properly locked out prior to beginning work. Any equipment should be verified with appropriate test equipment to ensure that hazardous energy has been eliminated. Nearby equipment may still be energized; those working on electrical systems should identify energized and de-energized lines near the work area with which they could come in contact. See Chapter 31, Lock Out/Tag Out for more information.
- A shock risk assessment should be conducted on new or existing electrical equipment prior to conducting work. This assessment should identify hazards, estimate the likelihood of shock and determine any necessary personal protective equipment requirements. The results of the assessment should be documented.
- Be aware of the risk of arc flashes. An arc flash is an unplanned electrical discharge passing between conductors or from a conductor to ground resulting in an explosive effect capable of ejecting heated gases or molten metal fragments in an area around the flash.
- An arc flash risk assessment should be conducted prior to work on electrical equipment. This assessment should identify hazards, estimate the likelihood of occurrence and potential injuries, and determine any necessary personal protective equipment requirements. The results of the assessment should be documented.
- Establish safe working boundaries and prevent others from entering. Arc flashes can cover a wide area depending on the current and voltage. Nonqualified persons should be trained to avoid approaching energized equipment during maintenance.

Infrared Thermography

Consideration should be given to having an infrared thermography survey performed on electrical equipment. This survey can uncover abnormal or



unexpected thermal patterns that can indicate a problem with the equipment. Caught early, these issues can often be repaired at a cost much less than if repaired after the equipment fails. More information about infrared surveys can be obtained by calling the HSB Inspection Hot Line toll free at **1.800.333.4677**.

- When working with electrical equipment, use insulated or nonconductive tools to reduce the risk of arc flashes and electric shock.
- Use appropriate personal protective equipment for the work being done. This may include arc-rated clothing, gloves, insulated tools, arc-rated face shields or balaclavas and hearing protection.

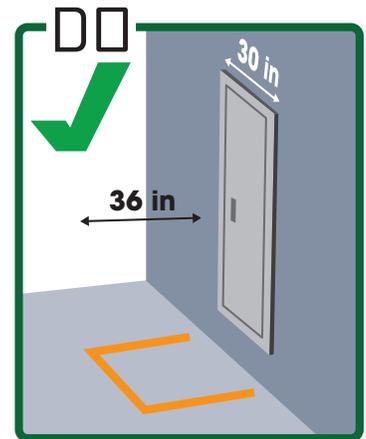
QUALIFIED ELECTRICAL WORK

Under Minnesota Department of Labor and Industry rules, electrical work must only be done by individuals appropriately licensed or by a qualified and registered maintenance electrician supervised by a responsible master electrician who either works for or is contracted by the individual's organization.

More information regarding electrical work within the scope of a maintenance electrician and the supervision requirements of the responsible master electrician, are provided in the "Licensing Requirements for Employees Performing Electrical Maintenance Work on an Employer's Premises" from the Minnesota Department of Labor and Industry (DLL.mn.gov).

ELECTRICAL PANELS

- The electrical breaker panel should be easily accessible at all times in the event of emergency. A clear space of not less than 36 inches deep and 30 inches wide (or the width of the electrical equipment, whichever is greater) should be maintained. One method of maintaining this clear space is either to tape or paint a stripe on the floor around the electrical panel to mark the above dimensions. There should also be a clear, direct path to the panel.
- The panel should have a closed cover. The panel cover should be able to open at least 90 degrees without obstruction.
- The panel should have an index identifying each individual circuit breaker. The labels should be



Maintain minimum clear space around electrical breaker panels.

legible and easily understood. This index is typically found on the inside face of the cover.

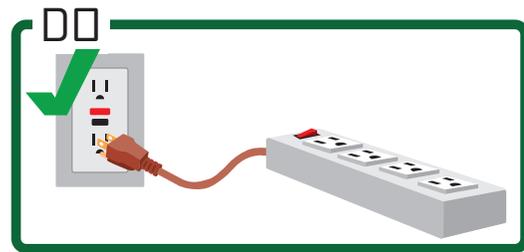
- There should be no other openings or missing knock-out plugs on the panel box that would allow contact with the inside wiring.
- There should be no missing breakers or other openings in the faceplate that would allow contact with panel wiring.
- When tripping or resetting breakers, employees should face away from the panel and trip the breaker with an outstretched arm. While arc flashes are rare, this precaution helps mitigate potential injury.
- If the electrical panel has not been inspected in the past 10 years, it would be prudent to have a certified electrician check the equipment to ensure that circuit breakers, fuses and switch gears have no corrosion, evidence of arcing, excess wear or damage.

EMERGENCY DISCONNECTS

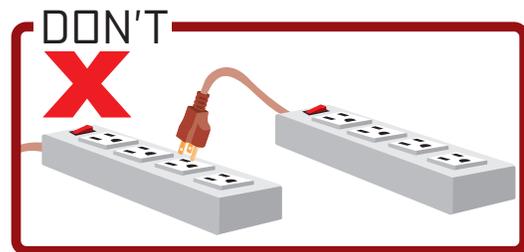
- Access to emergency disconnects must remain clear and accessible for people to disconnect the power in the event of an emergency. A best practice would be to maintain a clear area 36 inches in front of and 30 inches wide around the disconnect switch (similar to electrical panels).
- Avoid hanging objects on disconnect switches; switches must be clearly visible.
- Disconnect switches should be capable of accepting a lock to lock out a piece of equipment properly.

OUTLETS

- Outlet receptacles should show no signs of electrical burns or other damage. They should be secure in their electrical box and fully covered with a faceplate to protect against accidental contact with a “hot” wire.
- Outlets should be GFCI (ground fault circuit interrupter protected) if located near water or a water source. The Occupational Safety and Health Administration (OSHA) requires GFCI protection in bathrooms, rooftops and other locations where water may pose a danger when using equipment plugged into the outlet. A GFCI-protected outlet or circuit quickly opens the circuit, cutting power, when a minute change of current difference is detected. GFCI outlets should be tested periodically.
- Outdoor outlets should be protected against water by being equipped with a splash-proof cover.



Plug power strips into wall outlet.



Do not plug power strips into each other.

EXTENSION CORDS/POWER CORDS/POWER STRIPS

- All power strips or extension cords should be plugged directly into fixed outlets and not into each other. Plugging power strips, surge protectors or extension cords into one another, known as daisy chaining, increases the risk of fires or power shorts by overloading the equipment.
- Extension cords are to be used for temporary work only. They are not meant to be used as a permanent source of electricity. If an extension cord is required, it should not be in place for more than 90 days.
- Use extension cords that are the correct size or rating for the equipment. The diameter of the extension cord should be the same or greater than the cord of the equipment in use.
- Avoid using residential extension cords or power strips in public entity buildings.
- Only use electrical cords rated for outdoor use when using a cord outside.
- Keep electrical cords away from areas where they may be pinched and areas where they may pose a tripping or fire hazard.
- Only use electrical cords with the grounding pin (round prong below two flat prongs on a plug) intact. The grounding pin should never be removed.
- Electrical cords should be inspected before use to ensure that insulation is not cut or damaged. Discard damaged cords, cords that become hot or cords with exposed wiring.
- Extension cords that are 12 gauge or larger may be repaired only if spliced so that the splice retains



the insulation, outer sheath properties and usage characteristics of the cord being spliced.

- Do not unplug an electrical cord by pulling on the cord; pull on the plug.
- Consider using a cord strain relief device on areas of the cord that are under tension.
- Extension cords should be UL or another nationally recognized testing laboratory approved for their intended uses.
- When fans and other appliances are used on or near wet floors, ensure that they have grounded power cords in good condition.

TROUBLE LIGHTS

Using trouble lights to illuminate work under gas-powered vehicles or equipment can present several fire hazards. Leaking fuel vapors may accumulate in high concentrations in an unventilated service pit and ignite with a spark generated when an electric cord is plugged into or unplugged from a receptacle on the trouble light itself. A spark caused by an

arc of a light's metal shield contacting the vehicle's electrical system could also ignite fuel vapors. Fires can be caused by flammable liquid dripping onto a hot incandescent bulb.

To mitigate these fire exposures, trouble lights used under vehicles should include the following features:

- Enclosed light bulb
- Nonmetallic shield
- Nonsparking electrical switches
- No outlet receptacles

Further safety rules and regulations regarding electrical equipment can primarily be found in OSHA Electrical Standards 29 CFR1910.303, Electrical, General; 29 CFR1910.304, Wiring Design and Protection; 29 CFR1910.305, Wiring Methods, Components and Equipment for General Use; and Minnesota Department of Labor and Industry publication "Licensing Requirements for Employees Performing Electrical Maintenance Work on an Employer's Premises."

Equipment Breakdown

It is better to prevent failures from happening in electrical equipment than to have a breakdown. Hartford Steam Boiler, the provider of MCIT members' equipment breakdown coverage, details the common causes of equipment breakdowns and how that affects the bottom line in its pamphlet *Common Equipment Failures and Causes*, available through MCIT loss control consultants at **1.866.547.6516** or at MunichRe.com/HSB.





ELECTRICAL CHECK LIST

ITEM	YES	NO	ACTION ITEM
Electrical Work			
Are employees working on electrical equipment trained, licensed and authorized?			
Are electrical devices de-energized and locked out prior to maintenance per lock out/tag out instructions?			
Are these conditions verified with appropriate testing equipment and are other nearby energy sources tested that employees could contact?			
Has a shock risk assessment been conducted and documented on the electrical equipment prior to conducting work?			
Are employees working on electrical equipment aware of the risks of arc flashes?			
Are appropriate boundaries established when the risk of arc flash is present?			
Is staff trained not to cross the barrier without authorization and appropriate protective equipment?			
Are tools insulated or nonconductive when working on electrical equipment or systems?			
Is the appropriate personal protective equipment available for use when working on electrical equipment or components?			
Electrical Panels			
Is the area in front of electrical panels clear of materials to a distance of 36 inches and 30 inches wide or the width of the panel, whichever is greater, while maintaining a clear, direct path to the panel?			
Does the panel have a closed cover?			
Does the panel identify each breaker with its corresponding coverage area?			
Is the panel free of openings exposing electrical components? This includes missing breakers or knock out plugs.			
Emergency Disconnects			
Are electrical disconnect switches and the area around them clear and unobstructed?			
Are emergency disconnects free of hanging objects?			



ELECTRICAL CHECK LIST CONTINUED

Outlets			
Are outlets free of damage and fully covered with a secure faceplate?			
Are other electrical enclosures, e.g., junction boxes and switches, covered with tight-fitting plates?			
Are outlets within 6 feet of water sources or in wet areas GFCI protected?			
Are outdoor and wash bay outlets GFCI protected and equipped with splash-proof covers?			
Are all GFCI-protected outlets tested periodically?			
Electrical Cords/Power Strips			
Are extension cords or power strips plugged into fixed outlets, rather than into each other?			
Are extension cords used for temporary work only (not in place longer than 90 days, not attached permanently)?			
Are extension cords approved by UL or another nationally recognized testing laboratory and rated for their intended uses?			
Are electrical cords stored in a neat, orderly manner and is care taken not to pose a tripping hazard?			
Are electrical cords free of pinching or crushing hazards?			
Are electrical cords free of damage caused by doors, equipment, vehicles?			
Are electrical cords free of damage?			
Are plug grounding pins intact?			
Trouble Lights			
Are trouble lights used under vehicles equipped with a nonmetallic shield, nonsparking electrical switch, enclosed light bulb and without an electrical outlet?			