



## **SECTION 10–ELECTRICAL SAFETY**

10.1 Electrical Safety - Work Practices

10.2 Lockout /Tagout Procedure

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## 10.1 ELECTRICAL SAFETY – WORK PRACTICES

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### A. Objective

The purpose of this program is to establish guidelines and work practices designed to provide protection to Harper College employees from injuries and illnesses associated with electrical hazards and accidents. These safety procedures are designed for operations on any energized or de-energized electrical equipment on the Harper campus.

The goal of this program is to ensure that all employees are made aware of the risks they face when operating on energized electrical equipment, and the safe work practices necessary to mitigate these risks. These policies and procedures establish requirements for adequate training on basic, as well as advanced, electrical safety procedures and operations, and provide employees with adequate knowledge on how to protect themselves and their co-workers when operating on electrical equipment.

The Harper Electrical Safety Program is founded on the principle of **avoiding and not permitting energized work**.

### B. Scope

This program applies to all Harper employees that work on or around electrical sources on all campuses. This program provides a system for ensuring that personnel performing live electrical work are trained in the safety aspects of such work and have been qualified by their supervisor to perform the task assigned. **It is the policy of Harper College that no employee operates on any live electrical equipment unless determined absolutely necessary and approval has been granted by the appropriate supervisor via an Energized Electrical Work Permit.**

This Electrical Safety Program describes work practices for both **qualified** and **unqualified** employees.

### C. References

Department of Labor, Occupational Health and Safety Administration (OSHA) 29 Code of Federal Regulations 1910, Subpart S (1910.301-399); Illinois Department of Labor 820 ILCS 225 Health and Safety Act; National Fire Protection Association (NFPA) 70E; Virginia Tech Electrical Safety Program; University of Albany Electrical Safety Program and University of Rochester Electrical Safety Program.

### D. Responsibilities

**Management** (i.e., supervisors, professors) is responsible for ensuring work areas are free from electrical hazards, individuals working on electrical equipment and systems are authorized for such work and an electrical safety program is implemented which includes management authorization, training, safe work practices, personal protective equipment and hazard recognition.

**Employees** are responsible for completing necessary training and authorization and utilizing safe work practices such as Lockout/Tagout, use of adequate PPE and industry accepted techniques.

**Contractors** are responsible for ensuring systems and equipment are installed in a safe and reliable manner, meeting local codes and regulations.



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**Environmental Health and Safety** is responsible for program development, advice and counsel to management and employees, professors, students, and/or contractors and administration of permit programs.

### E. Training

There are 2 classifications of employees that may work on and around electrical sources:  
Unqualified Persons

***An “unqualified person” is any person who has not received specific training regarding electrical hazards involved in the work task and how to avoid the hazards. These employees may take awareness level training that includes information on common electrical hazards and protective measures, including safe work practices for extension cords and ground-fault circuit-interrupters (GFCI).***

#### **Qualified Persons**

Qualified persons must be designated (i.e. authorized) by their department Supervisor to perform work on energized electrical systems or equipment and must attend Electrical Qualified Person training.

***Note: Electrical Qualified Person training provides information related to live electrical work hazards and selection and use of appropriate personal protective equipment. It is not intended to provide the technical skills and knowledge necessary to work on electrical systems or components, nor does it authorize any person to do so.***

A person can be considered qualified with respect to certain equipment and methods, but unqualified for others.

Note: Unqualified persons assisting in energized electrical work must be under the direct supervision of a qualified person for the duration of the exposure. An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those duties.

At Harper College, there are two levels of electrical qualified persons based upon the scope of work that the person is expected to perform and the risk involved.

**Level I** - Persons who are employed in an electrical position with direct responsibility for **servicing/installing/maintaining** electrical systems, components, or equipment where a relatively high level of technical knowledge and skill is necessary to perform such tasks, and where there is a relatively high level of risk due to work on **energized** systems or equipment (operating at 50 volts or more to ground).

Level I qualified persons must:

- Be trained and knowledgeable of the construction and operation of equipment or a specific work method, and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.
- Be familiar with the proper use of the special precautionary techniques, personal protective equipment, including arc-flash, insulating and shielding materials, and insulating tools and test equipment.
- Be trained in the skills and techniques necessary to distinguish exposed energized parts from other (non-energized) parts of electrical equipment.
- Be training in skills and techniques necessary to determine the nominal voltage of exposed live parts by reading drawings, signs, and labels.



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- Be trained in the approach distances and the corresponding voltages to which the qualified person will be exposed.
- Be trained in the decision making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

Department Supervisors must maintain documents that provide evidence of the qualifications of each employee, this must include defined limits on the employee's qualifications. The Electrical Qualified Person Form maybe used.

**Level II** - Persons who are employed in a **non**-electrical/mechanical position, but who have some degree of risk from energized electrical systems, components, or equipment, or any employee who works on energized equipment which involves either direct contact or contact by means of tools or materials (i.e. voltage testing for diagnostic and troubleshooting purposes). **Typically the system or equipment is de-energized according to lockout/tagout program requirements when servicing, maintenance, installation, or repair work is conducted.** OSHA requires that these employees be trained on appropriate safe work practices and controls *if* their work brings them close enough to exposed parts of electric circuits (operating at 50 volts or more to ground).

Level II qualified persons must:

- Be trained and knowledgeable on the proper operation of equipment (e.g. voltage testers, arc welders), or in a specific work method or practice.
- Be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.
- Be trained to select an appropriate voltage detector and shall demonstrate how to use a device to verify the absence of voltage, including interpreting indications provided by the device. This shall include knowledge that enables the employee to understand all limitations of each specific voltage detector that maybe used.
- Be trained in the approach distances and the corresponding voltages to which the person may be exposed.

Supervisors are responsible for addressing any safety concerns employees might have regarding electrical work they have been assigned to perform. Employees who don't feel qualified or adequately trained to perform a specific task should immediately inform their supervisors of the issue. Supervisors will either provided the employee with the necessary training prior to work, or remove the employee from the job if another employee is adequately qualified, and timely completion of the work is necessary in order for facilities operations.

Retraining will be provided to employees whenever any of the following conditions occur:

- Supervision or annual inspections indicate that employees are not complying with the safety-related work practices.
- If new techniques, new types of equipment, or changes in the procedures necessitate the use of safety related practices that are different from those that the employee would not normally use.
- If an employee must use ANY work practices that are not normally used during their regular job duties.

### F. Electrically Safe Working Condition

The most effective way to prevent injuries and accidents due to the release of, or contact with, electrical energy is to remove the source of electrical energy and eliminate the possibility of any reappearance. This is done by ensuring that all equipment is put into an electrically safe working condition prior to performing any maintenance. In order to do that, employees must identify all possible sources of electricity and locate a disconnecting means



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for each source. An electrically safe work condition does not exist until **all** of the following six steps have been completed. If an electrically safe work condition is properly established, no electrical energy is in the immediate vicinity of the work tasks. All danger of injury from an electrical hazard is removed, and no protective equipment or special safety training is required. Unqualified workers may be used to perform work on equipment after an electrically safe working condition is established, but the employees must have the ability to execute the technical aspects of the work task.

The following 6 steps **MUST** be established before an electrically safe work condition can be considered established:

**1. Determine all possible sources of electrical supply to the specific equipment.**

Check all applicable, up-to-date one-line drawings, as well as any diagrams and identification tags. It's necessary to use all possible sources of information to identify and locate all sources of energy. Diagrammatic type drawings should be reviewed to locate any sneak circuits. Circuits containing or potentially containing transformers must be checked and links or disconnects opened to confirm no potential back feeds are possible. This is especially important when connecting temporary power in situations where equipment is taken out of service for repair or maintenance. All diagrammatic type drawings, including one-line drawings, must be maintained in an up-to-date condition to provide accurate information.

**2. After properly interrupting the load current, open the disconnecting devices for each source.** The rating of some disconnecting equipment is insufficient to interrupt the load current demanded by the utilization equipment. These disconnecting means must not be operated unless the load has been removed by another action. Even when the equipment is load rated, interrupting full-load current reduces the life of the disconnecting means. Driven equipment should be stopped to reduce the amount of current in the circuit before the disconnecting means is operated. Unless the contacts in the disconnecting means have a load rating at least as great as the current being conducted, the contacts can be destroyed and initiate significant failure, in some cases causing an arcing fault within the equipment.

**3. Wherever possible, visually verify that all blades of the disconnecting devices are fully open or that drawout-type circuit breakers are withdrawn to the fully disconnected position.** A disconnect switch sometimes fails to open all phase conductors when the handle is operated. It is necessary to ensure the handle device actually establishes a physical break in **all** conductors. After operating the disconnect handle, employees should open the door or cover and observe the physical opening in each blade of the disconnect switch. If the physical opening of the contacts is infeasible to view, the worker should verify the opening by measuring voltage on the load side of the device after the handle has been operated. The test must include measuring the voltage to ground from each conductor and between each conductor and each of the other conductors. Opening a door, removing a cover, or measuring the voltage of this equipment is considered operating on live electrical parts, and therefore requires the use of all necessary PPE.

**4. Apply lockout/tagout devices in accordance with a documented and established policy.** It is the employer's job to implement a lockout/tagout procedure. It is the employees' job to implement all aspects of the procedure. Refer to section 10.2 of the Harper College Environmental Health and Safety Procedure Manual for Harpers Lockout/Tagout program

**5. Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized.** Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily. The procedure for using a voltage tester should include the initial test of a known source of energy to verify the tester is operating properly, followed by a test of the equipment to confirm that it is deenergized, concluded



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by a retest of a known source of electricity to confirm the tester has not failed during the test. The voltage detecting device selected for use should be rated at least as great as the expected voltage it will be testing. A measurement must be made from each conductor to ground and between each conductor to each other conductor from a potential source of energy. **Note:** the voltage detector might indicate no voltage to ground in an ungrounded circuit.

**6. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them.** Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty. Electrical conductors installed at a high elevation have the potential to break and fall down onto another conductor installed at a lower level, resulting in an unexpected energization of equipment. This could also occur as a result of physical damage or poor maintenance to the equipment. Conductors installed in proximity to the deenergized conductor could induce a hazardous voltage onto the otherwise deenergized conductor, also known as magnetic coupling. A worker could also inadvertently connect a conductor that is not locked out and add a source of energy to a circuit that was believed to be deenergized. Because of this, a set of safety grounds is necessary to protect workers from potentially hazardous voltages. Safety grounds provide protection only if the rating is sufficiently great to conduct any potentially available energy.

### G. Energized Electrical Work

**Only “qualified persons” may work on or near exposed energized electrical systems or conductors. Unqualified persons assisting in the work must be under the direct supervision of a qualified person for the duration of the exposure.**

The routine acceptance of working a system energized should not be a risk that Harper College, the department, the electrical worker, or anyone else routinely accepts. Energized parts greater than 50 volts to which an employee might be exposed shall be put into an electrically safe work condition before an employee works on or near them, **unless work on energized components can be justified.**

***Note: Tasks that are considered to be diagnostic in nature (i.e. troubleshooting or testing where the equipment/system must be energized in order to perform such tests and there are no physical alterations done such as making or tightening connections or removing or replacing components) are considered to be justified by their nature and do not require documentation via the Energized Electrical Work Permit. Safe work practices, including appropriate personal protective equipment and tools as determined by the hazard analysis, must be used.***

Work that is **not** diagnostic in nature, where the equipment or system cannot be put into an electrically safe work condition, must be justified **in writing** via the Energized Electrical Work Permit. Justification means that the employer can demonstrate that de-energizing introduces additional or increased hazards, or is infeasible due to equipment design or operational limitations. A qualified person may perform work on or near exposed live parts under the following conditions:

- De-energizing the conductors or equipment would result in an **increased or additional hazard**. Examples include: the loss of electrical power to life support equipment, loss of electrical power which could result in an environmental spill, deactivation of emergency alarm systems in an occupied building, or the shutdown of hazardous location ventilation equipment that is in use.

Note: Lack of illumination is not justification for live work. Temporary lighting must be installed, where necessary.



- De-energizing the conductors or equipment is ***infeasible due to equipment design or operational limitations***. Examples include: performing diagnostics and testing (e.g. start-up or troubleshooting) that can only be performed with the circuit energized, or work on circuits that form 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. This condition is typical of chemical processing plants

There is a significant difference between ***infeasible*** and ***inconvenient***, and the two terms should not be used interchangeably. Inconvenience cannot serve to justify work on or near exposed live parts.

Note: For voltages less than 50 volts, the decision to de-energize should include consideration of the capacity of the source and any over current protection between the energy source and the worker. Sources of electrical energy less than 50 volts can be hazardous, for instance, control circuits that operate at less than 50 volts could impact process conditions and result in a release of another kind of energy. Even if the capacity of the energy source is limited, the integrity of the circuit could be critical.

## G. Energized Electrical Work Permit

Experience suggests that if managers and supervisors are advised that a significant risk of injury exists, they are reluctant to accept that increased risk, and he or she will be more critical of the plan to execute the work. **An Energized Electrical Work Permit must be completed for all work on or near exposed electrical conductors greater than 50 volts, with the exception of diagnostic testing as described above, where an electrically safe work condition cannot be established.** This assessment provides guidance on required analysis and establishes written justification and authorization for live work. It also provides a means of communication between the supervisor and the employees performing the work. View the Energized Electrical Work flow chart for more information.

### Elements of the Energized Electrical Work Permit

**Section I - Work Request:** This section is to be completed by the department being requested to perform the work live. (Typically, a Work Order will be submitted stating the scope of the work and a request to perform it live. The department who will be conducting the work will then initiate the Energized Electrical Work Permit.) It must provide a description of the circuit and equipment to be worked on and its location. It also indicates that the equipment has been requested to be shut down, either until the work has been completed or temporarily while barriers are installed.

**Section II - Hazard Analysis:** This section is to be completed by the electrical qualified person who will be performing the live work. It includes detailed information regarding the hazards expected to be encountered and protective measures that must be implemented prior to beginning work.

Results of the **shock hazard analysis** - A shock hazard analysis determines the voltage to which personnel will be exposed, the boundary requirements, and the personal protective equipment necessary to minimize the possibility of electrical shock. As voltage increases, so does the degree of risk.

Results of the **flash hazard analysis** - A flash hazard analysis determines if flame-retardant clothing must be worn by the worker (and the appropriate rating of the clothing), and the location of the arc-flash boundary. If the flash hazard analysis suggests that the intensity of the arc flash could expose a worker to 40 calories per square centimeter (cal/cm<sup>2</sup>), the work must **not** be performed unless an electrical safe work condition has been established. If the intensity is greater than 40 cal/cm<sup>2</sup>, no protective equipment exists that can protect the worker from the intense pressure that also will be produced by the arcing fault.

**Section III - Review of Proposed Energized Electrical Work:** Once the electrical qualified person has signed the Hazard Analysis section indicating that live work is requested and



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justified, final review must be performed by the supervisor for a hazard rating of 0-1 and additionally by the Director of Physical Plant or Electrical Engineer for hazard rating 2-4.

If review signatures are not obtained for all levels, or if all parties are not in agreement, the request to work live is denied. The work must then be performed in an electrically safe work condition (i.e. de-energized) and the date and time for shut down must be coordinated between the department and the electrical qualified person(s) performing the work.

**Note:** As tasks are evaluated (i.e. an Energized Electrical Work Permit is completed), file them with EH&S for future reference so that the information can be used again, provided the work task conditions remain consistent.

### I. Use of Equipment

Safety-related work practices should be followed when using cord and plug connected equipment and extension cords. Equipment should not be raised or lowered by its electrical cords. Electrical equipment should be inspected before use and, if found defective, removed from service until repaired.

Extension cords are for temporary use only, to supply electrical power to portable equipment such as audio video, hand drills and drop lights not a substitute for fixed wiring. These cords must be properly rated and listed for the intended use. Extension cords are not to be used inside equipment for providing electrical power to components. Extension cords shall not be fabricated using electrical boxes or duplex receptacles. Job-made extension cords are not allowed. Extension cords must not be extended across aisles or doorways or draped over equipment, facilities, etc.

Extension cords are to be inspected routinely for external defects (e.g., damage to the insulation, loose parts, deformed or missing pins, etc.) Any found to be damaged must be discarded (altering or repairing a listed device voids the listing of the device).

Devices with multiple outlets identified as power taps with line conditioners/stabilizers or spike/surge suppressers may also be used in offices, classroom and lab areas. These devices, must have a UL, CSA, ETL, or equivalent listing/approval and be used as intended by the manufacturer of the device; have a combine load not exceeding the rating of the wall outlet; be equipped with an over current device (circuit protection) and not be used in combination, that is, not "daisy chained" or plug one into another.

The environment in which electrical equipment is to be used should also be considered. Ground Fault Circuit Interrupters (GFCI) or low voltage tools should be used in conductive work locations. Special equipment may also be required in areas that may contain flammable or ignitable materials or vapors.

### J. Personal Protective Equipment

Personal protective equipment (PPE) must be selected and worn based upon the hazard/risk category for the task to be performed. Electrical protective equipment must be in good condition, worn properly, be of the proper type and class for the voltage to be worked with, and current tested if required. The specific types of PPE will be determined with the type of work conducted and assigned as part of the Energized Electrical Work Permit.

Signs, tags, or barriers can be used to warn and protect workers. When these techniques do not provide sufficient protection, an attendant should be used.

### K. Reporting

Employees should report any and all equipment they discover to be damaged or too dangerous for use to their supervisors to have it repaired or replaced. Whenever any dangerous or





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hazardous electrical situations are discovered, employees should report the issue to their supervisors immediately to have it corrected. Any broken or damaged locks used in the lock-out/tag-out program should be reported and corrected immediately. Situations where an employee is operating on electrical equipment without using proper lock-out/tag-out procedures, or the lock-out/tag-out procedures have been overridden by another employee, should be immediately shut down, and the issue should be reported to the supervisor.

Whenever an employee is assigned to work on or repair any electrical equipment that they feel is too complicated or dangerous for their skill set, training level, or physical ability, they should immediately report to their supervisors with their concerns about the job. The supervisor will then determine if another employee is qualified to perform the task, if he needs to provide additional training to his employees before they can safely operate on the equipment, or if the work is too inherently dangerous and needs additional support to be corrected.

Whenever an employee receives any sort of electrical shock or injury due to operation on or around electrical equipment, they should immediately report the incident to their supervisor. If the injury requires treatment, employees should report to Health and Psychological Services(HPS). Depending on the severity of the injury, HPS may later refer the employee to an Alexian Brothers Medical Group for further treatment.

***\*For life-threatening injuries, call 911 from any campus phone.\****



**Electrical Qualified Person**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

A qualified person must be trained and familiar with the construction and operation of equipment and must be able to recognize and avoid electrical hazards that might be present. This is a combination of the person's education and experience, on-the-job training for the type of equipment encountered, and safety-related information and training regarding hazards and protective equipment.

**Level I Electrical Qualified Persons - Indicate the current level of license/education or experience achieved to date.**

<p align="center"><b>Electrical License</b></p> <p><input type="checkbox"/> Master Electrician License  <input type="checkbox"/> Journeyman Electrician License</p> <p>Granted by: _____  License is: <input type="checkbox"/> current <input type="checkbox"/> expired</p>	<p align="center"><b>Electrical-Related Education</b></p> <p><input type="checkbox"/> Associate's degree (2-year) in an electrical field from a trade/technical school or community college  <input type="checkbox"/> Bachelor's degree (4-year) in an electrical engineering  <input type="checkbox"/> Other (specify): _____  <input type="checkbox"/> Electrical experience: ____ years</p>
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- Is trained and knowledgeable of the construction and operation of equipment or a specific work method, and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.
- Is familiar with the proper use of the special precautionary techniques, personal protective equipment, including arc-flash, insulating and shielding materials, and insulating tools and test equipment.
- Is trained in the skills and techniques necessary to distinguish exposed energized parts from other (non-energized) parts of electrical equipment.
- Is training in skills and techniques necessary to determine the nominal voltage of exposed live parts by reading drawings, signs, and labels.
- Is trained in the approach distances and the corresponding voltages to which the qualified person will be exposed.
- Is trained in the decision making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely.

**Level II Electrical Qualified Persons – Indicate training and/or information that the employee has been provided relating to electrical work tasks and potential exposures.**

- Is trained and knowledgeable on the proper operation of equipment (e.g. voltage testers, arc welders), or in a specific work method or practice.
- Is trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method.
- Is trained to select an appropriate voltage detector and shall demonstrate how to use a device to verify the absence of voltage, including interpreting indications provided by the device. This shall include knowledge that enables the employee to understand all limitations of each specific voltage detector that maybe used.
- Is trained in the approach distances and the corresponding voltages to which the person may be exposed.

**EH&S Safety Training** (online training)

<p><input type="checkbox"/> Lockout/Tagout  <input type="checkbox"/> Electrical Safety</p>	<p><input type="checkbox"/> Electrical Safety NFPA 70E  <input type="checkbox"/> Energized Electrical Work Permit</p>
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This employee has attended EH&S training as indicated above and it is current at this time.  
**Safety Representative Signature:**

This employee has received on-the-job skills and knowledge and the employee is authorized to work on the systems described on this form. I do not accept liability for their work performance or the conduct of their work in the field.  
**Supervisor's Signature:**

I understand that I am expected to have the skills and knowledge indicated above. I agree to discuss any work that is outside of my skills and knowledge with my supervisor or lead person.  
**Employee's Signature:**



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**ENERGIZED ELECTRICAL WORK PERMIT** Work Order Number \_\_\_\_\_

**PART I: TO BE COMPLETED BY THE REQUESTER:**

1. Description of circuit/equipment/job location: \_\_\_\_\_
2. Description of work to be done: \_\_\_\_\_  
\_\_\_\_\_
3. Justification of why the circuit/equipment cannot be de-energized or the work deferred until the next scheduled outage: \_\_\_\_\_  
\_\_\_\_\_

Start Date: \_\_\_\_\_ Expire Date: \_\_\_\_\_ Requestor: \_\_\_\_\_ Date: \_\_\_\_\_

**PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS DOING THE WORK:**

- (1) Detailed job description procedure to be used in performing the above detailed work including hazards, conditions, mechanical, environmental, space obstructions, other voltages:-  
\_\_\_\_\_  
\_\_\_\_\_

- (2) Description of the Safe Work Practices:  LOTO  Two Workers  Safety Watch  Notify affected workers   
Reason not to LOTO \_\_\_\_\_

Restart Checks Required: \_\_\_\_\_

- (3)

Hazard Risk Cat. (1 to 4)		Shock Hazard (max V)		Working Distance	
Flash Boundary		Limited Approach		Glove Class, minimum	
Incident Energy (cal/cm <sup>2</sup> )		Restricted Approach			
		Prohibited Approach			

- (4) Protective Equipment

<input type="checkbox"/> Natural Fiber Clothing	<input type="checkbox"/> Safety Glasses/Goggles	<input type="checkbox"/> Ear Plugs	<input type="checkbox"/> Leather Shoes
<input type="checkbox"/> FR Clothing	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Leather Gloves	<input type="checkbox"/> Voltage-rated Shoes
<input type="checkbox"/> Voltage-rated Tools	<input type="checkbox"/> Balaclava Hood	<input type="checkbox"/> Voltage-rated Gloves	<input type="checkbox"/> Hard Hat
<input type="checkbox"/> Category III Meter	<input type="checkbox"/> 2 Layer Switching Hood	<input type="checkbox"/> Flashsuit	<input type="checkbox"/> Other
Other _____			

- (5) Means employed to restrict the access of unqualified persons from the work area: \_\_\_\_\_

- (6)

<b>Authorized Workers</b>	<b>Dept.</b>	<b>Authorized Workers</b>	<b>Dept.</b>
_____	_____	_____	_____
_____	_____	_____	_____

- (7) Evidence of completion of Job Briefing including discussion of any job-related hazards:  
\_\_\_\_\_

- (8) Do you agree the above described work can be done safely?  Yes  No (if no, return to requestor)

Electrically Qualified Person: \_\_\_\_\_ Date: \_\_\_\_\_

**PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:**

\_\_\_\_\_  
Supervisor Date \_\_\_\_\_ (Supervisor authorization only for HRC 0-1)  
Hazard Level 2-4 \_\_\_\_\_ OR \_\_\_\_\_  
Director, Phy. Plt. Date Electrical Engineer Date

**POST A COPY OF THE WORK PERMIT AT THE WORKSITE**

**PART IV: POST WORK-FEEDBACK** \_\_\_\_\_

Return to: Manager EH&S for review and retention

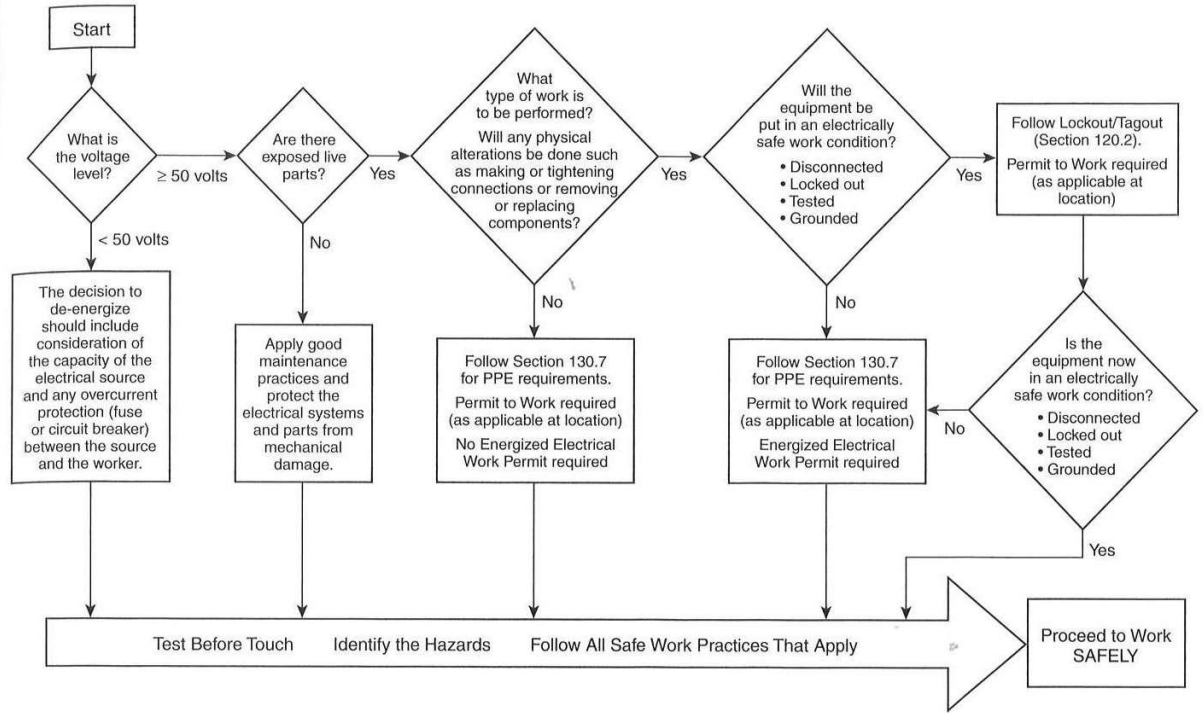


FIGURE J.2 Energized Electrical Work Permit Flow Chart.



## 10.2 LOCKOUT/TAGOUT PROCEDURE

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### A. Objective

To prevent the possibility of employee injury from the unintended release of energy or machine motion.

### B. Scope

This procedure establishes the minimum requirements for the lockout of energy isolating devices. It shall be used to ensure that the machine(s) or equipment is isolated from all potentially hazardous energy, before employees perform servicing, setup, or maintenance activities. Potential energy sources that must be considered and addressed within the scope of this procedure are:

Electrical	Compressed Gas	Hydraulic Systems
Natural Gas	Bottled Gas	Fuel Oil
Gravity	Stored Spring Tension	

### C. References

Department of Labor, Occupational Health and Safety Administration (OSHA) 29 Code of Federal Regulations 1910.147, Illinois Department of Labor 820 ILCS 225 Health and Safety Act.

### D. Responsibilities

- Department supervisors with assistance from appropriate technical support will make a survey to locate and identify isolating devices to be certain which switch(es), valve(s) or other energy-isolating devices apply to the equipment to be locked out. More than one energy source (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy sources) may be involved.
- Department supervisors working with the appropriate technical support will develop lockout procedures using the following format (see table 10.2):
  - Name of equipment/machine and manufacturer.
  - Type(s) and Magnitude(s) of energy and hazards.
  - Name(s)/Job Title(s) of employees authorized to lockout.
  - Name(s)/Job Title(s) of affected employees and how to notify.
  - Type(s) and Location of energy-isolating means.
  - Type(s) of Stored Energy Methods to dissipate or restrain.
  - Method(s) Selected—i.e., locks or additional safety measures, etc.
  - Type(s) of Equipment checked to ensure disconnection.
  - Name(s)/Job Title(s) of employees authorized for group lockout.

### E. Training

Training shall be provided to ensure that the purpose and function of the energy control program and understood by employees and that the knowledge and skills required of the safe application, usage, and removal of energy controls are required by employees.

1. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
2. Each affected employee shall be instructed in the purpose and use of the energy control program.
3. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and



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about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

4. Supervising departments shall maintain a current list of authorized employees. A copy of the list of authorized employees shall be forwarded to the Manager of Environmental Health & Safety.

Retraining is required for all employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures, or revealed by inspection.

The retraining should re-establish employee proficiency and introduce new or revised control methods and procedures, as necessary.

Documentation of training and/or retraining must be kept on file. At a minimum the documentation should include a signed statement by both the trainer and the trainee as to: what was taught, date of training and how the training was conducted.

### G. Procedures of Lockout/ Tagout (ALL 6 steps must be followed)

1. **Prepare for Shutdown:** Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked & tagged out to perform the servicing or maintenance. The authorized employee shall identify the type and magnitude of the energy that the machine or equipment utilizes, to understand the hazards of the energy, and the methods of how to control the energy.
2. **Machine or Equipment Shutdown:** If the machine or equipment is operating, shut it down by the normal stopping procedure (depress stop button, close valve, open switch, etc.)
3. **Machine or Equipment Isolation:** De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).
4. **Lockout & Tagout Device Application:** Lockout and tagout the energy isolating device(s) with assigned individual lock.
5. **Stored Energy:** Stored or residual energy (such as capacitors, springs, elevated machine members, hydraulic systems, and air, gas, steam or water pressure, etc.) must be dissipated or restrained by grounding, repositioning, blocking bleeding down, etc.
6. **Verification of Isolation:** Authorized employee shall verify that isolation and deenergization of the machine or equipment have been accomplished. The equipment is now locked and tagged out.

In the preceding steps, if more than one individual is required to lockout or tagout equipment, each shall place his or her own personal lockout or tagout device on the energy-isolating device(s). When an energy-isolating device cannot accept multiple locks, a multiple lockout device (hasp) may be used. If lockout is used, a single lock may be used to lockout the machine or equipment, with the key being placed in a lockout box or cabinet, which allows the use of multiple locks to secure it. Each employee will then use his or her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his or her lock from the box or cabinet.

### H. Restoring Machines or Equipment to Normal Operations

After the servicing and/or maintenance are completed and equipment is ready for normal production operations:

1. Check around the machines or equipment and the immediate area to ensure that no one is exposed and that tools have been removed, guards have been reinstalled, and employees are in the clear.
2. Verify that the controls are in neutral.



3. Remove the lockout-tagout device(s) and reenergize the machine or equipment.
4. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

#### **I. Emergency Removal of Padlock**

In the event a lockout device must be removed by anyone other than the person who installed the lockout, the supervisor will comply with the following steps and document in writing to the Manager of Environmental Health & Safety.

1. Verification that the authorized employee who applied the lock is not at the facility.
2. Supervisory personnel have made reasonable efforts to contact the authorized employee to inform him/her that the lock will be removed.
3. Supervisory personnel will inform the authorized employee(s) of the removal before the employee resumes work.
4. The employees have made certain that all of the requirements for restoring power are followed.

#### **F. Tagout**

It is not allowed to only use the tagout procedure as a method of controlling an energy source.

#### **J. Exclusions**

1. Work on cord and plug-connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing;
2. Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operation, if they are routine, repetitive, and integral to the use of the equipment, provided that the work is performed using alternative measures which provide effective protection, and ;
3. Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, provided that the supervising department demonstrates to the satisfaction of the Manager of Environmental Health & Safety, that 1) continuity of service is essential; 2) shutdown of system is impractical; and 3) documented procedures are followed, and special equipment is used which will provide proven, effective protection for employees.

**Table 10.2 - Locations/Equipment Requiring LO/TO Procedures – (non-comprehensive – other locations are possible)**

Name of equip./mach.	Type & Magnitude of energy and hazard	Name & Title of employee authorized to lockout	Name/Title of affected employees and how to notify	Type(s) and Location of energy-isolating means	Type(s) of stored energy methods to dissipate or restrain.	Method(s) selected.	Type(s) of equipment checked to ensure disconnection.	Name/Title of employees authorized for group lockout.
Electrical Panels – lighting outlets	Electrical	Trained Maintenance & Utilities	Maintenance, Utilities, Contractors, - radio, team meeting	Electrical Panels/ breakers	Electrical – activate circuit	Always activate circuit/switch or machine to confirm correct circuit and LO/TO	Volt meter	Trained Maintenance & Utilities personnel
Piping – Steam Water	Steam	Trained Maintenance & Utilities	Maintenance, Utilities, Contractors, - radio, team meeting	Steam - valves	Steam - drain	Drain off - valve	Gage	Trained Maintenance & Utilities personnel
Hard wired machines – Maint. Wood shop and L126	Electrical	Trained Maintenance & Utilities	Maintenance, Utilities, Contractors, - radio, team meeting	Electrical Panels/ breakers	Electrical – activate circuit	Always activate circuit/switch or machine to confirm correct circuit and LO/TO	Volt meter	Trained Maintenance & Utilities personnel
Pumps & Air Handlers	Electric, water	Trained Utilities	Maintenance, Utilities, Contractors, - radio, team meeting	Electrical Breaker Gas or steam valves	Electrical – activate circuit Steam – drain Gas - drain	Always activate circuit/switch Drain off - valve	Volt meter Gage	Trained Utilities personnel
Boilers	Steam Electric Natural Gas Compressed Air	Trained Utilities	Maintenance, Utilities, Contractors, - radio, team meeting	Electrical Breaker Gas or steam valves	Electrical – activate circuit Steam – drain Gas - drain	Always activate circuit/switch Drain off - valve	Volt meter Gage	Trained Utilities personnel



