

CONTROL OF HAZARDOUS ENERGY

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1. SCOPE and APPLICATION

- 1.1.** This program identifies the requirements for assessment and control of hazardous energy for faculty, staff, student assistants, or identified volunteers who clean, repair, service, set up, and/or adjust machines and equipment in which the unexpected energization or startup of the machines or equipment, or the release of stored energy could cause injury to employees.
- 1.2.** This program does not apply to any work within 10' of exposed energized moveable conductors or 3.5' of exposed energized fixed conductors for potentials greater than 50 volts. This includes troubleshooting. See Electrical Safety Program for requirements.

2. ROLES and RESPONSIBILITIES

2.1. EHS Program Administrator to:

- 2.1.1.** Establish, communicate and maintain this program in accordance with applicable regulations, and executive orders.
- 2.1.2.** Review training content to maintain compliance with this program.
- 2.1.3.** Conduct program reviews and communicate results to the organization.
- 2.1.4.** Track and trend results of program review by college or unit.
- 2.1.5.** Communicate hazard and control measure information to the organization.
- 2.1.6.** Assist the campus with identification of health and safety hazards and appropriate control measures related to Control of Hazardous Energy.

2.2. Associate Vice President (AVP)/Deans are responsible to:

- 2.2.1.** Communicate program to directors and department chairs
- 2.2.2.** Provide resources to directors and department chairs to communicate, implement and maintain program
- 2.2.3.** Request feedback from directors and department chairs on the communication and implementation of this program.
- 2.2.4.** Set priorities for the college or unit on implementation and maintenance with assistance from EHS

2.3. Directors/Department Chairs are responsible to:

- 2.3.1.** Communicate program to managers, supervisors, leads, and principal investigators
- 2.3.2.** Provide resources to managers, supervisors, leads, and principal investigators to communicate, implement and maintain program
- 2.3.3.** Request feedback from managers, supervisors, leads, and principal investigators on the communication and implementation of this program.
- 2.3.4.** Set priorities for managers, supervisors, leads, and principal investigators on implementation and maintenance with assistance from EHS

2.4. Managers/Supervisors/Leads/Principal Investigators are responsible to:

- 2.4.1.** Communicate program to Staff/Student Workers/Official Volunteers
- 2.4.2.** Provide resources to Staff/Student Workers/Official Volunteers to communicate, implement and maintain program
- 2.4.3.** Request feedback from Staff/Student Workers/Official Volunteers on the communication and implementation of this program.

- 2.4.4.** Set priorities for Staff/Student Workers/Official Volunteers on implementation and maintenance with assistance from EHS

2.5. Faculty are responsible to:

- 2.5.1.** Identify and report hazards associated with their teaching and research activities to the Department Chair and College/Department Safety Coordinator
- 2.5.2.** Attend/complete required training
- 2.5.3.** Work with Safety Coordinator and EHS to implement program requirements

2.6. Staff/Student Workers/Official Volunteers are responsible to:

- 2.6.1.** Review this program and associated hazard assessments prior to performing any activities subject to this program
- 2.6.2.** Attend /complete required training
- 2.6.3.** Report hazards, injuries, illness and near misses to your supervisor

2.7. Contractors: See Section 3.7 - Contractor & Cal Poly Requirements and Responsibilities

2.8. Program Specific Employee Designations and Responsibilities:

- 2.8.1. Affected Employee.** An employee whose job requires them to operate or use a machine or equipment on which cleaning, repairing, servicing, setting-up or adjusting operations are being performed under lockout or tagout, or whose job requires the employee to work in an area in which such activities are being performed under lockout or tagout.

- 2.8.1.1.** Is identified by the Authorized Employee
 - 2.8.1.2.** Must attend training as specified in Section 3.8.1
 - 2.8.1.3.** Must obey all warning signs and instructions pertaining to equipment locked out or tagged out.

- 2.8.2. Authorized Employee.** A person qualified to lockout or tagout specific machines or equipment in order to perform cleaning, repairing, servicing, setting-up, and adjusting operations on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include cleaning, repairing, servicing, setting-up and adjusting operations covered under this section.

- 2.8.2.1.** Is designated by their appropriate administrator
 - 2.8.2.2.** Must attend training as specified in Section 3.8.1
 - 2.8.2.3.** Performs/reviews the Job Hazard Analysis, in collaboration with Cal Poly EHS, See Attachment 9.1, Job Hazard Analysis Template, Control of Hazardous Energy, Lockout Tagout Procedure Template
 - 2.8.2.4.** Determines/reviews the appropriate Hazardous Energy Controls, in collaboration with Cal Poly EHS, See Attachment 9.1, Job Hazard Analysis Template, Control of Hazardous Energy, Lockout Tagout Procedure Template
 - 2.8.2.5.** Writes/reviews the equipment specific Lockout Tagout procedure for each applicable, in collaboration with Cal Poly EHS, See Attachment 9.1, Job Hazard Analysis Template, Control of Hazardous Energy, Lockout Tagout Procedure Template
 - 2.8.2.6.** Notifies any affected employees of a pending Lockout Tagout operation
 - 2.8.2.7.** Implements the Lockout Tagout procedure

2.8.2.8. Performs the annual review of the Lockout Tagout hazard assessment and procedure

2.8.3. Qualified Electrical Worker. A qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits and equipment and who has demonstrated by performance familiarity with the work to be performed and the hazards involved. This designation applies to electricians, lead electricians, and supervising electricians only. See Appendix 8.1, State Classifications Approved to Work on Energized Electrical Components

2.8.4. Qualified Person. A person, designated by the employer to work with low voltage electrical circuits (less than 600 volts), who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk. See Appendix 8.1, State Classifications Approved to Work on Energized Electrical Components

2.8.4.1. Whether an employee is considered to be a “qualified person” will depend upon various circumstances in the workplace. For example, it is possible for an individual to be considered “qualified” with regard to certain equipment in the workplace, but “unqualified” as to other equipment.

2.8.4.2. 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 is considered to be a qualified person for the performance of those duties.

3. REQUIREMENTS

3.1. Overview:

3.1.1. Implementation of the Control of Hazardous Energy Procedure requires the following:

- Hazard Assessment
- Selection of Controls
- Implementation of Lockout Procedure
- Training
- Recordkeeping
- Auditing

3.1.1.1. Procedure Overview

3.1.1.1.1. Notification of affected employees

3.1.1.1.2. If equipment is operating, shut it down using normal stopping procedure.

3.1.1.1.3. Operate the switch, valve, or other energy isolating device so that the energy source is disconnected or isolated from the equipment.

3.1.1.1.4. Dissipate stored energy, such as that in capacitors, springs, elevated machine members, rotating fly wheels, hydraulic systems, and air, gas, steam, or water pressure must also be dissipated or restrained.

- 3.1.1.1.5. Lockout energy isolating devices with appropriate lock.
 - 3.1.1.1.5.1. Electrical lockout of hardwired equipment for work on exposed energized conductors must be performed by qualified persons. See Appendix 8.1
- 3.1.1.1.6. After ensuring that no personnel are exposed operate the activation controls to verify the equipment will not operate. Return controls to neutral position.
- 3.1.1.1.7. To restore equipment to service.
 - 3.1.1.1.7.1. Ensure all personnel are clear of the equipment and notify affected personnel.
 - 3.1.1.1.7.2. Remove locks
 - 3.1.1.1.7.3. Restore energy sources
 - 3.1.1.1.7.4. Restart equipment

3.2. Hazard Assessment:

- 3.2.1. An authorized person shall complete/review a hazard assessment per Attachment 9.1 or equivalent prior to cleaning, repairing, adjusting, setting up, troubleshooting, or unjamming machines or equipment in which the unexpected energization or startup of the machines or equipment, or release of stored energy could cause injury to employees.
- 3.2.2. The hazard assessment shall document the following
 - 3.2.2.1. all energy sources present in the machine or equipment – including both shock and arc flash hazards
 - 3.2.2.2. the tasks to be performed
 - 3.2.2.3. whether energized troubleshooting is necessary
 - 3.2.2.4. and must be specific to the machine or equipment assessed.
 - 3.2.2.5. the specific hazard
 - 3.2.2.6. the potential for injury
 - 3.2.2.7. the potential severity of injury due to exposure
- 3.2.3. The hazard assessment must be performed by an authorized person knowledgeable in the operation, hazards, and controls pertaining to the specific machine or equipment assessed.
- 3.2.4. The hazard assessment shall include review of the manufacturer's instructions.
- 3.2.5. The hazard assessment must be reviewed annually for changes.

3.3. Hazardous Energy Controls

- 3.3.1. General
 - 3.3.1.1. Prior to the application of lockout tagout devices all energy sources must be disconnected and all stored energy dissipated.
 - 3.3.1.2. If equipment can use a lockout device or can be readily adapted to accept a lockout device then a lockout device must be used. A tagout device may only be used when a lockout device cannot be used.
 - 3.3.1.2.1. A lockout device is not required if the machine equipment must be capable movement during cleaning, servicing, adjusting, or unjamming operations then, Cal Poly shall minimize the hazard by providing and

requiring the use of extension tools (eg., extended swabs, brushes, scrapers) or other methods or means to protect employees from injury due to such movement. Employees shall be made familiar with the safe use and maintenance of such tools, methods or means, by thorough training.

- 3.3.1.2.2. A lockout device is not required for work on cord and plug-connected electric equipment for which exposure to the hazards of unexpected energization 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 work.

3.3.1.3. Lockout Devices-

- 3.3.1.3.1. Shall be uniform across Cal Poly and readily identifiable as lockout devices.
- 3.3.1.3.2. Shall include a lock – keyed or combination
- 3.3.1.3.3. Shall identify the person who installed it
- 3.3.1.3.4. Shall be used to prevent operation of the disconnecting/isolating means
- 3.3.1.3.5. Lockout devices shall be used with a tag which contains a statement prohibiting unauthorized operation of the disconnecting/isolating means and prohibiting unauthorized removal of the device.
- 3.3.1.3.6. The lockout device shall be suitable for the environment where used.
- 3.3.1.3.7. The key/combination for the lockout device shall remain in the possession of the authorized user who applied it unless removed in accordance with section 3.6 Alternate Removal of Lockout/Tagout Devices.
- 3.3.1.3.8. Lockout devices shall not be used for general prevention of unauthorized use. Locking mechanisms that are visually distinct from lockout devices must be used.

3.3.1.4. Tagout Devices-

- 3.3.1.4.1. The tag shall include a tag and attachment device.
- 3.3.1.4.2. The tag must be readily identifiable as a tagout device and suitable for the environment where used.
- 3.3.1.4.3. The tag attachment must withstand a 50 pound pull at right angles to the machine surface.
- 3.3.1.4.4. The tag attachment shall be non-reusable, attachable by hand, self-locking, non-releasable, and equal to an all environment nylon cable tie.
- 3.3.1.4.5. The tag shall contain a statement prohibiting unauthorized operation of the disconnecting means or removal of the tag.
- 3.3.1.4.6. In addition to the tag accident prevention signs may be required to ensure the machine/equipment is not activated or energized.

3.3.1.5. Energized Electrical Work Including Troubleshooting, Hardwired Conductors and Components - All work on energized hardwired electrical conductors or components must be performed by qualified personnel – See Appendix 8.1, State Classifications Approved to Work on Energized Electrical Components.

3.3.1.6. Energized Electrical Work Including Troubleshooting, Plug and Cord Equipment - **All work on energized electrical conductors or components in plug and cord connected equipment is not subject to this program See Electrical Safety Procedure for requirements.**

3.3.1.7. All work on energized electrical conductors or components 400 volts and above must be performed by Cal Poly Electricians.

3.3.2. Mechanical

3.3.2.1. All stored energy in a mechanical system must be dissipated or the equipment must be physically blocked to prevent movement. For example spring or weight energy sources must have the spring tension relieved or the weight at stable base of travel otherwise the system must be blocked/locked to prevent movement by a means capable of stopping all motion.

3.3.3. Hydraulic

3.3.3.1. All stored energy in a hydraulically actuated system must be dissipated or disconnected from the machine equipment.

3.3.3.2. This can be done by locking/tagging out the pump/pressure source and relieving the pressure. The system must be placed in a condition where the pressure cannot build up.

3.3.3.3. Alternatively, the hydraulic lines can be disconnected and secured with a LOTO device.

3.3.4. Pneumatic

3.3.4.1. All stored energy in a pneumatically actuated system must be dissipated or disconnected from the machine equipment.

3.3.4.2. This can be done by locking/tagging out the pump/pressure source and relieving the pressure. The system must be placed in a condition where the pressure cannot build up.

3.3.4.3. Alternatively, the pneumatic lines can be disconnected and secured with a LOTO device.

3.3.5. Chemical

3.3.5.1. Chemical energy sources must be secured and isolated in a manner which eliminates the potential for injury from the associated equipment.

3.3.5.2. The securing and isolation method is dependent the specific chemicals involved and the energy transfer mechanism of the equipment.

3.3.6. Electrical

3.3.6.1. Controls for plug and cord connected equipment

- 3.3.6.1.1. Lockout devices are required when plug and cord connected machines or equipment contain/use other sources of hazardous energy that are not controlled by unplugging the machine or equipment.
- 3.3.6.1.2. The authorized person shall verify that the plug and cord connected machine or equipment does not contain capacitors, batteries, or electrolytic cells that may contain hazardous energy after the machine or equipment is unplugged. If these elements are present the energy contained must be controlled.

3.3.6.2. Controls for hard wired equipment

- 3.3.6.2.1. LOTO of the disconnecting means is required for cleaning, repairing, adjusting, setting up, troubleshooting, or unjamming of machines or equipment performed on mechanical components and no possible contact with energized conductor or components.
- 3.3.6.2.2. The authorized person shall verify that hard wired machine or equipment does not contain capacitors, batteries, or electrolytic cells that may contain hazardous energy after the machine or equipment is unplugged. If these elements are present the energy contained must be controlled.
- 3.3.6.2.3. LOTO of the disconnecting means AND verification of Electrically Safe Work Condition is required for cleaning, repairing, adjusting, setting up, troubleshooting, or unjamming of machines or equipment performed on electrical components and/or possible contact with energized electrical conductors or components.
 - 3.3.6.2.3.1. Only Qualified Employees and Qualified Electrical Workers, designated by classification in Appendix 8.1 - State Classifications Approved to Work on Energized Electrical Components, are allowed to lock out and verify hardwired equipment.
- 3.3.6.2.4. All test instruments used must be rated for the nominal voltage present in the circuit under test.
- 3.3.6.2.5. Insulating Gloves are required when working on any exposed energized circuit components above 250 volts.

3.3.7. Thermal

- 3.3.7.1. Thermal energy sources must be secured and isolated in a manner which eliminates the potential for injury from the associated equipment.
- 3.3.7.2. The securing and isolation method is dependent the specific heating method involved and the energy transfer mechanism of the equipment.

3.3.8. Other hazardous energy sources

- 3.3.8.1. All energy sources must be evaluated for harm and appropriate controls implemented to prevent injury.

3.4. Lockout Procedure

3.4.1. Written procedures shall be developed, documented, and used for the control of potentially hazardous energy. See Attachment 9.1, Job Hazard Analysis Template, Control of Hazardous Energy, Lockout Tagout Procedure Template

3.4.2. The procedure shall clearly and specifically outline the scope, purpose, responsibility, authorization, rules, and techniques to be applied to the control of hazardous energy, and the measures to enforce compliance including, but not limited to, the following:

3.4.2.1. A specific statement of the intended use of this procedure;

3.4.2.2. Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

3.4.2.3. Specific procedural steps for the placement, removal, and transfer of lockout devices or tagout devices and the responsibility for them;

3.4.2.4. Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures; and

3.4.2.5. The LOTO procedure shall include separate procedural steps for the safe lockout/tagout of each machine or piece of equipment affected by the hazardous energy control procedure.

3.4.2.5.1. The procedural steps for the safe lockout/tagout of prime movers, machinery or equipment may be used for a group or type of machinery or equipment, when either of the following two conditions exist:

3.4.2.5.2. Condition 1:

3.4.2.5.2.1. A. The operational controls named in the procedural steps are configured in a similar manner, and

3.4.2.5.2.2. B. The locations of disconnect points (energy isolating devices) are identified, and

3.4.2.5.2.3. C. The sequence of steps to safely lockout or tagout the machinery or equipment are similar.

3.4.2.5.3. Condition 2: The machinery or equipment has a single energy supply that is readily identified and isolated and has no stored or residual hazardous energy.

3.4.3. General

3.4.3.1. All electrical conductors and components must be considered energized unless tested and verified de-energized.

3.4.3.2. All testing of electrical conductors and components for an electrically safe work condition must use the "live-dead-live" method.

3.4.3.3. Equipment that contains capacitors must have the capacitors shorted, grounded, and verified de-energized before performing any activities that may contact them or attached conductors.

3.4.3.4. Only qualified persons (see Appendix 8.1) may create an electrically safe work condition for hardwired equipment.

3.4. Troubleshooting of Equipment-

3.4.1. Troubleshooting requires enabling some or all of the energy source present for a machine or equipment. This condition significantly increases the risk of injury.

Additional hazard assessment and controls are required to ensure the hazards are mitigated.

3.4.2. Mechanical, Hydraulic, Pneumatic, Chemical, Thermal, and Other Hazardous Energy Sources.

3.4.2.1. Implement controls that minimize or eliminate the potential hazardous exposure.

3.4.3. Electrical

3.4.3.1. All troubleshooting of energized hard wired equipment that must be performed on exposed, energized conductors must be performed by qualified persons, (See Appendix 8.1).

3.4.3.2. All troubleshooting of energized plug and cord connected equipment that must be performed on exposed, energized conductors **is not subject to this program See Electrical Safety Procedure for requirements.**

3.5. Periodic Inspections

3.5.1. The employer shall conduct a periodic inspection of the energy control procedure(s) at least annually to evaluate their continued effectiveness and determine necessity for updating the written procedure(s).

3.5.2. The periodic inspection shall be performed by an authorized employee or person other than the one(s) utilizing the hazardous energy control procedures being inspected.

3.5.3. Where lockout and/or tagout is used for hazardous energy control, the periodic inspection shall include a review between the inspector and authorized employees of their responsibilities under the hazardous energy control procedure being inspected.

3.5.4. The employer shall certify that the periodic inspections have been performed. The certification shall identify the machine or equipment on which the hazardous energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

3.6. Group Lockout/Tagout

3.6.1. When servicing and/or maintenance is performed by a crew, craft, department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the utilization of a personal lockout or tagout device.

3.6.1.1. Group lockout or tagout devices shall be used in accordance with the procedures required by Section 3.2 Hazardous Energy Controls and also in accordance with requirements that include, but are not necessarily limited to, the following:

3.6.1.1.1. Primary responsibility shall be vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

3.6.1.1.2. Provision shall be made for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment;

3.6.1.1.3. When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control

responsibility shall be given to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

- 3.6.1.1.4. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

3.6.2. Shift or Personnel Changes.

- 3.6.2.1. Specific hazardous energy control procedures (i.e. lockout/tagout) shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including, but not necessarily limited to, provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, in order to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy.

3.7. Contractor & Cal Poly Requirements and Responsibilities

3.7.1. Cal Poly shall inform contract employers of the following :

- 3.7.1.1. Known hazards that are covered by this standard, that are related to the contract employer's work, and that might not be recognized by the contract employer or its employees
- 3.7.1.2. Information about the employer's installation that the contract employer needs to make the assessments
- 3.7.1.3. Shall report observed contract employer-related violations of this standard to the contract employer.

3.7.2. The contract employer shall ensure that each of his or her employees is instructed in the hazards communicated to the contract employer by Cal Poly. This instruction shall be in addition to the basic training required by this standard.

3.7.3. The contract employer shall ensure that each of his or her employees follows the work practices required by this standard and safety-related work rules required by the Cal Poly.

3.7.4. The contract employer shall advise Cal Poly of the following:

- 3.7.4.1. Any unique hazards presented by the contract employer's work
- 3.7.4.2. Hazards identified during the course of work by the contract employer that were not communicated by Cal Poly
- 3.7.4.3. The measures the contractor took to correct any violations reported by Cal Poly and to prevent such violation from recurring in the future.

3.7.5. Documentation. Where Cal Poly has knowledge of hazards covered by this standard that are related to the contract employer's work, there shall be a documented meeting between Cal Poly and the contract employer.

3.8. Training

- 3.8.1. Authorized employees shall be trained on hazardous energy control procedures and on the hazards related to performing activities required for cleaning, repairing, servicing, setting-up and adjusting prime movers, machinery and equipment.

Passing Skillsoft Course “Lockout/Tagout – Cal/OSHA” ehs_cal_a17_sh_enus and reading this document complies with this requirement for all non-electrical lockout/tagouts.

3.8.2. Each affected employee shall be instructed in the purpose and use of the energy control procedure.

3.8.3. All other employees whose work operations may be in an area where energy control procedures may be utilized, shall be instructed about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

3.8.4. Type of Training. The training shall be classroom, on-the-job, or a combination of the two. The type and extent of the training provided shall be determined by the risk to the employee.

3.8.5. Lockout/ Tagout Procedure Training.

3.8.5.1. Initial Training. Employees involved in or affected by the lockout/tagout procedures shall be trained in the following:

3.8.5.1.1.1. The lockout/tagout procedures

3.8.5.1.1.2. Their responsibility in the execution of the procedures

3.8.6. Retraining. Retraining in the lockout/ tagout procedures shall be performed as follows:

3.8.6.1. When the procedures are revised

3.8.6.2. At intervals not to exceed 3 years

3.8.6.3. When supervision or annual inspections indicate that the employee is not complying with the lockout/tagout procedures

3.8.7. Contact Release. Employees exposed to shock hazards and those responsible for the safe release of victims from contact with energized electrical conductors or circuit parts shall be trained in methods of safe release. Refresher training shall occur annually.

3.8.7.1. This training applies to all classifications listed in Appendix 8.1, State Classifications Approved to Work on Energized Electrical Components

3.8.8. Such training shall be documented in writing.

3.9. EHS Program Review

3.9.1. The program review shall be completed annually to identify and correct deficiencies in the following:

3.9.1.1. lockout/tagout program and procedures

3.9.1.2. The lockout/tagout training

3.9.1.3. Worker execution of the lockout/tagout procedure

3.10. Recordkeeping

3.10.1. The following records must be maintained in writing:

3.10.1.1. Training

3.10.1.2. Hazard Assessments

3.10.1.3. LOTO Procedures

3.10.1.4. Audits

4. DEFINITIONS

- 4.1.** Accepted. An installation is “accepted” if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes.
- 4.2.** Accessible (as applied to equipment). Admitting close approach; not guarded by locked doors, elevation, or other effective means.
- 4.3.** Accessible (as applied to wiring methods). Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in by the structure or finish of the building.
- 4.4.** Accessible Location. A location which can be reached by an employee standing on the floor, platform, runway, or other permanent working area.
- 4.5.** Accessible, Readily (Readily Accessible). Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to take actions such as to use tools (other than keys), to climb over or under, to remove obstacles, or to resort to portable ladders, and so forth.
- 4.6.** Accessible, Safely (Safely Accessible). Not exposing persons installing, operating, maintaining, or inspecting electrical apparatus to serious risks of tripping or falling or of coming in contact with energized electrical parts, moving machinery, surfaces or objects operating at high temperatures or other hazardous equipment.
- 4.7.** Adequate. Sufficient to reduce the risk to an acceptable minimum.
- 4.8.** Affected Employee. An employee whose job requires them to operate or use a machine or equipment on which cleaning, repairing, servicing, setting-up or adjusting operations are being performed under lockout or tagout, or whose job requires the employee to work in an area in which such activities are being performed under lockout or tagout.
- 4.9.** Ampacity. The current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.
- 4.10.** Appliance. Utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, etc.
- 4.11.** Appliance, Fixed. An appliance which is fastened or otherwise secured at a specific location.
- 4.12.** Appliance, Portable. An appliance which is actually moved or can easily be moved from one place to another in normal use.
- 4.13.** Approved. Acceptable to the authority having jurisdiction.
- 4.14.** Arc Flash Hazard. A source of possible injury or damage to health associated with the release of energy caused by an electric arc.
- 4.15.** Arc Flash Suit. A complete arc-rated clothing and equipment system that covers the entire body, except for the hands and feet.

- 4.16.** Arc Rating. The value attributed to materials that describes their performance to exposure to an electrical arc discharge. The arc rating is expressed in cal/ cm² and is derived from the determined value of the arc thermal performance value (ATPV) or energy of breakopen threshold (EeT) (should a material system exhibit a breakopen response below the ATPV value). Arc rating is reported as either ATPV or EeT, whichever is the lower value.
- 4.17.** Attachment Plug (Plug Cap) (Plug). A device that, by insertion in a receptacle, establishes a connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.
- 4.18.** Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.
- 4.19.** Authorized (in reference to an employee's assignment). Selected by the employer for that purpose.
- 4.20.** Authorized Employee. An employee authorized by their appropriate Cal Poly administrator to perform hazard assessments, determine appropriate controls, write and implement a lockout/tagout procedure, and perform the annual hazard assessment and procedure review. They are qualified by experience and training to perform these tasks for specific machines or equipment in order to perform cleaning, repairing, servicing, setting-up, and adjusting operations on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties including performing cleaning, repairing, servicing, setting-up and adjusting operations covered under this section.
- 4.21.** Automatic. Performing a function without the necessity of human intervention.
- 4.22.** Balaclava (Sock Hood). An arc-rated hood that protects the neck and head except for the facial area of the eyes and nose.
- 4.23.** Barricade. A physical obstruction such as tapes, cones, or A frame-type wood or metal structures intended to provide a warning and to limit access.
- 4.24.** Barrier. A physical obstruction that is intended to prevent contact with equipment or energized electrical conductors and circuit parts or to prevent unauthorized access to a work area.
- 4.25.** Bonded (Bonding). Connected to establish electrical continuity and conductivity.
- 4.26.** Bonding Conductor or Jumper. A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrically connected.
- 4.27.** Bonding Jumper, Circuit. The connection between portions of a conductor in a circuit to maintain required ampacity of the circuit.
- 4.28.** Bonding Jumper, Equipment. The connection between two or more portions of the equipment grounding conductor.
- 4.29.** Bonding Jumper, Main. The connection between the grounded circuit conductor and the equipment grounding conductor at the service.

- 4.30.** Boundary, Arc Flash. When an arc flash hazard exists, an approach limit from an arc source at which incident energy equals 1.2 cal/ cm² (5J / cm²)
- 4.31.** Boundary, Limited Approach. An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.
- 4.32.** Boundary, Restricted Approach. An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased likelihood of electric shock, due to electrical arc-over combined with inadvertent movement.
- 4.33.** Branch Circuit. The circuit conductors between the final over- current device protecting the circuit and the outlet(s).
- 4.34.** Branch Circuit, Appliance. A branch circuit supplying energy to one or more outlets to which appliances are to be connected; such circuits to have no permanently connected lighting fixtures not a part of an appliance.
- 4.35.** Branch Circuit, General Purpose. A branch circuit that supplies a number of outlets for lighting and appliances.
- 4.36.** Branch Circuit, Individual. A branch circuit that supplies only one utilization equipment.
- 4.37.** Branch Circuit, Multiwire. A branch circuit consisting of two or more ungrounded conductors having a potential difference between them, and an identified grounded conductor having equal potential difference between it and each ungrounded conductor of the circuit and which is connected to the neutral conductor of the system.
- 4.38.** Building. A structure that stands alone or that is cut off from adjoining structures by fire walls with all openings therein protected by approved fire doors.
- 4.39.** Building Space. A room, vault, or wiring enclosures such as conduit, pull box, switchboards, and other like enclosures.
- 4.40.** Cabinet. An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
- 4.41.** Capable of being locked out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.
- 4.42.** Cell Line. An assembly of electrically interconnected electrolytic cells supplied by a source of direct current power.
- 4.43.** Cell Line Attachments and Auxiliary Equipment. Cell line attachments and auxiliary equipment include, but are not limited to, auxiliary tanks, process piping, ductwork, structural supports, exposed cell line conductors, conduits and other raceways, pumps, positioning equipment, and cell cutout or bypass electrical devices. Auxiliary equipment also includes tools, welding machines, crucibles, and other portable

equipment used for operation and maintenance within the electrolytic cell line working zone. In the cell line working zone, auxiliary equipment includes the exposed conductive surfaces of ungrounded cranes and crane-mounted cell-servicing equipment.

- 4.44.** Center Pivot Irrigation Machine. A multi-motored irrigation machine that revolves around a central pivot and employs alignment switches or similar devices to control individual motors.
- 4.45.** Certified. Equipment is “certified” if it bears a label, tag, or other record of certification that the equipment:
 - 4.45.1.** Has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner; or
 - 4.45.2.** Is of a kind whose production is periodically inspected by a nationally recognized testing laboratory and is accepted by the laboratory as safe for its intended use.
- 4.46.** Circuit. A conductor or system of conductors through which an electric current is intended to flow.
- 4.47.** Circuit Breaker. A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its rating.
- 4.48.** Circuit Breaker, Adjustable. A qualifying term indicating that the circuit breaker can be set to trip at various values of current and/or time within a predetermined range.
- 4.49.** Circuit Breaker, Instantaneous Trip. A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker.
- 4.50.** Circuit Breaker, Inverse Time. A qualifying term indicating there is purposely introduced a delay in the tripping action of the circuit breaker, which delay decreases as the magnitude of the current increases.
- 4.51.** Circuit Breaker, Nonadjustable. A qualifying term indicating that the circuit breaker does not have any adjustment to alter the value of current at which it will trip or the time required for its operation.
- 4.52.** Circuit Breaker, Setting. The value of current and/or time at which an adjustable circuit breaker is set to trip.
- 4.53.** Competent Person. One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
- 4.54.** Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them. [See “Accessible -(As applied to wiring methods)”]
- 4.55.** Conductive. Suitable for carrying electric current.
- 4.56.** Conductor, Bare. A conductor having no covering or electrical insulation whatsoever.

- 4.57.** Conductor, Covered. A conductor encased within material of composition or thickness that is not recognized by this Code as electrical insulation.
- 4.58.** Conductor, Insulated. A conductor encased within material of composition and thickness that is recognized by this Code as electrical insulation.
- 4.59.** Continuous Duty. (See under "Duty.")
- 4.60.** Continuous Load. A load where the maximum current is expected to continue for three hours or more.
- 4.61.** Controller. A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.
- 4.62.** Current-Carrying Part. A conductor connected in an electric circuit to a source of voltage.
- 4.63.** Current-Limiting Overcurrent Protective Device. A device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.
- 4.64.** Cutout. An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link), or may act as the disconnecting blade by the inclusion of a nonfusible member.
- 4.65.** Damp Location. (See under "Location.")
- 4.66.** Dead Front. Without live parts exposed to a person on the operating side of the equipment.
- 4.67.** De-energized. Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth.
- 4.68.** Device. A unit of an electrical system, other than a conductor, that carries or controls electric energy as its principal function.
- 4.69.** Dielectric Heating. The heating of a nominally insulating material due to its own dielectric losses when the material is placed in a varying electric field.
- 4.70.** Different Systems. Those which derive their supply from different sources, or from individual transformers or banks of transformers which do not have their secondary windings interconnected, or from individual service switches.
- 4.71.** Disconnecting Means. A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.
- 4.72.** Disconnecting (or Isolating) Switch (Disconnecter, Isolator). A mechanical switching device used for isolating a circuit or equipment from a source of power.
- 4.73.** Dry Location. (See under "Location.")
- 4.74.** Dustproof. So constructed or protected that dust will not interfere with its successful operation.

- 4.75.** Dust-Tight. So constructed that dust will not enter the enclosing case.
- 4.76.** Duty.
 - 4.76.1.** Continuous Duty. Operation at a substantially constant load for an indefinitely long time.
 - 4.76.2.** Intermittent Duty. Operation for alternate intervals of (1) load and no load; or (2) load and rest; or (3) load, no load and rest.
 - 4.76.3.** Periodic Duty. Intermittent operation in which the load conditions are regularly recurrent.
 - 4.76.4.** Short Time Duty. Operation at a substantially constant load for a short and definitely specified time.
 - 4.76.5.** Varying Duty. Operation at loads, and for intervals of time, both of which may be subject to wide variation.
- 4.77.** Electrical Hazard. A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or arc blast injury.
- 4.78.** Electrical Safety. Identifying hazards associated with the use of electrical energy and taking precautions to reduce the risk associated with those hazards.
- 4.79.** Electrical Safety Program. A documented system consisting of electrical safety principles, policies, procedures, and processes that directs activities appropriate for the risk associated with electrical hazards.
- 4.80.** Electrically Safe Work Condition. A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to verify the absence of voltage, and, if necessary, temporarily grounded for personnel protection.
- 4.81.** Electrolytic Cell Line Working Zone. The cell line working zone is the space envelope wherein operation or maintenance is normally performed on or in the vicinity of exposed energized surfaces of electrolytic cell lines or their attachments.
- 4.82.** Electrolytic Cells. A tank or vat in which electrochemical reactions are caused by applying energy for the purpose of refining or producing usable materials.
- 4.83.** Employee: Faculty, Staff, Student Worker, Identified Volunteers
- 4.84.** Enclosed. Surrounded by a case, housing, fence, or wall(s) that prevents persons from unintentionally contacting energized parts.
- 4.85.** Enclosure. The case or housing of apparatus - or the fence or walls surrounding an installation to prevent personnel from unintentionally contacting energized electrical conductors or circuit parts or to protect the equipment from physical damage.
- 4.86.** Energized. Electrically connected to, or is, a source of voltage.
- 4.87.** Energized Parts (Live Parts). Parts which are of a potential different from that of the earth, or some conducting body which serves in place of the earth.
- 4.88.** 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.

- 4.89.** Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.
- 4.90.** Equipment. A general term, including fittings, devices, appliances, luminaires, apparatus, machinery, and the like, used as a part of, or in connection with, an electrical installation.
- 4.91.** Equipment Grounding Conductor. See "Grounding Conductor, Equipment."
- 4.92.** Equivalent. An alternate design, feature, device, or protective action which provides an equal degree of safety.
- 4.93.** Exposed (as applied to energized electrical conductors or circuit parts). Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated,
- 4.94.** Exposed (as applied to wiring methods). On or attached to the surface or behind panels designed to allow access.
- 4.95.** Externally Operable. Capable of being operated without exposing the operator to contact with live parts.
- 4.96.** Fall Protection. Any equipment, device, or system that prevents an employee from falling from an elevated location or mitigates the effect of such a fall.
- 4.97.** Fault Current. The amount of current delivered at a point on the system during a short-circuit condition.
- 4.98.** Fault Current, Available. The largest amount of current capable of being delivered at a point on the system during a short-circuit condition.
- 4.99.** Feeder. All circuit conductors between the service equipment, the source of a separate derived system, or other power supply source and the final branch circuit overcurrent device.
- 4.100.** Fitting. An accessory such as a locknut, bushing, or other part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function.
- 4.101.** Fuse. An overcurrent protective device with a circuit-opening fusible part that is heated and severed by the passage of over-current through it.
 - 4.101.1.** NOTE: A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electrical circuit.
- 4.102.** Ground. A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

- 4.103.** Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.
- 4.104.** Grounded (Grounding). Connected (connecting) to ground or to a conductive body that extends the ground connection.
- 4.105.** Grounded, Solidly. Connected to ground without inserting any resistor or impedance device.
- 4.106.** Grounded Conductor. A system or circuit conductor that is intentionally grounded.
- 4.107.** Ground-Fault Circuit Interrupter (GFCI). A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established for a Class A device.
- 4.108.** Grounding Conductor, Equipment (EGC). The conductive path(s) that provides a ground-fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both.
- 4.109.** Grounding Electrode. A conducting object through which a direct connection to earth is established.
- 4.110.** Grounding Electrode Conductor. A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system
- 4.111.** Guarded. Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger.
- 4.112.** Hazard. A source of possible injury or damage to health.
- 4.113.** Hazard Assessment. The process of identifying all associated tasks, assessing potential consequences, assessing potential exposures to hazards, assessing the probability of occurrence, and determining appropriate controls to achieve acceptable risk.
- 4.114.** Hazardous. Involving exposure to at least one hazard.
- 4.115.** Hazardous Energy Controls. Devices designed to prevent uncontrolled movement and the release of hazardous energy from machinery or equipment.
- 4.116.** Heating Equipment. The term "heating equipment" includes any equipment used for heating purposes if heat is generated by induction or dielectric methods.
- 4.117.** Hoistway. Any shaftway, hatchway, well hole, or other vertical opening or space that is designed for the operation of an elevator or dumbwaiter.
- 4.118.** Hot tap. A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. it is commonly used to

replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

- 4.119.** Incident Energy. The amount of thermal energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is typically expressed in calories per square centimeter (cal/cm²) .
- 4.120.** Incident Energy Analysis. A component of an arc flash risk assessment used to predict the incident energy of an arc flash for a specified set of conditions.
- 4.121.** Identified (as applied to equipment). Approved as suitable for the specific purpose, function, use, environment, or application, where described in a particular requirement.
 - 4.121.1.** NOTE: Some examples of ways to determine suitability of equipment for a specific purpose, environment, or application include investigations by a nationally recognized testing laboratory (through listing and labeling), inspection agency, or other organization recognized under the definition of “acceptable.”
- 4.122.** Inaccessible Location. A location to which access is provided only by portable ladders or other portable temporary means.
- 4.123.** Induction Heating. The heating of a nominally conductive material due to its own I²R losses when the material is placed in a varying electromagnetic field.
- 4.124.** Insulated. Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.
- 4.125.** Interlock. An electrical, mechanical, or key-locked device intended to prevent an undesired sequence of operations.
- 4.126.** Interrupter Switch. A switch capable of making, carrying, and interrupting specified currents.
- 4.127.** Interrupting Rating. The highest current at rated voltage that a device is identified to interrupt under standard test conditions
- 4.128.** Irrigation Machine. An electrically driven or controlled machine, with one or more motors, not hand portable, and used primarily to transport and distribute water for agricultural purposes.
- 4.129.** Isolated (as applied to location). Not readily accessible to persons unless special means for access are used.
- 4.130.** Isolated Power System. A system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors.
- 4.131.** Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
- 4.132.** Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with

evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

4.133. Location.

4.133.1. Damp Location. Partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold storage warehouses.

4.133.2. Dry Location. A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.

4.133.3. Wet Location. Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids, such as vehicle washing areas, and locations exposed to weather and unprotected.

4.134. Locked out. The use of devices, positive methods and procedures, which will result in the effective isolation or securing of prime movers, machinery and equipment from mechanical, hydraulic, pneumatic, chemical, electrical, thermal or other hazardous energy sources.

4.135. Locking in the Open Position. The use of lockable devices, such as padlocks, combination locks or other positive methods or procedures which will effectively prevent unexpected or inadvertent energizing of a designated circuit, equipment or appliance.

4.136. 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.

4.137. Maintenance, Condition of. The state of the electrical equipment considering the manufacturers' instructions, manufacturers' recommendations, and applicable industry codes, standards, and recommended practices.

4.138. Minimum Approach Distance. The closest distance a qualified person, which includes qualified electrical worker, qualified tree worker, and qualified line clearance tree trimmer may approach an exposed energized object.

4.139. Motor Control Center. An assembly of one or more enclosed sections having a common power bus and principally containing motor control units.

4.140. Normal Production Operations. The utilization of a machine or equipment to perform its intended production function.

4.141. Open Wiring. Uninsulated conductors or insulated conductors without grounded metallic sheaths or shields installed above ground, but not inside apparatus or wiring enclosures.

4.142. Open Wiring on Insulators. Open wiring on insulators is an exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of

single insulated conductors run in or on buildings, and not concealed by the building structure.

- 4.143.** Other Employee. All other employees whose work operations are or may be in an area where energy control procedures may be used.
- 4.144.** Outlet. A point on the wiring system at which current is taken to supply utilization equipment.
- 4.145.** Overcurrent. Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload, short circuit, or ground fault.
- 4.146.** Overload. Operation of equipment in excess of normal, full- load rating, or of a conductor in excess of rated ampacity that, when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as a short circuit or ground fault, is not an overload.
- 4.147.** Panelboard. A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front.
- 4.148.** Power Outlet. An enclosed assembly which may include receptacles, circuit breakers, fuseholders, fused switches, buses and watt-hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles or boats, or to serve as a means for distributing power required to operate mobile or temporarily installed equipment.
- 4.149.** Premises Wiring (System). Interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all their associated hardware, fittings, and wiring devices, both permanently and temporarily installed. This includes:
 - 4.149.1.** wiring from the service point or power source to the outlets; or
 - 4.149.2.** wiring from and including the power source to the outlets where there is no service point.
 - 4.149.3.** Such wiring does not include wiring internal to appliances, luminaires, motors, controllers, motor control centers, and similar equipment.
 - 4.149.4.** NOTE: Power sources include, but are not limited to, interconnected or stand-alone batteries, solar photovoltaic systems, other distributed generation systems, or generators.
- 4.150.** Prime Mover. The source of mechanical power for a machine.
- 4.151.** Pull Box. A box with a blank cover into which workers may reach but not enter which is inserted in one or more runs of raceway to facilitate pulling, joining, supporting, distributing or inspecting conductors. The term "pull box" includes but is not limited to: junction boxes, splice boxes, conductor support boxes, inspection boxes, and handholes.
- 4.152.** Qualified Electrical Worker. A qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits and equipment and who

has demonstrated by performance familiarity with the work to be performed and the hazards involved.

- 4.153.** **Qualified Line Clearance Tree Trimmer.** A person who has completed a minimum of 18 months-related training and on-the-job experience and is familiar with the special techniques and hazards involved in line clearance tree trimming operations.
- 4.154.** **Qualified Person.** A person, designated by the employer to work with low voltage electrical circuits (less than 600 volts), who has demonstrated skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to identify the hazards and reduce the associated risk. See Appendix 8.1, State Classifications Approved to Work on Energized Electrical Components
- 4.154.1.** Whether an employee is considered to be a “qualified person” will depend upon various circumstances in the workplace. For example, it is possible for an individual to be considered “qualified” with regard to certain equipment in the workplace, but “unqualified” as to other equipment.
- 4.154.2.** 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 is considered to be a qualified person for the performance of those duties.
- 4.155.** **Raceway.** An enclosed channel of metal or nonmetallic materials designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this standard.
- 4.156.** **Rainproof.** So constructed, protected, or treated as to prevent rain from interfering with successful operation of the apparatus.
- 4.157.** **Raintight.** So constructed or protected that exposure to a beating rain will not result in the entrance of water.
- 4.158.** **Receptacle.** A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.
- 4.159.** **Receptacle Outlet.** An outlet where one or more receptacles are installed.
- 4.160.** **Remote-Control Circuit.** Any electric circuit that controls any other circuit through a relay or an equivalent device.
- 4.161.** **Risk.** A combination of the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a hazard.
- 4.162.** **Risk Assessment.** An overall process that identifies hazards, estimates the likelihood of occurrence of injury or damage to health, estimates the potential severity of injury or damage to health, and determines if protective measures are required.
- 4.162.1.** As used in this standard, arc flash risk assessment and shock risk assessment are types of risk assessments.

- 4.163.** Separately Derived System. A premises wiring system whose power is derived from a battery, a solar photovoltaic system, or from a generator, transformer, or converter windings and that has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.
- 4.164.** Service. The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.
- 4.165.** Service Cable. Service conductors made up in the form of a cable.
- 4.166.** Service Conductors. The conductors from the service point to the service disconnecting means.
- 4.167.** Service-Entrance Conductors, Overhead System. The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.
- 4.168.** Service-Entrance Conductors, Underground System. The service conductors between the terminals of the service equipment and the point of connection to the service lateral.
- 4.169.** Service Equipment. The necessary equipment, usually consisting of one or more circuit breakers or switches and fuses, and their accessories, connected to the load end of service conductors to a building or other structure, or an otherwise designated area, and intended to constitute the main control and cutoff of the supply.
- 4.170.** Service Lateral. The underground conductors between the utility electric supply system and the service point.
- 4.171.** Service Point. The point of connection between the facilities of the serving utility and the premises wiring.
- 4.172.** Servicing and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.
- 4.173.** Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation.
- 4.174.** Shall. A mandatory requirement.
- 4.175.** Shock Hazard. A source of possible injury or damage to health associated with current through the body caused by contact or approach to energized electrical conductors or circuit parts.
- 4.176.** Short-Circuit Current Rating. The prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding defined acceptance criteria.
- 4.177.** Should. A recommendation.

- 4.178.** Show Window. Any window used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear and whether or not it has a platform raised higher than the street floor level.
- 4.179.** Signaling Circuit. Any electric circuit that energizes signaling equipment.
- 4.180.** Single-Line Diagram. A diagram that shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used in the circuit or system.
- 4.181.** Special Permission. The written consent of the authority having jurisdiction.
- 4.182.** Step Potential. A ground potential gradient difference that can cause current flow from foot to foot through the body.
- 4.183.** Structure. That which is built or constructed.
- 4.184.** Switch, General-Use. A switch intended for use in general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage.
- 4.185.** Switch, General-Use Snap. A form of general-use switch so constructed that it can be installed in device boxes or on box covers, or otherwise used in conjunction with wiring systems recognized by this Order.
- 4.186.** Switch, Isolating. A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means.
- 4.187.** Switch, Motor Circuit. A switch, rated in horsepower, capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage.
- 4.188.** Switchboard. A large single panel, frame, or assembly of panels on which are mounted on the face, back, or both, switches, overcurrent and other protective devices, buses, and usually instruments. These assemblies are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets.
- 4.189.** Switchgear, Arc-Resistant. Equipment designed to withstand the effects of an internal arcing fault and that directs the internally released energy away from the employee.
- 4.190.** Switchgear, Metal-Clad. A switchgear assembly completely enclosed on all sides and top with sheet metal, having drawout switching and interrupting devices, and all live parts enclosed within grounded metal compartments.
- 4.191.** Switchgear, Metal-Enclosed. A switchgear assembly completely enclosed on all sides and top with sheet metal (except for ventilating openings and inspection windows), containing primary power circuit switching, interrupting devices, or both, with buses and connections. This assembly may include control and auxiliary devices. Access to the interior of the enclosure is provided by doors, removable covers, or both. Metal-enclosed switchgear is available in non-arc-resistant or arc-resistant constructions.

- 4.192.** Switching Device. A device designed to close, open, or both, one or more electric circuits.
- 4.193.** Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.
- 4.194.** Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.
- 4.195.** Thermal Cutout. An overcurrent protective device that contains a heater element in addition to and affecting a renewable fusible member which opens the circuit. It is not designed to interrupt short-circuit currents.
- 4.196.** Thermally Protected. (As applied to motors.) The words “Thermally Protected” appearing on the nameplate of a motor or motor-compressor indicate that the motor is provided with a thermal protector.
- 4.197.** Thermal Protector. An inherent overheating protective device which is responsive to temperature and/or current and which protects the equipment against overheating due to overload or failure to start.
- 4.198.** Troubleshooting. Diagnostics and testing that can only be performed with the circuit(s) energized or energy sources engaged.
- 4.199.** Touch Potential. A ground potential gradient difference that can cause current flow from hand to hand, hand to foot, or another path, other than foot to foot, through the body.
- 4.200.** Ungrounded. Not connected to ground or to a conductive body that extends the ground connection.
- 4.201.** Unqualified Person. A person who is not a qualified person.
- 4.202.** Utilization Equipment. Equipment that utilizes electric energy for electronic, electromechanical, chemical, heating, lighting, or similar purposes.
- 4.203.** Vehicle. A device by which any person or property may be propelled, moved, or drawn, excepting a device moved by human power or used exclusively upon stationary rails or tracks.
- 4.204.** Ventilated. Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors.
- 4.205.** Volatile Flammable Liquid. A flammable liquid having a flash point below 38°C (100°F) or a flammable liquid whose temperature is above its flash point, or a Class II combustible liquid having a vapor pressure not exceeding 276 kPa (40 psia) at 38°C (100°F) and whose temperature is above its flash point.
- 4.206.** Voltage (of a Circuit). The greatest root-mean-square (rms) (effective) difference of potential between any two conductors of the circuit concerned.

- 4.207.** Voltage, Nominal. A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (e.g., 120/240 volts, 480Y/277 volts, 600 volts).
- 4.208.** Watertight. So constructed that moisture will not enter the enclosure.
- 4.209.** Weatherproof. So constructed or protected that exposure to the weather will not interfere with successful operation.
- 4.210.** Rainproof, raintight, or watertight equipment can fulfill the requirements for weatherproof, where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.
- 4.211.** Wireways. Sheet-metal troughs with hinged or removable covers for housing and protecting electric wires and cable and in which conductors are laid in place after the wireway has been installed as a complete system.
- 4.212.** Working Distance. The distance between a person's face and chest area and a prospective arc source.
- 4.213.** Working On (energized electrical conductors or circuit parts). Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment (PPE) a person is wearing. There are two categories of "working on":
 - 4.213.1.** Diagnostic (testing) is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment;
 - 4.213.2.** Repair is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).
- 4.214.** Working Level or Working Area. A platform, walkway, runway, floor or similar area fixed with reference to the hazard and used by employees in the course of their employment. This does not include ladders or portable or temporary means used for access, repair or maintenance, provided such means are removed immediately upon completion of the work.

5. GOVERNING DOCUMENT

5.1. Safety and Health Executive Order 1039

6. COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

6.1. Title 8, California Code of Regulations

- 6.1.1.** Section 2320.1, General
- 6.1.2.** Section 2320.2, Energized Equipment or Systems
- 6.1.3.** Section 2320.3, Tests
- 6.1.4.** Section 2320.4, De-Energized Equipment or Systems
- 6.1.5.** Section 2320.5, Energizing (or Re-Energizing) Equipment or Systems

- 6.1.6.** Section 2320.6, Accident Prevention Tags
- 6.1.7.** Section 2530.43, Automatic Restarting
- 6.1.8.** Section 2530.86, Motor Not in Sight from Controller
- 6.1.9.** Section 2940.13, Hazardous Energy Control Procedures.
- 6.1.10.** Section 2940.14, De-energizing Lines and Equipment for Employee Protection
- 6.1.11.** Section 2940.17, Disconnecting Capacitors and Means for Discharge
- 6.1.12.** Section 3314, The Control of Hazardous Energy for the Cleaning, Repairing, Servicing, Setting-Up, and Adjusting Operations of Prime Movers, Machinery and Equipment, Including Lockout/Tagout
- 6.1.13.** Section 3328, Machinery and Equipment
- 6.1.14.** Section 3441 (C), (D), (E) Operation of Agricultural Equipment
- 6.1.15.** Section 6004, Accident Prevention Tags

6.2. Title 29, Code of Federal Regulations

- 6.2.1.** Section 1910.147, The Control of Hazardous Energy (Lockout/Tagout)
- 6.2.2.** Section 1910.333, Selection and use of work practices
- 6.2.3.** Section 1910.339, Definitions
- 6.2.4.** Section 1926.417, Lockout and tagging of circuits

6.3. EH&S Electrical Safety Program,

https://afd.calpoly.edu/ehs/docs/CSP_ELEC10282014.pdf

7. REFERENCE DOCUMENTS

7.1. Developmental References:

- 7.1.1.** NFPA 70E – 2018, Standard for Electrical Safety in the Workplace
- 7.1.2.** ANSI Z244.1 – 2016, Control of Hazardous Energy - Lockout/Tagout and Alternative Methods

8. APPENDICES

8.1. State Classifications Approved to Work on Energized Electrical Components

- 8.1.1.** Qualified Persons. The following classifications are designated as Qualified Persons and have been approved to work on energized electrical components, less than 600 volts, by the Associate Vice President of Facilities (AVP). This approval is based on job function and completion of a 16 hour arc flash and electrical safety training course. From Electrical Safety Procedure.

- Electrician
- Lead Electrician
- Supervising Electrician
- Building Service Engineer

- Refrigeration Mechanic
- Facilities Control Specialist
- Facility Worker II
- Maintenance Mechanic
- Supervising Building Service Engineer
- Anyone specifically approved by the AVP of Facilities

8.1.2. This approval does not apply to other on-campus entities.

8.1.3. Qualified Electrical Worker. A qualified person who by reason of a minimum of two years of training and experience with high-voltage circuits (greater than 600 volts) and equipment and who has demonstrated by performance familiarity with the work to be performed and the hazards involved. This designation applies to:

- Electrician
- Lead Electrician
- Supervising Electrician.

8.2. Recommended Lockout/Tagout Products

8.2.1. Idesco Safety Color Coded Locks – KWLP4 Series

8.2.2. Idesco Safety Lockout Hasps, Plug and Switch Lockouts, Circuit Breaker and Fuse Lockouts, Valve Lockouts, Cable Lockouts, Group Lockout Boxes

8.2.3. Idesco Lockout Safety Tag – T1-14T

8.2.4. All Available from www.idescosafety.com

8.2.4.1. Products may be obtained from other sources as long as the models are the same.

8.2.5. See Attachment 9.2, Hazardous Energy Controls, Typical and Recommended, for examples

8.3. Personal Protective Equipment (PPE)

8.3.1. Use appropriate PPE for the hazards identified in the equipment specific hazard assessment.

8.3.2. For Electrical hazards the following PPE is required

- 8.3.2.1. Safety Glasses
- 8.3.2.2. Hearing Protection
- 8.3.2.3. Cotton (Natural Fiber) Shirt and Pants – won't melt when burned
- 8.3.2.4. Where indicated by a Shock and Arc Flash hazard analysis significant additional PPE is required.

9. ATTACHMENTS

9.1. Job Hazard Analysis Template, Control of Hazardous Energy, Lockout Tagout Procedure Template (See separate document)

9.2. Hazardous Energy Controls, Typical and Recommended

10. DOCUMENT MAINTENANCE

10.1. DOCUMENT RECISION-

Delete or replace documents from the EH&S website due to this document release: NA

10.2. DOCUMENT APPROVER-

David Korpan, EH&S Director, Cal Poly

10.3. DOCUMENT OWNER-

Christina Juarez EH&S Supervisor, Cal Poly

10.4. DOCUMENT CONTACT-

Tim H Hastings, Sr. Environmental Health Specialist, EH&S, Cal Poly
Christina Juarez, EH&S Supervisor, EH&S Cal Poly

10.5. REVISION NOTES-

Revision Number: NA
Changes from previous: NA

Cal Poly Environmental Safety
Equipment-Specific Hazard Analysis, Hazard Controls,
and Lockout/Tagout Procedure, Attachment 9.1

Section A. Equipment Description

Equipment Location:

Building Number: _____ **Room Number:** _____

Equipment Description:

Author

Employee who completed this form(print name & sign)

date

This document has been reviewed and approved by

Supervisor (print name & sign)

date

Section B. Procedure Purpose

The purpose of this procedure is to identify all hazardous energies and hazardous energy isolation points and list all required steps to safely shut equipment down and return it to service after work is completed.

Cal Poly Environmental Safety

Equipment-Specific Hazard Analysis, Hazard Controls, and Lockout/Tagout Procedure, Attachment 9.1

Section C: Hazardous Energy Assessment

Evaluate the equipment for all hazardous potential energy sources and check the left hand box if present. For each, describe the type and magnitude, danger zone (the part(s) of the equipment where the energy is found), and isolation points. Note: Describe how to control each identified hazardous energy source in Section E.

	Types of Energy	Type / Magnitude	Danger Zone	Isolation Point(s)
<input type="checkbox"/>	Mechanical - Capable of crushing, pinching, cutting, snagging, striking			
<input type="checkbox"/>	Mechanical - Stored energy - Flywheel, Springs, Differences in Elevation			
<input type="checkbox"/>	Pressure - Hydraulic List pressure (psi)			
<input type="checkbox"/>	Pressure - Pneumatic List pressure (psi)			
<input type="checkbox"/>	Pressure - Compressed Gas List pressure (psi) and other hazards (flammable, asphyxiant)			
<input type="checkbox"/>	Pressure - Pressurized Water List pressure (psi)			
<input type="checkbox"/>	Chemical -			
<input type="checkbox"/>	Electrical - low voltage (50-600 V) - List Type: AC/DC, Phase: 1 or 3, Amperage, and Connection Type (Plug/Cord, Disconnect, Breaker)			
<input type="checkbox"/>	Electrical - Batteries List Voltage and Current			
<input type="checkbox"/>	Electrical - Capacitors List Voltage			
<input type="checkbox"/>	Thermal - High temperature-surface temperature, hot liquids, steam			
<input type="checkbox"/>	Other - Other Energy Sources			

<p>Cal Poly Environmental Safety</p> <p>Equipment-Specific Hazard Analysis, Hazard Controls, and Lockout/Tagout Procedure,</p> <p>Attachment 9.1</p>

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Cal Poly Environmental Safety
Equipment-Specific Hazard Analysis, Hazard Controls,
and Lockout/Tagout Procedure, Attachment 9.1

Section D: Preparation and Notification

Step 1. Will this lockout span a shift change? ☐ Yes ☐ No

If “yes” then supervisor or manager must sign this section confirming that the following shift has been notified of the presence of the lockout and the need to place their locking devices at the energy control point before working on the locked out equipment :

Name of Supervisor/Manager: _____

Signature of Supervisor/Manager: _____

Step 2. Notify

Prior to starting work, notify affected workers of the lock out activity.

Employees notified: _____

<p style="text-align: center;">Cal Poly Environmental Safety Equipment-Specific Hazard Analysis, Hazard Controls, and Lockout/Tagout Procedure, Attachment 9.1</p>

<p>Section E. Steps for Controlling Hazardous Energy Identified in Section C.</p>
--

<p>Perform orderly equipment shut down: <i>Add steps as needed.</i></p>
--

<p>PPE REQUIRED: _____</p>

<p>STEP 1: _____</p>

<p>STEP 2: _____</p>

<p>STEP 3: _____</p>

<p>STEP 4: _____</p>

<p>STEP 5: _____</p>

<p>STEP 6: _____</p>

<p>Energy Source – Isolation, Control, Dissipation, and Verification</p>

<p>Energy source description:</p>
--

<p>Isolate:</p>

<p>Control:</p>

<p>Dissipation:</p>

<p>Verify zero energy state appropriate to the type of hazardous energy involved:</p>
--

<p>If movement/energized work required. Controls/methods used to prevent contact with moving parts or injury:</p>
--

<p>Energy source description:</p>
--

<p>Isolate:</p>

<p>Control:</p>

<p>Dissipation:</p>

<p>Verify zero energy state appropriate to the type of hazardous energy involved:</p>
--

<p>If movement/energized work required. Controls/methods used to prevent contact with moving parts or injury:</p>
--

<p style="text-align: center;">Cal Poly Environmental Safety Equipment-Specific Hazard Analysis, Hazard Controls, and Lockout/Tagout Procedure, Attachment 9.1</p>

Energy source description:

Isolate:

Control:

Dissipation:

Verify zero energy state appropriate to the type of hazardous energy involved:

If movement/energized work required. Controls/methods used to prevent contact with moving parts or injury:

Energy source description:

Isolate:

Control:

Dissipation:

Verify zero energy state appropriate to the type of hazardous energy involved:

If movement/energized work required. Controls/methods used to prevent contact with moving parts or injury:

Energy source description:

Isolate:

Control:

Dissipation:

Verify zero energy state appropriate to the type of hazardous energy involved:

If movement/energized work required. Controls/methods used to prevent contact with moving parts or injury:

<p style="text-align: center;">Cal Poly Environmental Safety Equipment-Specific Hazard Analysis, Hazard Controls, and Lockout/Tagout Procedure, Attachment 9.1</p>

<p>Section F: Steps to Return to Service</p>

<p><i>(Add any necessary, equipment specific, steps.)</i></p>

<p>Step 1. Verify equipment and area is clear of tools, workers, equipment, materials, and debris.</p>

<p>Step 2. Unlock and remove any blocking devices; remove linkages.</p>
--

<p>Step 3. Reposition any safety devices, guards, interlocks.</p>
--

<p>Step 4. Warn workers to stay clear of area.</p>

<p>Step 5. Remove all locks and tags for energy control points.</p>
--

<p>Step 6. Verify affected areas are clear of personnel.</p>

<p>Step 7. Re-energize the equipment. Note: be certain to consider effects of re-energization on all systems “downstream” of energy source.</p>
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<p>Step 8. Notify supervisor when work is complete.</p>
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<p>Step 9. If you find any errors in this procedure, or have suggestions on how to improve it, provide your comments to your supervisor and EHS.</p>

Control of Hazardous Energy
Attachment 9.2 Hazardous Energy Controls – Typical and Recommended

Available from www.idescosafety.com

Idesco Safety Color Coded Locks – KWLP4 Series:









Idesco Lockout Safety Tag – T1-14T:



Control of Hazardous Energy Attachment 9.2 Hazardous Energy Controls – Typical and Recommended

Idesco Lockout Products:

		
<p>Padlocks</p>	<p>Lockout Hasps</p>	<p>Plug and Switch Lockouts</p>
<p>Durable and economical, and can serve all your safety, maintenance and lockout needs. Choose either brass or aluminum also available in a variety of sizes, bright, distinctive colors, or with the bold warning, DANGER, LOCKED OUT. Choose also to have the padlocks Keyed Alike or Keyed Differently, or Master Keyed.</p>	<p>Our Lockout Hasps are safe and versatile. Lockout Hasps allow you to use one padlock or several padlocks to lock out all types of machines, as well as electrical panels, breaker boxes, and other electrical sources.</p>	<p>Our Plug and Switch Lockouts are safe and versatile. These Lockouts allow you to use a padlock or a Lockout Hasp with multiple padlocks to lock out plugs and wall or machine switches, from 110V to 550V.</p>
		
<p>Valve Lockouts</p>	<p>Cable Lockouts</p>	<p>Saf-Start Restart Protection</p>
<p>Our Valve Lockouts are safe and economical and include Valve Wheel Lockouts, Ball Valve Lockouts and our versatile Universal (adjustable) Valve Lockouts for various sized ball valves.</p>	<p>Do you need to lock out mutiple energy controls or valves, disconnect switches or high risk cabinets? Use a Cable Lockout!</p>	<p>Safe start device prevents automatic restart of machinery to avoid injuring employees working on or near the site.</p>

Control of Hazardous Energy Attachment 9.2 Hazardous Energy Controls – Typical and Recommended

Idesco Lockout Products:



Circuit Breaker and Fuse Lockouts

Circuit breaker lockouts work on a wide range of breakers, including single and multi-pole breaker configurations. Snap-on and clamp-on breaker Lockouts accommodate almost any situation.



Group Lockout Box

This Group Lockout box is a portable, metal lock box made of heavy-duty steel and powder coated for extra rust resistance.