City of Hendersonville, NC
Electrical Safety Work Practices
In compliance with: 29 CFR 1910.331-335

I. Purpose

Safety-related work practices shall be employed by the City of Hendersonville to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards. The content of this Electrical Safe Work Practice is as required in OSHA Subpart S (electrical) 29CFR 1910.331-335.

This program covers the servicing and maintenance of machines and equipment which have not been placed in an electrically safe working condition and the installation/removal of main disconnect switches on bus ducts. Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged shall be treated as energized parts. Any machine or equipment which has not been shut down per our lockout tagout procedures will ***not*** be considered to be electrically safe.

II. Covered Employees

The provisions of these procedures cover electrical safety-related work practices for both qualified persons (those who have training in avoiding the electrical hazards of working on or near exposed-energized parts) and unqualified persons (those with little or no such training) working on, near, or with the following installations:

* Premises Wiring - Installations of electric conductors and equipment within or on buildings or other structures, and on other premises such as yards, parking, and other lots, and industrial substations.

* Wiring for Connections to Supply - Installations of conductors that connect to the supply of electricity.

* Other Wiring - Installations of other outside conductors on the premises.

* Fiber Optic Cable- Installations of optical fiber cable where such installations are made along with electric conductors.

* Bus Duct Switches - Installation and removal of Bus Duct Switches on energized busses.

Qualified persons (i.e., those permitted to work on or near exposed energized parts, see Appendix B) shall, at a minimum, be trained in and familiar with the following:

A. The skills and techniques necessary to distinguish exposed live parts from other parts of electrical equipment.
B. The skills and techniques necessary to determine the nominal voltage of exposed live parts.

III. Training

The training requirements contained in this document apply to employees who face a risk of shock that is not reduced to a safe level by the installation as required by the National Electrical Code, NFPA 70E, and 29CFR 1910 Subpart S, Electrical. Appendix A lists personnel to be trained.

A. Other employees who also may reasonably be expected to face comparable risk of injury due to electric shock or other electrical hazards must also be trained.
B. Employees who are covered by the scope this policy, but who are not qualified persons shall also be trained in and familiar with any electrically related safety practices not specifically addressed but which are necessary for their safety.
C. The training required shall be of the classroom or on-the-job type (preferably both). The degree of training provided shall be determined by the risk to the employee.

IV. Selection and Use of Work Practices

Safety-related work practices shall be used 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. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

A. De-energized parts - Live parts to which an employee may be exposed shall be de-energized before the employee works on or near them, unless the employer can demonstrate that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. Live parts that operate at less than 50 volt to ground need not be de-energized if there will not be increased exposure to electrical burns or to explosion due to electric arcs.
B. Energized Parts - If the exposed live parts are not de-energized, (i.e., troubleshooting, verification or for reasons of increased or additional hazards or infeasibility), other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. When working on energized parts, the appropriate PPE shall be used.

V. Lock Out and Tag Out

The City of Hendersonville has a procedure established for the lockout or tagout of energy isolating devices. It shall be used to ensure that the machines or equipment are isolated from all potentially hazardous energy before employees perform any servicing or maintenance activities where the unexpected energization, start-up or release of stored energy could cause injury. See this procedure for more information and the requirements of 1910.147.

VI. Working On or Near Energized Equipment

Employees are considered working on or near exposed energized parts when working on exposed live parts either by direct contact or contact by means of tools or materials or when working near enough to energized parts to be exposed to any hazard they present.

Only qualified persons are permitted to work on electric circuit parts or equipment that have not been de-energized (lockout/tagout). Qualified persons are capable of working safely on energized circuits and are familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

- **Illumination** - Employees may not enter spaces containing exposed energized parts, unless illumination is provided that enables the employees to perform the work safely. Where lack of illumination or an obstruction precludes observation of the work to be performed, employees may not perform tasks near exposed energized parts. Employees may not reach blindly into areas which may contain energized parts.

- **Conductive Materials and Equipment** - Conductive materials and equipment that are in contact with any *part of an* employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If an employee must handle long dimensional conductive objects (such as ducts or pipes) in areas with live parts, the hazard must be minimized by the use of insulation, guarding, or material handling techniques.

  NOTE: *Non-conductive fish tapes must be used when pulling wire through conduit that contains energized conductors or when entering an enclosure with exposed live parts.*

- **Portable Ladders** - Portable ladders shall be at the non-conductive type (fiberglass) if they are used where the employee or the ladder could contact exposed energized parts.

- **Conductive apparel** - Conductive articles of jewelry and clothing (such as bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts, unless they are rendered non-conductive by covering, wrapping, or other insulating means.

- **Housekeeping Duties** - 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 or barriers) are provided. Electrically conductive cleaning materials may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

- **Interlocks** - Only a qualified person following the requirements of this section may defeat an electrical safety interlock, and then only temporarily while he or she is working on the equipment. The interlock system shall be returned to its operable condition when this work is completed.

- **Confined or Enclosed Workspaces** - When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, the employer shall provide, and the employee shall use, protective shields, protective barriers, or insulating materials as necessary to avoid inadvertent contact with these

parts. Doors, hinged panels, and the like shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts.

- **Overhead Lines** - Employees shall use extra care when working close to overhead lines. OSHA provides specific instructions regarding work on overhead lines. Refer to Subpart S - Electrical 1910.333(c) (3) for more detail.

- Underground Digging-underground electrical should be soft/hand dug around.

VII. Use of Equipment

A. **Extension Cord Use**

1. Employees using extension cords (drop cords) to power tools and/or equipment for the performance of *construction, maintenance, repair, or demolition* shall use GFCI protection.
2. All extension cords must be grounding type, made with UL listed parts, and be in good physical condition.
3. Extension cords may not be lengthened, or "repaired" with tape.
4. Power outlet strips are for equipment needing surge protection (e.g., computers).
5. Extension cords shall not be run through holes in walls, ceilings or floors.
6. Extension cords may not be plugged into power strips. Power strips may not be connected to each other (i.e., "piggy-backed").
7. An extension cord should not be run across high traffic areas or used in applications where potential damage to the cord might occur.
8. The use of an extension cord must not create a trip hazard.
9. Extension cords shall not be attached to building surfaces or used in lieu of fixed wiring of a structure.
10. Extension cords shall not be run through doorways or windows, or concealed behind walls, ceilings, or floors.
11. Extension cords shall not be left in use over 90 days. (OSHA 29 CFR 1910.305(a)(2)(i)(A) through C

B. **Handling** - Portable equipment shall be handled in a manner, which will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment. Flexible cords may not be fastened with staples or otherwise hung in such a fashion as could damage the outer jacket or insulation.

C. **Visual Inspection** - Portable cord-and-plug connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects and for evidence of possible internal damage.

1. Cord and plug-connected equipment and 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.
2. Defective or damaged items shall be removed from service until repaired.

D. **Grounding type equipment** - A flexible cord used with grounding-type equipment shall contain an equipment-grounding conductor.
   1. Attachment plugs and receptacles may not be connected or altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, these devices may not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.
   2. Adapters (i.e., "cheaters") that interrupt the continuity of the equipment grounding connection may not be used.

E. **Conductive Work Locations** - 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, shall be approved for those locations.

F. **Connecting Attachment Plugs** - Employees' hands may not be wet when plugging and unplugging flexible cords and/or cord and plug-connected equipment, if energized equipment is involved.
   1. 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 employee's hand.
   2. Locking-type connectors shall be properly secured after connection.

VIII. Electric Power and Lighting Circuits

A. Routine Opening and Closing of Circuits - Load rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the opening, reversing, or closing of circuits under load conditions. Cable connector's not of the load-break type, fuses, terminal lugs, and cable splice connections may not be used for such purposes, except in an emergency.

B. Re-closing Circuits After Protective Device Operation - 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. The repetitive manual re-closing of circuit breakers or re-energizing circuits through replaced fuses is prohibited.

C. Overcurrent Protection Modification - Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed in the installation safety requirements for overcurrent protection.

IX. Test Instruments and Equipment

Use - Only qualified persons may perform testing work on electric circuits or equipment.

Visual Inspection - Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall 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 shall be removed from service, and no employee may use it until necessary repairs and tests to render the equipment safe have been made.

Rating of Equipment - Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

X. Personnel Protection

Personal Protection Equipment - Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.

A. Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected or tested, as required by 29CFR 1910.137.
B. 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 is sometimes used for the protection of rubber insulating material.)
C. Employees shall wear non-conductive head protection wherever there is a danger of head injury from electric shock or bums due to contact with exposed energized parts.
D Employees shall 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.

When working near exposed energized conductors or circuit parts, each employee shall 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 shall be protected.

Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.

Ropes and hand lines used near exposed energized parts shall be nonconductive.

Protective shields, protective barriers, or insulating materials shall 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. When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with live parts.

Alerting Techniques – This section covers situations where: energized equipment is exposed and must be left unattended, the scope of the energized equipment is so large that the person working cannot monitor it, or the equipment cannot otherwise be guarded against accidental intrusion by a passerby.

The following alerting techniques shall be used to warn and protect employees from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts:

- **Safety signs**, safety symbols, or accident prevention tags shall be used where necessary to worn employees about electrical hazards, which may endanger them, as required.
- **Barricades** shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated 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 shall be stationed to warn and protect employees.

John F. Connet

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