



ADMINISTRATIVE PRACTICES MANUAL

SAFETY MANUAL – ELECTRICAL SAFETY:

1.0 Scope and Application

The purpose of this policy is to establish safe work practices that are intended to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts when work is performed near or on equipment or circuits which are or may be energized. This policy applies to both “Qualified” employees and “Unqualified” employees who are working on, near, or with electrical installations defined below. This policy complies with Chapter SPS 332 (Public Employee Safety and Health) of the Wisconsin Administrative code as promulgated by the Wisconsin Department of Safety and Professional Services and 29 CFR 1910.302 through 1910.335 (Electrical Safety), including 1910.137 (Electrical Protective Devices) and 1910.269 (Electrical Generation, Transmission and Distribution) as promulgated by the U.S. Occupational Safety and Health Administration.

2.0 Responsibilities

Risk Management: Support and management of this policy.

Department Heads: Implementation of policy. Will ensure training of Assistant Department Head.

Assistant Dept. Head: Identification and location of hazardous electrical exposures and equipment, employee training and selection and use of personal protective equipment.

Supervisors: Ensure policy is adhered to by all employees.

Employees: Follow requirements contained in this policy.

All employees are responsible for complying with the requirements contained in this policy. Failure to abide by these requirements may subject the employee to disciplinary action, up to and including discharge.

3.0 Departmental Policies and Requirements

This policy represents minimum electrical safety requirements. Department Heads may develop more specific procedures to be followed in their respective departments.

4.0 Definitions

Qualified Person: An employee who is permitted to work on or near exposed energized parts after having met the training requirements established below. Qualified persons must be capable of working safely on energized circuits and must be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

Unqualified Person: An employee, such as a custodian or building engineer, whose work may cause them to come into close contact with an energized component, such as a fuse box, but who are not allowed to perform work on or near an energized part or piece of equipment.

5.0 Training

Qualified Employees:



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All qualified employees and any employee working with or exposed to 50 volts or more shall be trained in the following topics prior to their assignment and whenever facility electrical conditions change. Department Heads shall ensure this training is received and documented.

- The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.
- The skills and techniques necessary to determine the nominal voltage of exposed live parts, and
- The clearance distances specified in 29 CFR Part 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.
- The proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

Unqualified Employees:

Unqualified employees shall be instructed prior to their assignment in safety related work procedures necessary for them to protect themselves from electrical hazards (e.g. resetting of a circuit breaker, etc.). Supervisors shall ensure this instruction is received and documented.

6.0 Documentation Requirements

Written certification of training and instruction record.

7.0 General Requirements

- a) No County employee shall be authorized to work on energized components of an electrical system except specifically authorized and qualified employees who have been designated in this policy.
- b) Work activities and authorizations for qualified employees are restricted to the use of voltage meters to determine if voltage is being supplied to the equipment being tested. In these instances, test meters shall be properly insulated and under no condition shall they be used on systems in excess of 120 volts AC.

8.0 Work On Or Near Exposed De-energized Parts

a) Live parts to which any employee may be exposed will be de-energized by following the County's lockout procedure before any employee works on or near them, unless de-energizing will introduce additional or increased hazards or is not feasible due to equipment design or operational limitations. In cases where de-energizing cannot be accomplished, employees will be instructed by supervision to stay clear of the area and Supervisors will ensure that appropriate safeguards (e.g. locking doors, barricading) are put in place to ensure that employees keep away from the area. Live parts that operate at less than 50 volts to ground need not be de-energized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

- Examples of increased or additional hazards include deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.
- Examples of work that may be performed on or near energized circuit parts because of infeasibility due to equipment design or operational limitations include testing of electric circuits that can only be performed with the circuit energized and work on circuits that form



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an integral part of a continuous process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment. In these cases, such work is limited to systems of no more than 120 volts AC.

- b) Whenever any employee is exposed to contact with parts of fixed electric equipment or circuits that have been de-energized, the circuits energizing the parts will be properly locked out as per the County's lockout policy.
- c) Safe procedures for de-energizing circuits and equipment will be determined before circuits or equipment are de-energized. These procedures are required to be developed as per the County's lockout policy.
- d) The circuits and equipment to be worked on will be disconnected from all electric energy sources. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means for de-energizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout procedures.
- e) Stored electric energy that might endanger personnel will be released before starting work. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel.
- f) Stored non-electrical energy in devices that could reenergize electric circuit parts will be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.
- g) No work will be performed on or near de-energized live parts, circuits or equipment until their de-energized condition has been verified. Verification of the de-energized condition will be made as follows:
 - A qualified person will operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
 - A qualified person will use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and will verify that the circuit elements and equipment parts are de-energized.
 - The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been de-energized and presumed to be safe.
- h) Before any circuit or equipment is reenergized (even temporarily) the following requirements will be met in the order listed:
 - a. A qualified person will conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.
 - b. Employees exposed to the hazards associated with reenergizing the circuit or equipment will be warned to stay clear of circuits and equipment.
 - c. Each lock will be removed by the employee who applied it or under his or her direct supervision.
 - d. If that employee is absent from the workplace, then the lock may be removed provided that it is certain that the employee who applied the lock is not available at the workplace, and that employee is made aware that the lock has been removed before he or she resumes work as per the County's lockout policy.
 - e. There will be a visual determination that all employees are clear of the circuits and equipment.

9.0 Work On Or Near Exposed Energized Parts

In those cases where the exposed live parts are not de-energized, either because of increased or additional hazards or because of infeasibility due to equipment design or operational limitations,



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other safety-related work practices must be used to protect employees who may be exposed to the electrical hazards involved. The work practices used must protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object or where employees are near enough to be exposed to any hazard they present.

- a) Only qualified persons may work on electric circuit parts or equipment that, has not been de-energized. This work is limited to systems of no more than 120 volts AC. These employees must be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.
- b) Whenever any type of work is to be performed near overhead lines, the lines will be de-energized and grounded, or other protective measures will be provided before work is started. When overhead lines are to be de-energized, arrangements to de-energize and ground them will be made with the organization that operates or controls the electrical circuits involved. When protective measures are provided such as guarding, isolating, or insulating, those precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment. Only electrical utility employees or their contractors will be permitted to install insulating devices on overhead power transmission or distribution lines.
- c) Whenever an unqualified employee is working in an elevated position near overhead lines (e.g. aerial lift), the location will be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:
 - For voltages to ground 50,000 volts (50kV) or below - 10ft.(305cm);
 - For voltages to ground over 50kV - 10 ft. (305cm) plus 4 inches (10 cm) for every 10kV over 50kV.
- d) Whenever an unqualified employee is working on the ground in the vicinity of overhead lines, the person may not bring any conductive object closer to unguarded, energized overhead lines than the distances given above.
- e) For voltages normally encountered with overhead power lines, objects which do not have an insulating rating for the voltage involved are considered to be conductive. For example, a wooden rake handle that does not have an insulating rating is considered to be a conductive object.
- f) Whenever any person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than that shown Table 1 below unless:
 - The person is insulated from the energized part. Gloves, with sleeves if necessary, rated for the voltage involved, are considered to be insulation of the person from the energized part on which work is performed, or
 - The energized part is insulated both from all other conductive objects at a different potential and from the person, or
 - The person is insulated from all conductive objects at a potential different from that of the energized part.



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Table 1
Minimum Safe Approach Distances

Voltage Range (Phase to Phase)	Minimum Approach Distance
300V and less	Avoid Contact
Over 300V, not over 750V	1 ft. 0 in. (30.5 cm)
Over 750V, not over 2kV	1 ft. 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm)
Over 87.5kV, not over 121kV	4 ft. 0 in. (122 cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm)

- g) Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines will be operated so that a minimum clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance will be increased a minimum of 4 inches (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:
- h) Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless:
- The employee is using protective equipment rated for the voltage; or
 - The equipment is located so that no un-insulated part its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in paragraph number 12 (see above).
- i) If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding will not stand at the grounding location whenever there is a possibility of overhead line contact.
- j) Additional precautions, such as the use of barricades or insulation, will be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents that can develop within the first few feet or more outward from the grounding point.
- k) Qualified employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the qualified employee to perform the work safely.
- l) Where lack of illumination or an obstruction precludes observation of the work to be performed, qualified employees may not perform tasks near exposed energized parts.
- m) Employees must not reach blindly into areas which may contain energized parts.
- n) Whenever a qualified employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, he/she must be provided with, and will use, protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with those parts.
- o) Doors, hinged panels, and the like that are present in any confined or enclosed space will be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts.



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- p) Conductive materials and equipment that are in contact with any part of an employees body will be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts.
- q) Whenever an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, appropriate work practices (such as the use of insulation, guarding and material handling techniques) shall be instituted which will minimize the hazard.
- r) Only wooden ladders or ladders with nonconductive side rails will be used in situations where the employee or ladder could contact exposed energized parts.
- s) Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, metal belt buckles, metal rimmed glasses, keychains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts. However, such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means.
- t) Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at such close distances to the parts that there is a possibility of contact, unless adequate safeguards (such as insulating equipment) are provided.
- u) Electrically conductive cleaning materials (including conductive solids such as steel wool, metalized cloth, and silicon carbide, as well as conductive liquid solutions) may not be used in proximity to energized parts unless appropriate procedures are followed that will prevent electrical contact.
- v) Only a qualified person following the requirements of the procedures set forth in this section of the policy may defeat an electrical safety interlock (limited to 120 volts AC) and then only temporarily while he or she is working on the equipment.
- w) The interlock system will be returned to its operable condition when such work is completed.

10.0 Portable Electric Equipment

- a) All cord- and plug- connected electric equipment, flexible cord sets (extension cords), and portable electric equipment will be handled in a manner that will not cause damage.
- b) Flexible electric cords connected to equipment may not be used for raising or lowering the equipment.
- c) Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.
- d) Portable cord- and plug- connected equipment and flexible cord sets (extension cords) shall be visually inspected before use and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). However, cord- and plug- connected equipment and flexible cord sets (extension cords) which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.
- e) If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item will be removed from service, and no employee may use it until necessary repair and tests have been made to render the equipment safe.
- f) Whenever an attachment plug is to be connected to a receptacle (including any on a cord set), the relationship of the plug and receptacle contacts will first be checked to ensure that they are of proper mating configurations.
- g) A flexible cord used with grounding-type equipment will contain an equipment grounding conductor.
- h) Attachment plugs and receptacles may not be connected or altered In a manner that would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, those devices may not be altered to allow the grounding



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pole of a plug to be inserted into slots intended for connection to the current carrying conductors.

- i) Adapters that interrupt the continuity of the equipment grounding connection may not be used.
- j) Portable electric equipment and flexible cords used in highly conductive work locations (such as those inundated with water or other conductive liquids), or in job locations where employees are likely to contact water or conductive liquids,
- k) Employees' hands may not be wet when plugging and unplugging flexible cords and cord and plug-connected equipment, if energized equipment is involved.
- l) Energized plug and receptacle connections may be handled only with insulating protective equipment if the condition of the connection could provide a conducting path to the employees hand (if, for example, a cord connector is wet from being immersed in water).
- m) Locking-type connectors will be properly secured after connection.

11.0 Electric Power And Lighting Circuits

- a) Load rated switches, circuit breakers, or other devices specifically designed as disconnecting means will be used for the routine opening, reversing, or closing of circuits under load conditions.
- b) Cable connectors not of the load-break type, fuses, terminal lugs, and cable splice connections may not be used for such purposes, except in an emergency.
- c) After a circuit is de-energized by a circuit protective device, the circuit may not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. However, when it can be determined from the design of the circuit and the overcurrent devices involved that the automatic operating of a device was caused by an overload connected equipment is needed before the circuit is reenergized.
- d) Repetitive manual reclosing of circuit breakers or reenergizing circuits through replaced fuses is prohibited. Such a condition would indicate an electrical problem and a qualified outside contractor should be contacted.
 - 1. Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed by the OSHA standard regulating the installation safety requirements for overcurrent protection (See 29 CFR 1910.304(e)).

12.0 Test Instruments And Equipment

- a) Only qualified persons may perform testing work on electric circuits or equipment.
- b) Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors will be visually inspected for external defects and damage before the equipment is used. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item will be removed from service, and no employee may use the item until necessary repairs and tests to render the equipment safe have been made.
- c) Test instruments and equipment and their accessories will be insulated and rated for the circuits and equipment to which they will be connected and will be designed for the environment in which they will be used.

13.0 Flammable Or Ignitable Materials

- a) In those situations where flammable materials are present only occasionally, electric equipment capable of igniting them will not be used, unless measures are taken to prevent hazardous conditions from developing. Flammable materials include, but are not limited to: flammable gases, vapors, or liquids; combustible dust and ignitable fibers or filings.



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- b) In those situations where flammable vapors, liquids or gases, or combustible dusts or fibers are (or may be) present on a regular basis, the electrical installation requirements contained in the OSHA standard regulating hazardous locations must be observed (See 29 CFR 1910.307).

14.0 Personal Protection Safeguards

- a) Employees working in areas where there are potential electrical hazards will be provided with, and will use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed. This equipment may include rubber protective equipment such as insulating gloves, blankets, hoods, line hose, sleeves, and matting for use around electric apparatus.
- b) Protective equipment will be maintained in a safe, reliable condition and will be periodically inspected and/or tested.
- c) If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected. For example, an outer covering of leather can be used for the protection of rubber insulating material.
- d) Employees will wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.
- e) Employees will wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.
- f) When working near exposed energized conductors or circuit parts, each employee will use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts. If the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material will be protected.
- g) Fuse handling equipment, insulated for the circuit voltage, will be used to remove or install fuses when the fuse terminals are energized.
- h) Ropes and hand lines used near exposed energized parts shall be nonconductive.
- i) Protective shields, protective barriers, or insulating materials will be used to protect each employee from shock, burns, or other electrically related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur.
- j) When normally enclosed live parts are exposed for maintenance or repair, they will be guarded to protect unqualified persons from contact with their live parts.
- k) Alerting techniques will be used to warn and protect employees from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts as follows:
- Safety Signs and Tags: Safety signs, safety symbols, or accident prevention tags will be used where necessary to warn employees about electrical hazards which may endanger them.
 - Barricades: Barricades will be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to un-insulated energized conductors or circuit parts. Conductive barricades may not be used where they might cause an electrical contact hazard.
 - Attendants: If signs and barricades do not provide sufficient warning and protection from electrical hazards, an Attendant will be stationed to warn and protect employees.

END POLICY