LLR
Electric, Inc.

LLR ELECTRIC
Electrical Safe work Awareness Program

I. Safety-related work practices shall be employed to prevent electric shock or electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. Live parts shall be de-energized before the employee works on them unless it can be established that de-energizing introduces additional or increased hazards or is not feasible due to design of equipment or operational limitations. If exposed live parts are not de-energized for the above reasons, other safety practices shall be used to protect employees. Only qualified persons may work on energized circuits or equipment. They shall be capable of working safely on energized circuits and be familiar with the proper use of special precautions, personal protective equipment, insulating and shielding materials, and insulated tools.

II. Working on or near exposed de-energized parts.

A. Application. This applies to work on exposed de-energized parts or near enough to them to expose employees to any electrical hazard present. Conductors and parts of electric equipment that have been de-energized but have not been locked out or tagged shall be treated as energized.

B. Lockout and tagging. While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been de-energized, the circuits shall be locked out or tagged or both.

Note: Lockout and tagging that comply with paragraphs (c) through (f) of 1910.147 (Lockout & Tagging Standard) will comply with these requirements provided:

1. The procedures address electrical hazards
2. Stored non-electrical energy that could re-energize electrical circuits shall be effectively blocked or relieved
3. A qualified person shall use test equipment (volt-ohm meter, etc.) and shall verify that the circuit and equipment are de-energized. If the circuit is over 600 volts, the test equipment shall be checked for proper operation immediately before and immediately after this test.

C. Procedures. These written procedures shall be available for inspection by employees and by the Commissioner of Labor or authorized representatives.

D. De-energizing equipment. Safe procedures for de-energizing circuits and equipment shall be determined before circuits or equipment are de-energized.

E. The circuits and equipment to be worked on shall 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 and tagging procedures.

F. Stored electric energy which might endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel.

G. Stored non-electrical energy in devices that could re-energize electric circuit parts shall be blocked or relieved so that the circuit parts could not be accidentally energized.

III. Application of lock and tags.

A. A lock and a tag shall be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed, except as provided in paragraphs C and E below. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools, (bolt cutter, etc.).

B. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.

C. If a lock cannot be applied, or tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.

D. A tag used without a lock, as permitted by paragraph C above, shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock. Examples of additional safety measures include the removal of a fuse, blocking a controlling switch, or opening an extra disconnect.

E. A lock may be placed without a tag only under the following conditions:

1. Only one circuit or piece of equipment is de-energizing, and
2. The lockout period does not extend beyond the work shift, and
3. Employees exposed to the hazards associated with re-energizing the circuit or equipment are familiar with this procedure.

IV. Verification of de-energizing condition: The requirements of this paragraph shall be met before any circuits or equipment can be worked as de-energizing.

A. A qualified person shall operate the equipment controls or otherwise verify that the equipment cannot be restarted.

B. A qualified person shall use test equipment (volt-ohm meter, etc.) to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall 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 back feed even though specific parts of the circuit have been de-energized and presumed to be safe. If the

circuit to be tested is over 600 volts, the test equipment shall be checked for proper operation immediately before and immediately after this test.

V. Re-energizing equipment. These requirements shall be met, in the order given, before circuits or equipment are re-energized, even temporarily.

A. A qualified person shall conduct tests and visual inspections to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed, so that the circuits and equipment can be safety energized.

B. Employees exposed to the hazards of re-energizing the circuit or equipment shall be warned to stay clear of circuits and equipment.

C. Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if this employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that:

1. The employer ensures that the employee who applied the lock or tag is not available at the workplace, and

2. The employer ensures that the employee is aware that the lock or tag has been removed before he or she resumes work at that workplace.

D. There shall be a visual determination that all employees are clear of he circuits and equipment.

Scope

Safety-related work practices shall be enforced by employees of LLR ELECTRIC 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) 29CFRl 910.331 through 29CFRl 910.335.

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 shutdown per our lockout tagout procedures will ***not*** be considered to be electrically safe.

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.

* **Optical Fiber 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) shall, at a minimum, be trained in and familiar with the following:

1. The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.

3. The skills and techniques necessary to determine the nominal voltage of exposed live parts.
4.

Training

The training requirements contained in this document apply to LLR ELECTRIC 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 and 29CFRl910 Subpart S, Electrical. Listed below are employees who may face such a risk and shall be trained Electricians

1. 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.

2. 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.

3. 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.

Selection and Use of Work Practices

Safety-related work practices shall be used BY LLR ELECTRIC 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.

1. **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.

2. **Energized Parts** - If the exposed live parts are not de-energized, (i.e., 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.

NOTE., 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 (troubleshooting) and work on circuits that form an integral part of a continuous industrial process that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

Lockout and Tagout

While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been de-energized the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of this paragraph in the following order.

1. Procedures shall be in place before equipment may be de-energized.

2. Circuits and equipment to be worked on shall be disconnected from all electrical energy sources.

3. Stored electrical energy, which poses a hazard to workers, shall be released.

4. Stored non-electrical energy in devices that could re-energize electric circuit parts shall be blocked or relieved to the extent that the circuit parts could not be accidentally energized by the device.

5. A lock and a tag shall be placed on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided below.

6. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.

7. If a lock cannot be applied, or if the employer can demonstrate that tagging procedures will provide a level of safety equivalent to that obtained by the use of a lock, a tag may be used without a lock.

8. A tag used without a lock as permitted above, shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock. Examples include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

9. A lock may be placed without a tag only under the following conditions:

a. Only one circuit or piece of equipment is de-energized.
b. The lockout period does not extend beyond the work shift.
c. Employees exposed to the hazards associated with re-energizing the circuit or equipment are familiar with this procedure.

10. Before any circuits or equipment can be considered and worked as de-energized:
    a. A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.
    b. A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment to which employees will be exposed and shall verify that the circuit elements and equipment parts are de-energized.

11. Before circuits and equipment are re-energized, even temporarily, the following requirements shall be met, in the order given:
    a. A qualified person shall 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 re-energizing the circuit or equipment shall be warned to stay clear of circuits and equipment.
    c. Each lock and tag shall be removed by the employee who applied it or under his or her direct supervision. However, if the employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that the employer ensures that the employee who applied the lock or tag is not available at the workplace and is aware that the lock or tag has been removed before he or she resumes work at that workplace.
    d. There shall be a visual determination that all employees are clear o the circuits and equipment.

Working On or Near Energized Equipment

This section applies to work performed on exposed live parts by LLR ELECTRIC employees (involving either direct contact or contact by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.

Only qualified persons may work on electric circuit parts or equipment that have not been de-energized under the procedures of these standards. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

1. **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.

2. **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.

3. **Portable Ladders** - Portable ladders shall be at the non-conductive type with nonconductive side rails (wood or fiberglass) if they are used where the employee or the ladder could contact exposed energized parts. **(Question number 13)**

4. **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.

5. **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.

6. **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.

7. **Confined or Enclosed Work Spaces** - When an employee works in a confined or enclosed space (such as a manhole or vault) that contains exposed energized parts, LLR ELECTRIC employees 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.

8. **Overhead Lines** - Employees shall not work on, or near (within 12 feet) overhead lines. This 12 foot barrier includes any conductive object in that space. OSHA provides specific instructions regarding work on overhead lines. Refer to Subpart S - Electrical 1910.333(c) (3) for more detail.

9. Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage**. (Question number 10)**

Bus Duct Switches

l.. For the purposes of installing or removing main disconnect switch on energized bus ducts, only designated persons are allowed to plug or unplug bus switches (see Safety Manager for approved electricians).

2. Employees installing or removing switches on energized bus ducts shall use the following EPPE during the steps noted.
   a. Rubber gloves with leather protectors.
   b. Full face shield.
   c. Welding jacket.

3. Switch installation procedures.
   a. Remove fuses and place switch in off position.
   b. Install switch per manufacturers instructions (PPE required).
   c. Lock and tag switch in off position.
   d. Connect load - verify safety of load circuit by checking resistance between phases and between phases to ground.
   e. Install fuses.
   f. **Manually actuate switch to on position from floor using hot stick - DO NOT actuate switch from scissors lift or ladder**.

NOTE. EPPE must be worn when performing switch installation as indicated in step b.

4. Switch removal procedures
   a. **Manually actuate switch to off position from floor using hot stick - DO NOT** actuate switch from scissors lift or ladder.
   b. Lock and tag switch.
   c. Verify that there is no Voltage present on the switch.
   d. Remove fuses.
   e. Disconnect load - remove associated wiring and conduit.
   f. Remove switch from bus duct (PPE required).

***NOTE**: PPE must be worn when performing switch removal as indicated in step f.*

Use of Equipment

Portable Electric Equipment – This section applies to the use of cord and plug connected equipment, including flexible cord sets (extension cords).

1. **Extension Cord Use**
   a. Employees using extension cords (drop cords) to power tools and/or equipment for the performance of *construction, maintenance, repair or demolition* shall use Ground Fault Circuit Interrupter protection for all LLR Electric work.
   b. All extension cords must be grounding type, made with UL listed parts, and be in good physical condition.
   c. Extension cords may not be lengthened, or "repaired" with tape.
   d. Power outlet strips are for equipment needing surge protection (e.g., computers).
   e. Extension cords shall not be run through holes in walls, ceilings or floors.
   f. Extension cords may not be plugged into power strips. Power strips may not be connected to each other (i.e., "piggy-backed").
   g. An extension cord should not be run across high traffic areas or used in applications where potential damage to the cord might occur.
   h. The use of an extension cord must not create a trip hazard.
   i. Extension cords shall not be attached to building surfaces or used in lieu of fixed wiring of a structure.
   j. Extension cords shall not be run through doorways or windows, or concealed behind walls, ceilings or floors.

2. **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.

3. **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.
   a. 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.
   b. Defective or damaged items shall be removed from service until repaired.

4. **Grounding type equipment** - A flexible cord used with grounding-type equipment shall contain an equipment-grounding conductor.
   a. 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.
   b. Adapters (i.e., "cheaters") that interrupt the continuity of the equipment grounding connection may not be used.

5. **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.

6. **Connecting Attachment Plugs** - Employees' hands may not be wet when plugging and unplugging flexible cords and cord and plug-connected equipment, if energized equipment is involved.
   a. 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.
   b. Locking-type connectors shall be properly secured after connection.

Electric Power and Lighting Circuits

1. **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 dosing 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.

2. **Re-closing Circuits After Protective Device Operation** - After a circuit is deenergized 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.

***N0TE**: Circuit breakers or fuses can only be energized after an overload condition has been determined. If a fault condition exists, the circuit must be tested and determined safe before the circuit can be energized Circuit breakers can be reset, however repetitive reclosing is prohibited. 7he problem should be traced to the root cause if a circuit breaker trips twice in succession.*

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.

Test Instruments and Equipment

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

2. **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.

3. **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.

Occasional Use of Flammable or Ignitable Materials

Where flammable materials are present only occasionally, electric equipment capable of igniting them shall not be used, unless measures are taken to prevent hazardous conditions from developing.

Safeguard for Personnel Protection

1. **Personal Protection Equipment** - LLR ELECTRIC 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 29CFRl 910.137.

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 LLR ELECTRIC 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 handlines 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.

***NOTE**: Cabinet doors and electrical enclosures should be kept closed. If however, this is not possible due to the conditions which follow, additional precautions must be taken to minimize the extent of the hazard.*

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.
- The equipment cannot otherwise be guarded against accidental intrusion by a passerby.

2. **Alerting Techniques** - 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:
   a. **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.
   b. **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.
   c. **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.

Electrical Safety-Related Work Practices (1910.331-335)
Self-Audit Checklist

Building _____ Room _____ Supervisor _____ Date _____

Audit Performed by _____

	Y	N	NA	COMMENTS
A. Electrical Safety-Related Work Practices Program				
1. Model written program available				
2. Training complete and documented				
3. Lockout/Tagout program includes electrical safety-related work practices				
B. Selection and Use of Work Practices				
1. Minimum safe work distances established when work involves energized parts				
2. Illumination provided in all spaces containing exposed electrical conductors				
3. Measures taken to avoid inadvertent contact with energized parts in enclosed or confined spaces				
4. Measures taken to avoid inadvertent contact of conductive materials or equipment with energized parts during handling				
5. Portable ladders have nonconductive siderails				
6. Conductive apparel not worn unless rendered nonconductive				
7. Measures taken to avoid inadvertent contact with energized parts during housekeeping duties				
8. Electrical safety interlocks defeated only by a qualified person following specific procedures				
C. Use of Equipment				
1. Procedures for handling portable equipment implemented				
2. Procedures for working with extension cords implemented				
3. Only qualified persons allowed to perform test work				
4. Measures taken to prevent hazards from the occasional use of flammable materials near electrical equipment				
D. Safeguards for Personnel Protection				
1. Personal Protective Equipment appropriate for the electrical hazard provided and used				
2. Insulated tools and handling equipment used for work performed near exposed energized circuits				
3. Protective shields, barriers, or insulating materials used near exposed electrical circuits or where dangerous electric heating or arcing may occur				
4. Appropriate alerting techniques used to warn and protect workers				