

CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

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THE CONTROL OF HAZARDOUS ENERGY: LOCKOUT/TAGOUT & ELECTRICAL SAFETY

Penn Fencing, Inc.

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LOCKOUT/TAGOUT PROGRAM

Penn Fencing, Inc.

1.1 PURPOSE

The purpose of this written program is to establish a means of positive control to prevent the accidental starting or activating of machinery or systems while they are being repaired, cleaned and/or serviced. This program serves to:

- Establish a safe and positive means of shutting down machinery, equipment and systems.
- Prohibit unauthorized personnel or remote control systems from starting machinery or equipment while it is being serviced.
- Provide a secondary control system (tagout) when it is impossible to positively lockout the machinery or equipment.
- Establish responsibility for implementing and controlling lockout/tagout procedures.
- Ensure that only approved locks, standardized tags and fastening devices provided by the company will be utilized in the lockout/tagout procedures.

1.2 RESPONSIBILITY

PROGRAM COORDINATOR - CHAD GALBREATH

- Oversee and manage the Penn Fencing Plan for Control of Hazardous Energy.
- Implement the lockout/tagout program.
- Enforce the program and ensuring compliance with appropriate procedures in all departments.
- Monitor compliance.

AUTHORIZED PERSONNEL – SEE ATTACHMENT B

- Follow established lockout/tagout procedures when performing lockout/tagout to machinery or equipment in order to perform servicing or maintenance.
- Be knowledgeable of the different energy sources and the proper sequence of disconnecting energy means.
- Notify affected personnel of the application and removal of lockout/tagout devices before the controls are applied and after they are removed.

AFFECTED PERSONNEL

- Have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.
- Be aware of lockout/tagout practices when applied to a piece of equipment in which you are required to work or in your work area.
- Never attempt to restart or re-energize equipment that has been locked out or tagged out.

1.3 PROTECTIVE DEVICES & HARDWARE

ENERGY ISOLATING DEVICE

- A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

LOCKOUT DEVICE

- A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

TAGOUT DEVICE

- A warning tag standardized in size, color, with wording warning of hazardous energy (Do Not Start; Do Not Open; Do Not Close; Do Not Energize; Do Not Operate). A tagout system must be utilized whenever an energy source cannot be locked out.
- Must be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
- Must be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

All Lockout/Tagout devices must be:

- Capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
- Standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.
- Substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
- Clearly able to identify the employee applying the device.

1.4 PREPARATION FOR SHUTDOWN

In order to properly lockout a piece of equipment, all energy sources must be de-energized. More than one energy source may be utilized on some equipment and the proper procedure must be followed in order to identify energy sources and lockout/tagout accordingly. See Attachment C for equipment/machine-specific procedures.

Energy sources include any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy. Typical shutdown procedures are included below.

ELECTRICAL

- 1) Shut off power at machine and disconnect.
- 2) Disconnecting means must be locked or tagged.
- 3) Press start button to see that correct systems are locked out.
- 4) All controls must be returned to their safest position.

Points to remember:

- If a machine or piece of equipment contains capacitors, they must be drained of stored energy.
- Possible disconnecting means include the power cord, power panels (look for primary and secondary voltage), breakers, the operator's station, motor circuit, relays, limit switches, and electrical interlocks.
- Some equipment may have a motor isolating shut-off and a control isolating shut-off.
- If simply unplugging the power cord disconnects the electrical energy, the cord must be kept under the control of the authorized employee or the plug end of the cord must be locked out or tagged out.

HYDRAULIC/PNEUMATIC

- 1) Shut off all energy sources (pumps and compressors). If the pumps and compressors supply energy to more than one piece of equipment, lockout or tagout the valve supplying energy to the piece of equipment being serviced.
- 2) Stored pressure from hydraulic/pneumatic lines shall be drained or bled when release of stored energy could cause injury to employees.
- 3) Make sure controls are returned to their safest position (off, stop, standby, inch, jog, etc.).

FLUIDS AND GASES

- 1) Identify the type of fluid or gas and the necessary personal protective equipment.
- 2) Close valves to prevent flow, and lockout/tagout.
- 3) Determine the isolating device, then close and lockout/tagout.
- 4) Drain and bleed lines to zero energy state.
- 5) Some systems may have electrically controlled valves. If so, they must be shut off and locked/tagged out.
- 6) Check for zero energy state at the equipment.

MECHANICAL ENERGY

Mechanical energy includes gravity activation, energy stored in springs, etc.

- 1) Block out or use die ram safety chain.
- 2) Lockout or tagout safety device.
- 3) Shut off, lockout or tagout electrical system.
- 4) Check for zero energy state.
- 5) Return controls to safest position.

1.5 RELEASE FROM LOCKOUT/TAGOUT

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

- 1) Make certain the work is completed and inventory the tools and equipment that were used.
- 2) Clean-up, remove all towels, rags, work-aids, etc.
- 3) Replace all guards possible. Sometimes a particular guard may have to be left off until the start sequence is over due to possible adjustments. However, all other guards should be put back into place.
- 4) Check controls to ensure that they are in the safest position.
- 5) Inspect the work area to ensure that all employees have been safely positioned or removed and notified that the lockout/tagout devices are being removed.
- 6) Remove locks/tags. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device.

In the event that an authorized employee who applied the lockout or tagout device is not available to remove it, the following procedure will be followed:

- 1) Chad Galbreath must verify that the authorized employee who applied the device is not at the facility.
- 2) Make all reasonable efforts to advise the employee that his/her device has been removed. (This can be done when he/she returns to the facility).
- 3) Ensure that the authorized employee has this knowledge before he/she resumes work at the facility.

1.6 MAINTENANCE REQUIRING UNDISRUPTED ENERGY SUPPLY

Where maintenance, repairing, cleaning, servicing, adjusting, or setting up operations cannot be accomplished with the prime mover or energy source disconnected, such operations may only be performed under the following conditions:

- The operating station (e.g. external control panel) where the machine may be activated must at all times be under the control of a qualified operator.

- All participants must be in clear view of the operator or in positive communication with each other.
- All participants must be beyond the reach of machine elements that may move rapidly and present a hazard.
- Where machine configuration or size requires that the operator leave the control station to install tools, and where there are machine elements which may move rapidly, if activated, such elements must be separately locked out.
- During repair procedures where mechanical components are being adjusted or replaced, the machine shall be de-energized or disconnected from its power source.

1.7 GROUP LOCKOUT OR TAGOUT

When service or maintenance on a piece of equipment is performed by more than one person, each authorized employee shall place his own lock or tag on the energy isolating source utilizing a multiple lock scissors clamp if the equipment is capable of being locked out. If the equipment cannot be locked out, then each authorized employee must place his tag on the equipment. Chad Galbreath has primary responsibility for all employees working under the protection of a group lockout.

1.8 TESTING OR POSITIONING OF MACHINES, EQUIPMENT OR COMPONENTS

In situations in which lockout or tagout devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions shall be followed and documented:

- 1) Clear the machine or equipment of tools and materials
- 2) Remove employees from the machine or equipment area
- 3) Remove the lockout or tagout devices as specified
- 4) Energize and proceed with testing or positioning
- 5) De-energize all systems and reapply energy control measures to continue the servicing and/or maintenance

1.9 SHIFT OR PERSONNEL CHANGES

A high percentage of accidents historically occur shortly after a shift change and are often due to a lack of communication.

When work involving lockout/tagout extends across two or more shifts, the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees will be maintained. The recommended procedure for orderly transfer of lockout/tagout responsibility is as follows.

During a shift change, exiting personnel should meet oncoming personnel at the location of the lockout/tagout device. The oncoming authorized employee should place his/her lock or tag on the energy isolating device before the exiting authorized employee removes his /her lock or tag. If this is not possible, the oncoming authorized employee should place his/her lock or tag on the energy isolating device immediately after the exiting authorized employee removes his/her lock or tag. Exiting employees should inform oncoming employees of any problems or concerns regarding the service and maintenance of machinery or equipment.

1.10 PROCEDURES FOR OUTSIDE PERSONNEL/CONTRACTORS

Outside personnel/contractors shall be advised that the company has and enforces the use of lockout/tagout procedures. They will be informed of the use of locks and tags and notified about the prohibition of attempts to restart or re-energize machines or equipment that are locked out or tagged out.

The company will obtain information from the outside personnel/contractor about their lockout/tagout procedures and inform affected employees of their procedures. The contract employer must advise the host employer of any unique hazards presented by the work, unanticipated hazards, and any measures taken to correct hazards reported to them.

The outside personnel/contractor will be required to sign a certification form (see Attachment D). If outside personnel/contractor has previously signed a certification that is on file, additional signed certification is not necessary.

1.11 TRAINING AND COMMUNICATION

Each authorized employee who will be utilizing the lockout/tagout procedure will be trained in the recognition of applicable hazardous energy sources, type and magnitude of energy available in the work place, and the methods and means necessary for energy isolation and control.

Each affected employee (all employees other than authorized employees utilizing the lockout/tagout procedure) shall be instructed in the purpose and use of the lockout/tagout procedure, and the prohibition of attempts to restart or re-energize machines or equipment that are locked out or tagged out.

Retraining shall be provided for all authorized and affected employees at least annually and 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.

Additional retraining shall also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

Documentation of training will be implemented using the forms in Attachment G. All training certifications will be retained indefinitely by the company.

1.12 PERIODIC INSPECTION

A periodic inspection (at least annually) will be conducted of each authorized employee under the lockout/tagout procedure. An authorized person shall perform this inspection.

The inspection will include a review between the inspector and each authorized employee of that employee's responsibilities under the energy control (lockout/tagout) procedure. The inspection will also consist of a physical inspection of the authorized employee while performing work under the procedures.

The inspector shall certify in writing that the inspection has been performed. The company shall retain the written certification (Attachment E).

1.13 EXCEPTIONS TO OSHA'S LOCKOUT OR TAGOUT REQUIREMENTS

Certain operations, situations, and tasks are not covered under OSHA's General Industry standard for control of hazardous energy (lockout/tagout). These exceptions are summarized below. See Attachment A for the exact language.

EXEMPT OPERATIONS:

- 1) Construction, agriculture and maritime employment
- 2) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering
- 3) Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations (See 29 CFR 1910, Subpart S)
- 4) Oil and gas well drilling and servicing
- 5) Normal Production, including minor tool changes and adjustments and other minor servicing activities, which take place during normal production operations are not covered if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection.
- 6) Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energizing or startup 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 or maintenance.
- 7) 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 employer demonstrates that-
 - o Continuity of service is essential;
 - o Shutdown of the system is impractical; and
 - o Documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

ELECTRICAL SAFETY PROGRAM

Penn Fencing, Inc.

2.1 INTRODUCTION

OSHA's Electrical Safety-Related Work Practices Standard uses performance criteria necessary to protect workers (both qualified and unqualified) working on/near or with electrical circuits and equipment. It complements the existing electrical installation standards as well as the lockout/tagout standard. It contains requirements for working on or near energized and de-energized electrical equipment, the use of electrical protective equipment, and the safe use of electrical equipment.

Miscellaneous provisions of the General Industry Standards were also amended to promote uniformity and to reduce redundancy among the General Industry Standards. They were amended to:

- Change existing regulations referring to the 1971 National Electrical Code so that they will refer instead to OSHA's Electrical Standards;
- Remove existing electrical work-practices requirements from other parts of the General Industry Standards so that all general electrical safety-related work practices will be covered in the Electrical Safety Standards; and
- Remove an existing provision relating to construction from the General Industry Electrical Safety Standards.

OSHA evaluated the National Fire Protection Association (NFPA) 70E National Consensus Standard and determined that this standard was appropriate for OSHA to use as a basis for its proposed rule. The new standard incorporates most of the consensus standard.

The Electrical Safety-Related Work Practice Standard became effective December 4, 1990, except 29 CFR 1910.332 (Training), which became effective on August 6, 1991.

The information contained herein is not intended as a substitute for the provisions of the standard. The purpose of this package is to assist the instructor in providing training on the requirements of the standard. See Attachment F for a copy of the Standard.

2.2 LOCKOUT/TAGOUT VS. ELECTRICAL WORK PRACTICES

In September 1989 OSHA promulgated the standard on the control of hazardous energy (lockout/tagout). 1910.147 addressed practice and procedures that are necessary to disable machinery or equipment and to prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed. The lockout/tagout standard covers electrical energy sources, but it specifically excludes "exposure to electrical hazards from work on, near, or with conductors or equipment in the electrical utilization installations", which is covered by Subpart S of this part. Thus, the general lockout/tagout standard does not cover electrical hazards associated with conductors and equipment but only covers that electrical equipment which relates to machinery and equipment that is covered by the lockout standard.

2.3 SCOPE

OSHA's 29 CFR 1910.331 covers electrical safety-related work practices for both qualified persons and unqualified persons working on, near, or with the following installations:

- a. Premises Wiring-Wiring and equipment within or on buildings or other structures and on such premises as yards, carnivals, parking and other lots and industrial substations
- b. Wiring for connection to supply
- c. Other wiring
- d. Optical fiber cable

Other covered work by unqualified persons - Covers work done by unqualified persons (those with little or no training) on, near, or with installations listed in paragraphs (C)(1) through (C)(4) of this section.

Excluded work by qualified persons - Does not apply to work performed by qualified persons (those who have training in avoiding the electrical hazards of working on or near exposed energized parts) on or directly associated with the following installations.

- a. Generation, transmission, and distribution installations
- b. Communications installations (that part is covered by 1910.268)
- c. Installations in vehicles
- d. Railway installations

2.4 TRAINING

Training is required for employees who face a risk of electrical shock that is not reduced to a safe level by the electrical installation requirements or 1910.303 through 1910.308. Training shall be either in a classroom or on the job, with the degree based on risk to the employee during training. Training documentation can be found in Attachment G.

CONTENT

- 1) Employees shall be trained and familiar with the safe work practices contained in this standard.
- 2) Employees who are covered by this section but are otherwise not qualified shall be trained and familiar with other safe work practices that are not contained in this section but which are necessary for their safety.
- 3) Additionally, qualified persons shall be trained and familiar with the following:
 - Skills and techniques necessary to distinguish exposed live parts
 - Skills and techniques necessary to determine nominal voltage of exposed live parts.
 - Clearance distances specified and corresponding voltages
 - Shall be classroom or on the job, with degree based on risk to employee.

2.5 SELECTION AND USE OF WORK PRACTICES

GENERAL

Safe work practices shall be used and shall be consistent with the nature and extent of the associated hazard.

- 1) De-energized parts: Calls for de-energizing all live parts before working on or near them unless it is more hazardous to do so or if it is not possible because of design or operational limitations.
- 2) Energized parts: Additional safe practices are mandated if working on exposed live parts.

WORKING ON OR NEAR EXPOSED DE-ENERGIZED PARTS

- 1) Application: Conductors and equipment that have been de-energized but not locked out shall be treated as ENERGIZED
- 2) Lockout and Tagging: De-energized circuits shall be locked out and tagged (Note special conditions given in 1910.333(b)(2)(iii)(c).)
 - Written procedures shall be kept and made available for inspection. (Note: A copy of paragraph b of this section will fulfill this requirement)
 - De-energized Equipment:

Procedures shall be in place before equipment may be de-energized and circuits and equipment to be worked on shall be disconnected from all electrical energy sources. Stored electrical energy that poses a hazard to workers shall be released.
 - Application of Locks and Tags - A lock and a tag must be used together unless the lock cannot be applied or if the employer can prove that a tag only will provide as much protection as a lock. If only a tag is used an additional safety measure in lieu of a lock shall be used. A lock can only be used without a tag if:
 - Only one circuit or piece of equipment is de-energized, and,
 - The lockout period does not extend beyond the work shift, and,
 - Exposed employees are familiar with the procedures.

A qualified person shall operate the controls and/or otherwise verify that the equipment cannot be started. The qualified person will further check the exposed parts with test equipment. If the circuit is over 600 volts, nominal, the test equipment shall be checked for proper operation before and immediately after the test. These tests shall also be done before circuits or equipment is re-energized even temporarily. The qualified person would also verify that the circuit was safe to energize and that employees exposed to the hazards were warned to stay clear of the circuits.

- The person who placed the lock shall remove it unless they are not in the workplace, in which case a qualified person could remove it.

WORKING ON OR NEAR EXPOSED ENERGIZED PARTS

Applies to work being performed on exposed live parts or work in close proximity to those parts.

- 1) Only qualified persons: Those familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials and insulated tools are allowed to work on exposed energized lines.
- 2) Overhead Lines:
 - They should be de-energized and grounded or otherwise protected.
 - When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances
 - For voltages to ground 50kV or below - 10 feet
 - For voltages to ground over 50kV - 10 feet (305 cm) plus 4 inches (10 cm) for every 10kV over 50kV
 - When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table S-5 (1910.333 is located in Attachment F) unless the following conditions exist:
 - The person is insulated from the energized part, or
 - The person is insulated from all conductive objects at a potential different from that of the energized part
- 3) Vehicular and Mechanical Equipment: Parts of trucks and cranes, which could come into contact with power lines, should be kept a minimum distance of 10 feet with that distance being increased 4 inches for every 10kv above 50kv. The distance is lowered to 4 feet for vehicles in transit with their structures lowered. Employees may not contact the equipment unless it is positioned so that it cannot violate these distances even at its maximum reach.
- 4) Illumination: Employees may not enter a space that contains live parts or work near exposed energized parts unless there is proper illumination.

- 5) Confined or Enclosed Work Spaces: Employees working near or with exposed live parts shall be provided, and shall use, protective shields, barriers, or insulating materials in order to avoid inadvertent contact with live parts.
- 6) Conductive Materials and Equipment: Conductive materials used by employees that may come into contact with live parts shall be handled in a safe manner. Proper safe work practices must be instituted where employees work with long dimensional conductive objects that could come into contact with live parts.
- 7) Portable Ladders: They have to be of nonconductive construction if used around live parts.
- 8) Conductive Apparel: Conductive jewelry and clothing (unless rendered nonconductive) cannot be worn if they can come into contact with live parts.
- 9) Housekeeping Duties: Are not allowed around or near live parts unless adequate safety precautions are taken. Conductive cleaning materials may not be used around live parts.
- 10) Interlocks: Only qualified persons may defeat an electrical safety interlock and then only temporarily, while working on the equipment. The interlock shall then be returned to its operating condition.

2.6 USE OF EQUIPMENT

PORTABLE ELECTRIC EQUIPMENT

This applies to extension cords and cord and plug connected equipment:

- 1) Handling: Flexible cords connected to equipment cannot be used to raise or lower the equipment nor can they be fastened with staples or otherwise hung so as to damage the cord.
- 2) Flexible Cords: Are to be inspected before use for visible defects or evidence of internal damage and removed from service if found to be defective. They should also be checked for the appropriate attachment plug and receptacle.
- 3) Grounding-type Equipment: Flexible cords should have the appropriate grounding conductor.
- 4) Conductive Work Locations: Equipment and flexible cords used in wet, conductive locations shall be approved for those locations.
- 5) Connecting Attachment Plugs: Employee's hands should be dry or insulating PPE shall be used before an energized plug and receptacle may be handled.

ELECTRICAL POWER AND LIGHTING CIRCUITS

- 1) Routine Opening and Closing of Circuits: Except in an emergency only load rated switches, circuit breakers or other disconnecting means shall be used on circuits under load conditions.
- 2) Reclosing Circuits after Protective Device Operation: The circuit cannot be re-energized until it has been determined safe to do so.
- 3) Over-current Protection Modification: Cannot be modified even temporarily.

- 4) Test Instrument and Equipment: Only qualified persons may perform tests on circuits and equipment. Test equipment shall be visually inspected for damage or defects before use. The test equipment shall be appropriately rated for the circuits to which they will be connected and the environment of use. Test instruments must be verified before and after an absence of voltage test is performed. The test equipment should be intrinsically safe if used in hazardous locations.

2.7 SAFEGUARDS FOR PERSONAL PROTECTION

USE OF PROTECTIVE EQUIPMENT

Employers shall provide, and employees must use, appropriate protective equipment if exposed to hazards. It must be maintained in a safe, reliable condition. Non-conductive head protection must be worn, as well as eye and face protection, if needed.

- 1) General protective equipment and tools - Appropriate insulated tools and equipment must be used if it is possible to contact live parts. While working near live parts which could be contacted; employees must be protected by protective shields, barriers or other insulating materials. These protective measures should also be used to protect unqualified persons from energized parts that are exposed for repair or maintenance.
- 2) Alerting techniques - Safety signs, tags, barricades, and/or attendants (where other precautions cannot be taken) must be used to alert employees of electrical HAZARDS.

2.8 DEFINITION OF QUALIFIED PERSONS

OSHA defines a Qualified Person in 29 CFR 1910.399 as one who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved.

- Dependent upon variables in the workplace a person could be considered qualified as to certain equipment in the workplace and unqualified as to other equipment in the work place.
- A trainee who has demonstrated an ability to perform duties safely at their level of training, and who is under the direct supervision of a qualified person is to be considered a qualified person for the performance of those duties.

2.9 ARC FLASH SAFETY

OSHA's arc flash regulations are currently located in 29 CFR 1910.333(a). However, the NFPA 70E outlines specific arc flash safety. Although this is not an OSHA regulation, OSHA uses the 70E as a reference when issuing a citation for an arc flash/electrical hazard.

An electric arc flash can occur if a conductive object gets too close to a high-amp current source or by equipment failure. The arc can heat the air to temperatures as high as 35,000°F, and vaporize metal in the equipment. The arc flash can cause severe skin burns by direct heat exposure and by igniting clothing. Arc-blast impacts occur from the heating of the air and vaporization of metal, creating a pressure wave that can damage hearing and cause memory loss and other injuries. Electric shocks and blasts can also cause falls if the shock occurs when the employee is on a ladder or scaffold.

Every job that deals with electricity needs to be carefully planned. Before starting a job, decide on the approach and step-by-step procedures and discuss hazards and procedures with other employees who will be exposed before starting a job. A job briefing should be held before starting each job and include all employees involved. The briefing should cover hazards associated with the job, work procedures involved, special precautions, energy source controls, and PPE requirement. The following principles should be applied before starting a job:

- 1) Identify the hazards – Perform a job hazard analysis to identify steps that could create electric shock or arc flash hazards. The hazard analysis should contain event severity, frequency, probability, and avoidance to determine the level of safe practices employed.
- 2) Minimize the hazards – De-energize the equipment, insulate, or isolate exposed live parts. If this is not possible, use the proper PPE and tools.
- 3) Anticipate problems – Plan and have the materials available for the worst-case scenario
- 4) Training – Ensure that everyone who is working with electricity is a qualified person with the appropriate training for the job.

DE-ENERGIZE

Whenever possible, live parts should be put into an electrically safe work condition, unless it can be demonstrated that de-energizing creates more or worse hazards or is not practical because of equipment design or operational limitations. You may have to work live to avoid interrupting life-support systems, de-activating emergency alarm systems, or shutting down ventilation equipment for hazardous locations, for instance. De-energizing would not be practical during testing of live electric circuits or work on circuits that are part of a continuous process that cannot be completely shut down.

The most important principle of electric safety is to *assume electric circuits are energized unless you make **sure** they are not*. Test every circuit and conductor every time you work on them. The National Fire Protection Association lists six steps to ensure conditions for electrically safe work.

- 1) Identify all sources of power to the equipment.
- 2) Interrupt the load current, and then open the disconnecting devices for each power source.
- 3) Where possible, visually verify that blades of disconnecting devices are fully open or that draw out-type circuit breakers are fully withdrawn.
- 4) Apply lockout/tagout devices in accordance with a formal, written policy.
- 5) Test each phase conductor or circuit part with an adequately rated voltage detector to verify that the equipment is de-energized, check all conductors phase to phase and phase to ground. Check the voltage detector before and after each test to be sure it is working.

- 6) Properly ground all possible sources of induced voltage and stored electric energy (such as, capacitors) before touching. If conductors or circuit parts that are being de-energized could contact other exposed conductors or circuit parts, apply ground-connecting devices rated for the available fault current.

The process of de-energizing is “live” work and can result in an arc flash due to equipment failure. When de-energizing, follow the procedures described below in “Working On or Near Live Circuits.”

WORKING ON OR NEAR LIVE PARTS

Working on live circuits means actually touching energized equipment with body parts or tools. Working near live circuits means working close enough to energized parts to pose a risk even though you may be working on de-energized parts.

Common tasks where you need to work on or near live circuits include:

- Taking voltage measurements
- Opening and closing disconnects and breakers
- Racking breakers on and off the bus
- Removing panels and dead fronts
- Opening electric equipment doors for inspection

Standard written procedures and training for these common tasks must be created. All employees must be trained to understand the specific hazards associated with electrical energy, and training must be documented. Unqualified persons are not permitted to work with or near electricity.

When opening and closing disconnects, use the right-hand rule when possible (stand to the right side of the equipment and operate the disconnect switch with your left hand). For other situations where you may have to work on or near live circuits, an Energized Electrical Work Permit, which must be authorized by a qualified foreman should be instituted.

An Energized Electrical Work Permit should, at a minimum, contain this information:

- A description of the circuit and equipment to be worked on and location
- The date and time covered by the permit
- Justification as why the work is to be done in an energized condition.
- Results of shock hazard analysis and determination of shock protection boundaries
- Results of flash hazard analysis and determination of flash protection boundary
- PPE to be worn and description of safe work practices to be used
- Who will do the work and how unqualified persons will be kept away
- Evidence of completion of job briefing, including description of job-specific hazards.

APPROACH DISTANCES

- 1) Limited Approach Boundary - the closest distance an unqualified person can approach, unless accompanied by a qualified person. When working within the Limited Approach Boundary, always consider all electrical parts live until proven otherwise. Employees shall be trained in the skills and techniques to:
 - Distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment
 - To determine the normal voltage of exposed energized electrical conductors and circuit parts
 - The approach distances
 - The decision making process necessary to determine the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely
- 2) Restricted Approach Boundary - the closest distance to exposed live parts a qualified person can approach without proper PPE and tools. Inside this boundary, accidental movement can put a part of your body or conductive tools in contact with live parts. To cross the restricted approach boundary, the qualified person must:
 - Have a documented plan that is approved by the manager responsible for the safety plan.
 - Use PPE suitable for working near exposed live parts and rated for the voltage and energy level involved.
 - Minimize the risk from unintended movement, by keeping as much of the body as possible out of the restricted space; body parts in the restricted space should be protected.
- 3) Flash protection boundary - the distance at which PPE is needed to prevent incurable burns (2nd degree or worse) if an arc flash occurs. (You still can get 1st or 2nd degree burns.) For systems of 600 volts and less, the flash protection boundary is 3 feet, based on an available bolted fault current of 25 kA (kilo amps) and a clearing time of 6 cycles (0.1 seconds) for the circuit breaker to act, or any combination of fault currents and clearing times not exceeding 150 kA cycles. For other fault currents and clearing times, see NFPA 70E.
 - When you have de-energized the parts you are going to work on, but are still inside the flash protection boundary for nearby live exposed parts: If the parts cannot be de-energized, you must use barriers such as insulated blankets to protect against accidental contact or you must wear proper PPE.

PERSONAL PROTECTIVE EQUIPMENT

When working on or around live circuits, be sure to wear the right PPE to protect against electric shock and arc flash. Never wear clothing made from synthetic materials, such as acetate, nylon, polypropylene and spandex – alone or combined with cotton. Such clothing is dangerous because it can burn and melt into your skin.

The type of PPE worn depends on the type of electrical work being done. All insulating PPE must be inspected prior to each day's use and immediately after any incident. Testing of rubber insulating PPE must be performed before issue and at the following maximum test intervals: blankets - every 12 months, gloves – every 6 months, sleeves – every 12 months, covers and Line hose – if insulating valve is suspect.

Once the hazard/risk category has been identified, check requirements for clothing and other PPE when working on or near energized equipment within the flash protection boundary. These PPE requirements protect against electric shock and incurable arc-flash burns. They do not protect against physical injuries from arc blasts.

ATTACHMENT A: OSHA STANDARD FOR THE CONTROL
OF HAZARDOUS ENERGY
(LOCKOUT/TAGOUT)

- 29 CFR 1910.147

ATTACHMENT B: AUTHORIZED PERSONNEL

ATTACHMENT B: AUTHORIZED PERSONNEL

PERSONNEL AUTHORIZED TO PERFORM LOCKOUT/TAGOUT

PAT ZIACIK

ERIC GREENWAY

SHAWN CODDINGTON

CHAD GALBREATH

**ATTACHMENT C: EQUIPMENT-SPECIFIC
PROCEDURES FOR
LOCKOUT/TAGOUT**

Note: The following procedures establish the minimum requirements for the lockout of energy whenever maintenance or servicing is performed. Authorized employees are required to perform the lockout in accordance with each individual machine's procedure. All employees, upon seeing a machine or piece of equipment which is locked out shall not attempt to start, energize, or use that machine or equipment.

STANDARD PROCEDURE FOR SINGLE ENERGY SOURCE (SINGLE PLUG) MACHINES



- 1) The authorized person must have exclusive control of the power cord



- 2) Insert the plug into the lockout receptacle.



- 3) Lock and tag the closed receptacle.
The authorized person must maintain sole possession of the key.



- 4) The machine is now locked and tagged.

New Equipment

Machine: _____
Manufacturer: _____
Location: _____

ENERGY SOURCES:

(Energy types may include: Electrical, Mechanical, Battery, Natural Gas, Gasoline/Diesel, Hydraulic, Pneumatic, Steam, etc.)

Energy Type	Energy Isolation Device (s)	Magnitude(s)	Location & Description of Energy Isolation Device (s)	Lockout Device/ Means of Isolation
1.				
2.				
3.				
4.				

AUTHORIZED EMPLOYEES

Refer to Attachment B of the Control of Hazardous Energy (Lockout/Tagout) program for a list of authorized employees.

SHUTDOWN PROCEDURES:

The steps listed below must be followed to properly shut down and de-energize this equipment.

1. Notify all affected employees (the machine operator and any employees working in the area) that servicing or maintenance is required on this machine and that the machine must be shut down and locked out to perform the servicing or maintenance.
 - a. Notification will be made by the following methods:

2. If the machine is operating, please follow the normal stopping procedure to shut it down.
 - a. _____
 - b. _____
3. De-activate each energy source and apply energy isolating devices, which are stored _____, so that the machine is isolated from all energy sources.
4. Lock out the energy isolating devices with the assigned individual locks and apply individual tags to the locks.
5. All stored or residual energy must be dissipated or restrained
 - a. _____
 - b. _____
6. Verify that all energy has been dissipated by first checking that no personnel are exposed, then by attempt to re-start the machine. Return the operating controls to the "neutral" or "off" position after verifying the isolation of the machine.
7. The machine or equipment has now been locked out.

RESTART PROCEDURES:

The steps listed below must be followed to properly release this equipment from a locked or tagged out condition and restart it.

1. Inspect the machine and the immediate area around the machine to ensure that nonessential items have been removed and that the machine components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine.
5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

New Equipment

Machine: _____
Manufacturer: _____
Location: _____

ENERGY SOURCES:

(Energy types may include: Electrical, Mechanical, Battery, Natural Gas, Gasoline/Diesel, Hydraulic, Pneumatic, Steam, etc.)

Energy Type	Energy Isolation Device (s)	Magnitude(s)	Location & Description of Energy Isolation Device (s)	Lockout Device/ Means of Isolation
1.				
2.				
3.				
4.				

AUTHORIZED EMPLOYEES

Refer to Attachment B of the Control of Hazardous Energy (Lockout/Tagout) program for a list of authorized employees.

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 - a. Notification will be made by the following methods:

2. If the machine is operating, please follow the normal stopping procedure to shut it down.
 - a. _____
 - b. _____
3. De-activate each energy source and apply energy isolating devices, which are stored _____, so that the machine is isolated from all energy sources.
4. Lock out the energy isolating devices with the assigned individual locks and apply individual tags to the locks.
5. All stored or residual energy must be dissipated or restrained
 - a. _____
 - b. _____
6. Verify that all energy has been dissipated by first checking that no personnel are exposed, then by attempt to re-start the machine. Return the operating controls to the "neutral" or "off" position after verifying the isolation of the machine.
7. The machine or equipment has now been locked out.

RESTART PROCEDURES:

The steps listed below must be followed to properly release this equipment from a locked or tagged out condition and restart it.

1. Inspect the machine and the immediate area around the machine to ensure that nonessential items have been removed and that the machine components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine.
5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

New Equipment

Machine: _____
Manufacturer: _____
Location: _____

ENERGY SOURCES:

(Energy types may include: Electrical, Mechanical, Battery, Natural Gas, Gasoline/Diesel, Hydraulic, Pneumatic, Steam, etc.)

Energy Type	Energy Isolation Device (s)	Magnitude(s)	Location & Description of Energy Isolation Device (s)	Lockout Device/ Means of Isolation
1.				
2.				
3.				
4.				

AUTHORIZED EMPLOYEES

Refer to Attachment B of the Control of Hazardous Energy (Lockout/Tagout) program for a list of authorized employees.

SHUTDOWN PROCEDURES:

The steps listed below must be followed to properly shut down and de-energize this equipment.

1. Notify all affected employees (the machine operator and any employees working in the area) that servicing or maintenance is required on this machine and that the machine must be shut down and locked out to perform the servicing or maintenance.
 - a. Notification will be made by the following methods:

2. If the machine is operating, please follow the normal stopping procedure to shut it down.
 - a. _____
 - b. _____
3. De-activate each energy source and apply energy isolating devices, which are stored _____, so that the machine is isolated from all energy sources.
4. Lock out the energy isolating devices with the assigned individual locks and apply individual tags to the locks.
5. All stored or residual energy must be dissipated or restrained
 - a. _____
 - b. _____
6. Verify that all energy has been dissipated by first checking that no personnel are exposed, then by attempt to re-start the machine. Return the operating controls to the "neutral" or "off" position after verifying the isolation of the machine.
7. The machine or equipment has now been locked out.

RESTART PROCEDURES:

The steps listed below must be followed to properly release this equipment from a locked or tagged out condition and restart it.

1. Inspect the machine and the immediate area around the machine to ensure that nonessential items have been removed and that the machine components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine.
5. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

ATTACHMENT D: OUTSIDE
 PERSONNEL/CONTRACTOR
 CERTIFICATION

Outside Personnel/Contractor Certification

We certify that Penn Fencing and _____
(outside personnel/contractor)
have informed each other of our respective lockout/tagout procedures. Penn Fencing and contractor employees understand and will comply with the restrictions and prohibitions set forth in the other employer's energy control program.

Penn Fencing, Inc. Representative

Date

Contractor Representative

Date

ATTACHMENT E: LOCKOUT/TAGOUT PERIODIC
INSPECTION FORM

Lockout/Tagout Periodic Inspection Form

Machine/Equipment Name: _____

Authorized Inspector (Print): _____

Authorized Employee(s) (Print): _____

Review the energy control procedure and employee responsibilities with the involved employee(s) and complete the following:

- | | Yes | No |
|---|--------------------------|--------------------------|
| 1. Are the steps in the energy control procedure being followed? <ul style="list-style-type: none">• If no, provide a detailed description of the problem on the next page, along with a description of any corrective action taken or planned. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Do the involved employee(s) understand their responsibility under the procedure? <ul style="list-style-type: none">• If no, provide a detailed description of the problem and any corrective action needed on the next page | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Are there any inadequacies in the employees' knowledge, abilities, or use of the procedures? <ul style="list-style-type: none">• If yes, provide a detailed description of the problem and any corrective action needed on the next page | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Is the procedure adequate to provide the necessary protection? <ul style="list-style-type: none">• If no, provide a detailed description of the problem and any corrective action needed on the next page. | <input type="checkbox"/> | <input type="checkbox"/> |

Corrective Action

- No deviations or inadequacies have been found. A corrective action plan is not needed.
- Deviations or inadequacies exist and need to be corrected. Continue to the Corrective Action plan on the next page.

I hereby certify the periodic inspection for compliance with lockout/tagout standards on this machine/equipment have been satisfactory completed with the employee identified above

Authorized Inspector:

Signature Title Date

Lockout/Tagout Periodic Inspection: Corrective Action Form

Machine/Equipment Name: _____

Authorized Inspector (Print): _____

Authorized Employee(s) (Print): _____

Corrective Action: Use the space provided below to describe any problems identified during the inspection, along with a description of any corrective action needed. Appropriate action must be taken to ensure that the deficiencies are corrected. This may involve making changes to the procedure, providing retraining to employees, and/or taking additional steps to ensure compliance.

Deviations or inadequacies are scheduled to be corrected by (date): _____

Authorized Inspector: _____
Signature Date

I certify that repairs/corrections have been completed:

Signature Title Date

ATTACHMENT F: OSHA STANDARD FOR ELECTRICAL
SAFETY-RELATED WORK
PRACTICES

- 29 CFR 1910.331-335

ATTACHMENT G: TRAINING DOCUMENTATION

OSHA's Employee Responsibilities

- Read the OSHA Poster at the workplace.
- Comply with all applicable OSHA standards.
- Follow all lawful employer safety and health rules and regulations and wear or use prescribed protective equipment while working.
- Report hazardous conditions to the supervisor.
- Report any work-related injury or illness to the employer, and seek treatment promptly.
- Exercise rights under the Act in a responsible manner.

ATTACHMENT H: NEW HIRE TRAINING
DOCUMENTATION

OSHA's Employee Responsibilities

- Read the OSHA Poster at the workplace.
- Comply with all applicable OSHA standards.
- Follow all lawful employer safety and health rules and regulations and wear or use prescribed protective equipment while working.
- Report hazardous conditions to the supervisor.
- Report any work-related injury or illness to the employer, and seek treatment promptly.
- Exercise rights under the Act in a responsible manner.

New Hire Training Summary: Lockout/Tagout & Electrical Safety

The following items must be reviewed with employees upon initial assignment.

- The requirements of the OSHA standard covering Lockout/Tagout
- Employee Responsibilities
 - Authorized Employees: An authorized employee is defined as a person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment.
 - Affected Employees: (all other employees) are responsible for insuring they do not attempt to restart or re-energize machines or equipment that are locked out or tagged out. An affected employee is defined as a person whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.
- 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
 - Discuss the different types of energy sources associated with the company-specific equipment and the appropriate means of isolation control
 - Make sure the employee is aware of all hazards associated with the company-specific equipment.
- The purpose and use of the energy control procedure
 - Lockout/Tagout is to be used to control hazardous energy relating to the maintenance and service of company equipment
 - Procedure:
 - Review the Written LO/TO Procedure
 - Notify Affected Employees
 - Shut Down the Equipment
 - Isolate the Equipment from all its Energy Sources
 - Lock and Tag the Energy-Isolating Device
 - Ensure There is no Residual Energy in the Energy-Controlled Device
 - Attempt to Start Equipment
- Procedures and prohibitions relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out
 - Procedure to release from lockout/tagout
 - Verify that it is Safe to Reenergize
 - Clear all Tools and Personnel
 - Replace Safety Guards
 - Remove all LO/TO Devices, Isolating and Grounding Devices
 - Notify all Affected Personnel
 - Return Equipment to Service
- Tags (when to use and limitations)
 - Tags are used to verify that the lockout/tagout program is being utilized.
 - Tags should be used in conjunction with a locking device to assure that the energy is isolated.

- Safe work practices when working with and near electrical equipment
 - De-energize electrical equipment before inspecting or making repairs.
 - Only use electric tools that are in good repair.
 - Use good judgment when working near energized lines or equipment.
 - Use appropriate PPE and insulated tools.
 - Only use approved electrical or electronic equipment, instrumentation, and tools in hazardous (classified) locations.
 - Keep cords and electrical equipment away from water.
 - Use surge protectors to protect computer equipment.
 - Use proper watt bulb called for by the lighting fixture.
 - Make sure all appliances and equipment are FM or UL approved.

Upon completing the review of the above information, have new employees sign the new hire training log on the following page.

