Control of Hazardous Energy
Lock Out Tag Out

(rev 12-2017, 12-2018, 12-2019, 12-2020, 11-2021)

17.1 PURPOSE

This establishes procedures to assure employee protection from hazards associated with the inadvertent activation of mechanical equipment, energizing of electrical circuits, the release of pressurized or chemical fluids including steam and water, hydraulic systems, gas systems, and gravity-based systems, and other sources of energy and stored energy.

17.1.1 To avoid injuries related to electric, steam, water, or other energy or stored energy sources.

17.1.2 To provide guidance in determine the level of protection needed based on hazard exposure.

17.2 GENERAL SCOPE

It is the policy of T.A. Woods Company to complete all work in a ZERO energy state. It is the intent of TAW to prohibit energized work. Energized work is defined as working on or being in close proximity of live components, specifically electricity, pressurized or chemical fluids, tension, or any other source of energy regardless of system type.

17.2.1 Employees will not work on, in, or near equipment, vessels, etc., which are not in a ZERO ENERGY state with the following exceptions:

- Situations where powering down system and utilizing LOTO increases the hazards.
- Situations when it is infeasible to power down inclusive only when voltage reading and troubleshooting live components.

17.2.2 This program applies to qualified and non-qualified employees with exposure to energy hazards through inspection, testing, troubleshooting, installation of equipment, operations of switches, controllers, lockout procedures, power supply installations or maintenance with exposure to energized parts.

17.2.3 Responsibilities of Supervisor/Competent Person and Employees

Supervisor/Competent Person:

- Prior to start of work, request authorized employee of the controlling contractor or host company, de-energize or render inoperative all mechanical equipment, electrical circuits, steam tunnels, or other located in the immediate vicinity of the work.
- Request controlling contractor or host company have all locks and tags attached to all points of potential energization. T.A Woods Company employees will also affix locks and tags including the name and date. System will be tested for Zero Energy by supervisor/competent person prior to start of work.
- When the above procedure cannot be carried out by a representative of the controlling contractor or host employer, it is the supervisor's (or technician if qualified as a competent person) responsibility. In such cases, a work area inspection document such as the Energy Source Evaluation Form or document provided by the controlling contractor or host company will be completed and reviewed prior to continued preparation and work. System will be tested for Zero Energy prior to start of work.
- Prior to the onset of any work tasks and if work tasks change, the supervisor will hold a safety huddle to discuss hazards, mediation of hazards, protective equipment, instructions for using protective equipment, testing of protective equipment as applicable.
- If in the course of work, the supervisor/competent person observes any additional hazards or employees working in an unsafe manner, all work is to cease. A full review of the work tasks, hazards, Worksite Observation Form, etc, must be completed. The T.A. Woods Company supervisor has full discretion to prohibit any employee for continuing work.
- If during the course of evaluation, it is determined by the host employer or controlling contractor and T.A. Woods Company tasks cannot be completed in Zero Energy state, TAW supervisor will submit an Energized Work permit as designated by the host or controlling contractor.

Employee:

- Must be trained in control of hazardous energy, LOTO and specific LOTO for the current work tasks to be considered qualified.
- Employees are required to actively participate in pre-start and hazard-based huddles to discuss hazards, mediation of hazards, protective equipment, and instructions for the completion of work.

- All are required to report all unsafe conditions to the supervisor/competent person.

17.3 DEFINITIONS

Approach Distances – Must be established whenever work is to be conducted on systems or components not in a safe work condition

Flash Protection Boundary – Distance beyond which flash protection is required to prevent injury

Limited Approach Boundary – Shock protection boundary designed to keep non-qualified persons at a safe distance away from exposed parts. Only qualified employees are allowed within this boundary

Restricted Approach Boundary – Secondary shock protection measure whereby accidental movement can put a body part or object in contact with a live system or live part. Only qualified employees with proper personal protective equipment are allowed within this boundary.

Approach Boundary for Live Parts for Shock Protection

Voltage Range Phase to Phase	**Limited** Approach Boundary	**Restricted** Approach Boundary	**Min. Flash** Protection Boundary
0-50	Avoid Contact	Avoid Contact	N/A
51-250	3 ft 6 in	Avoid Contact	4 ft
251-750	3 ft 6 in	1 ft 0 in	10 ft

Disconnecting means – A device used to disconnect the source of energy supply. As an energy isolation control, it shall have the capacity to be locked out

Enclosure – A case or housing of apparatus surrounding an installation to prevent employees from accidentally contacting energized parts. If the enclosure is conductive it must be grounded or bonded to a grounding system

Exposed – Capable of being inadvertently touched or approached nearer than a safe distance by a person. Not insulated

Ground – A conducting connection to earth

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 to a point of danger or contact by persons or objects

Isolated – Not readily accessible to persons unless special means for access are used

Non-Qualified Worker – One who is not exposed to hazards due to proximity to work areas and/or will not approach live systems, parts, or circuits operating at 50 volts or more to ground.

Qualified Worker – One who has demonstrated an understanding of construction and operation of equipment and who has full understanding of associated hazards. Includes authorized employees.

17.4 WORK PROCEDURES

The following procedures apply to both qualified and non-qualified employees unless specifically referenced to qualified employees.

17.4.1 *Pre-Start Safety/Production Huddle* – Before starting task involving live parts or systems, the supervisor/competent person will conduct a pre-start briefing with all employees involved and cover:

- Hazards associated with the tasks where applicable. Inclusive of identifying exposure
- Work tasks and procedures
- Special precautions to be utilized to ensure power down through task completion
- Energy source controls including lockout tagout points
- Personal protective equipment
- Emergency response procedures

Additional huddles will be conducted if significant task changes occur, additional hazards are encountered, or unsafe work practices are observed.

If working alone, the items listed shall be carefully considered before working on or near energized systems.

The Energized Work Permit or similar document as authorized by the controlling contractor or host employer may be used as a pre-work hazard assessment tool.

17.4.2 *Selection and Use of Safe Work Practices* – Safety-related work practices shall be used to prevent injuries result energized contact.

- A thorough inspection of all equipment and/or systems will be completed to evaluate potential hazards

- Live parts to which an employee may be exposed will be de-energized by a qualified competent worker, (controlling contractor, host company, or TAW) prior to an employee working on or near them unless greater hazard is introduced. Only qualified workers are allowed to complete testing, voltage measuring, and troubleshooting within the limited approach boundary. The qualified worker will test to ensure that the previously energized part is de-energized using an UL listed meter rated for the voltage being tested. Parts and systems de-energized but not locked or tagged out will be treated as live.
- If it is not feasible to de-energize exposed live parts, other safety-related work practices will be used to protect exposed employees. Only qualified employees are allowed to work where exposed to energized equipment or systems. Procedures utilized to perform this work will include special precautionary techniques such as the use of personal protective equipment, insulating and shielding material and/or insulated tools. An Energized Work Permit (Exhibit A) or other as directed by the controlling contractor or host company will be completed before beginning the work. This form is not required for troubleshooting or testing process unless otherwise directed by the controlling contractor or host company.
- No work on or near exposed parts is permissible without proper illumination.
- Employees working in confined or enclosed spaces will de-energize or effectively barricade with protective shields or barriers any exposed live parts. Doors and hinged panels will be secured to prevent swinging freely.
- Conductive materials and ladders will be handled in such a manner to prevent them from encroaching specified clearances. Only non-conductive ladders are allowed near energized parts.
- Conductive apparel such as chains, watches, and rings will not be worn while working within a limited approach boundary.
- Unqualified employees are restricted from access to exposed energized parts, equipment, and systems. In the case of electrical, entails voltage greater than 50 volts. Qualified employees will place a barricade, guard energized parts, or have an attendant to prevent unqualified employees and other personnel from encroaching the limited approach and flash protection boundary, whichever is greater.
- Blind reaching is not allowed on any electrical panel, equipment, or system.
- All troubleshooting and/or testing above 50 Volts require voltage insulting gloves and appropriate personal protective equipment.
- Inform the controlling contractor or host employer if a hazardous condition is introduced or identified including corrective measures taken or required to make the condition safe.

17.4.3 *Pre-Work, During Work and Post- Work Safety/Production Huddle* – At the completion of the work tasks or at minimum the end of the work day, the supervisor will hold Safety/Production Huddles to discuss task related safety specific to the tasks performed. This allows for informing, debriefing and continued communication related to safe work practices.

17.5 LOCK OUT TAG OUT PROCEDURES

17.5.1 The following procedures will be followed when it becomes necessary for T.A. Woods Company employees to be directly involved in Lock Out Tag Out. Follow procedures cited previously including completion of LOTO Procedures Fill Form, Pre-start Safety/Production Huddle, and Post-Work Safety/Production Huddle.

17.5.2 Before allowing work to begin, or before the shut down process begins, the qualified employee(s) should have knowledge of the type and magnitude, hazards, means and methods to control the energy.

17.5.3 Each qualified employee required to work on a job where lock out is necessary will be provided with an individual safety lock and tag out cards. All other personnel who are effected by the lock out will also add their lock and tags. Procedures should include a shift change or personnel change, different crafts, departments or employers, if necessary.

17.5.4 The qualified employee (supervisor or technician as designated competent person) will have primary responsibility for a set number of employees and/or assigned area of work.

17.5.5 If more than one supervisor, technician, or qualified employee is assigned to a task, each supervisor or technician will also place their lock or tag on the unit to be sure that controls cannot be operated. If the controls are so located that only one lock can be accommodated and more than one lock is required, a multi-lock device will be used.

17.5.6 The equipment or system will be tuned off, shut down or isolated, using the procedures established for the machine or equipment. In the immediate vicinity of mechanical equipment, electrical circuits, vessels, or pipes containing chemicals or pressurized fluids, the main switch for the unit will be de-energized, and locked and tagged out in a safe position.

17.5.7 LOTO devices will be affixed to each energy-isolating device by authorized employees. Lock out devices will be affixed in a manner that will hold the energy isolating devices in a safe or off position. Following the application of LOTO, all potentially hazardous stored energy will be relieved, disconnected, restrained and otherwise rendered safe. If there exists a potential for a rebuild up of energy, verification of isolation is necessary.

17.5.8 When the energy sources being controlled involve operating equipment, the qualified employee will verify that the source(s) of energy have been isolated by attempting to activate the equipment.

17.5.9 LOTO devices where used should be attached as will clearly indicate the operation or movement of the energy isolating devices for the safe or off position. The purpose of the tag is to identify the person who may authorize the removal of the safety device.

17.5.10 Prior to testing machines or systems, the competent person will hold a safety huddle ensure all employees are apprised of the upcoming testing.

17.5.11 For testing equipment and systems and the temporary removal of LOTO devices, clear away tools, remove employees to areas behind accepted boundaries, remove LOTO device, energize and proceed with testing. De-energize and reapply control measures. This procedure will be completed by a supervisor or technician designated as a competent person.

17.5.12 Procedures of the controlling contractor or host employee will be followed regarding the use of LOTO devices when TAW is not on site or performing associated tasks.

17.5.13 Power and lighting circuits, including the use of circuit breakers and fuses, entail using load rated circuit breakers for opening and closing circuits. Fuses, terminal lugs, and cable splice connections will not be used to make or break a load.

After a circuit, has been de-energized using a circuit protective device, the circuit will not be reenergized until it has been determined safe to do so by a qualified employee.

Only qualified employees may perform testing on electrical circuits. Test equipment will be rated for the voltage to which it is connected. Proper testing deenergized parts will include testing for impressed line to ground, back feed load, and residual energy.

Equipment capable of igniting spark will not be used near flammable or ignitable material. Combustible material will be moved if it is in proximity of an energy source such as an electrical panel.

Materials will not be stored on equipment.

17.6 PERSONAL PROTECTION

Personal protection includes the use of personal protection equipment (PPE). Employees will use general PPE. The level of PPE used will be determined by conducting a hazard assessment and choosing a level of protection that significantly reduces or eliminates the risk of injury related to the hazard. Conducting a pre-start assessment including a walkthrough of the work area and tasks, will assist in determining hazards.

17.6.1 To determine hazard risk classifications and PPE requirements, a simplified program:

- If the task is identified as hazard risk 1 or 2, the qualified employee will wear HRC 3 protective equipment.
- If the task is identified by a hazard risk 3 or, the qualified employee will wear HRC 4 protective equipment

17.6.2 Hazard Risk Category Classification

Rating	Task
0	Electrical work on systems rated 240 volts or including: operate circuit breakers or fused switches and disconnects with doors closed, cable trav cover removed, work on control circuits 120 volts or less
1	Working on systems rated 240 volts or less including: removal of bolted covers on control circuits enclosures and voltage testing
2	Working on near exposed energized parts rated at 600 volts or less where exposed to electrical parts where the arc flash hazard is determined to be less than 8cal/cm2 and no physical work is performed that may cause a serious arch flash and not listed in HRC 3 or 4 category
3	Working on or near exposed energized parts rated 600 volts or less including removing bolted covers on exposed 480 volt cabinets where the hazard risk category is greater than 8cal/cm2 or unknown, open cover to exposed parts of the ATS, racking in or out 480-volt generator breakers on an energized bus
4	Work on exposed parts rated greater than 25 cal/cm2 including energized parts of pad mounted 480 volt transformers, main switch gear, racking in or out medium voltage breakers and transfer switches, phasing or other energized work, testing and grounding with a hot stick

*Table may be used when available fault current is less than 25,000 amps. If fault current exceeds 25kA an engineering study must be conducted. Hazards identified on an equipment label where an arch flash study has been conducted. Data will take precedence over information presented in Table.

17.6.3 Personal protective equipment will be used to protect from electrical hazards that have not been eliminated by de-energizing or guarding. PPE will be inspected prior to each day's use and immediately following an incident.

- **Eye Protection:** Plastic rimmed safety glasses with side shields meeting ANSI Z87 standards
- **Face Protection:** A tinted arch flash shield with a balaclava-style hood will be worn when there is danger of flying objects from an electrical arc for HRC 1 or 2. Eye protection will be worn under the shield. A full FR (beekeeper style) will be used for high incident energy level on HRC 3 or 4.
- **Head Protection:** Non-conductive hard hats will be worn at all times on the project work area.
- **Hearing Protection:** arc-rated hearing protection is required for all electrical switching of devices or when exposed to energized electrical parts rated greater than 50 volts.
- **Insulated Equipment:**
    - **Rubber gloves:** rated for the voltage will be worn when working within the restricted approach boundary on exposed parts with voltages higher than 50. Rubber gloves will be air tested prior to each shift's use and dielectrically tested every 6 months.
    - **Insulated barriers:** (rolled rubber material) approved for use on energized equipment may be required dependent upon the task and work area.

- **Clothing:** Only natural fiber clothing including underwear (cotton or wool) will used at a minimum while working near exposed live parts. In addition, conditions dictate an arc flash hazard exists, arc-rated clothing may be required.

Hazard Risk	Clothing Description	Minimum ATPV*
0	Untreated cotton clothing	N/A
1-2	AR shirt and AR pants or coverall	8
3-4	AR switching toad ant pants, arc hood	40

*ATPV-Arc Thermal Performs Exposure Value
AR-Arc rated

- **Hot-line Tools:** Hot line tools will be used to test voltages or place protective grounds on systems greater than 600 volts. An approved hot-line voltage tester connected to a hot-stick will be used to verify all circuits to be worked on are de-energized. The tester will first be brought into contact with a live source (if possible) to ensure correct operation, then it will be put into contact with all phases of the previously energized parts and then again to an energized source. If no such source is available, the self-test method will be used by engaging the test mechanism on the tester.
- **Grounding for Protection:** No work may be performed on any electrical component rated at greater than 600 volts without first testing to ensure parts are de-energized, using a volt meter rated for the voltage, then installing grounds to all previously energized parts. Effective barricades will be in place to avoid contact with other sources of electrical energy before attempting to install grounds. Temporary grounding equipment will be tested at a minimum of every 3 years.
- **Foot Protection:** Safety-toed leather boots will be worn at all times. Electrical-rated boots should be considered to provide additional resistance.

17.6.4 Additional Safety Requirements – inclusive of signs and barriers:

1) Safety symbols and signs will be prominently displayed to warn employees of electrical hazards. This may include warning signs on panel doors, doors to electrical rooms or any hazardous location which may endanger employees. If signs are not posted by the controlling contractor or host company and voltage is unknown, covers or doors will not be opened until voltages are known.
2) Protective shields, protective barriers, or insulating materials will be used to protect employees from shock, burns and other energy-related injuries while working near exposed energized live parts. Conductive barriers are prohibited. Barricades such as "danger tape" will used to prevent non-qualified employees from entering the limited approach boundary.

17.7 TRAINING

Employees who face a risk of injury due to working on or near energized parts, equipment, or systems must be trained.

17.7.1 Type of training: The training required by this section may be of the classroom or on-the-job type. The degree of training provided must be determined by the risk to the employee.

17.7.2 Content of training: Qualified employees will be trained in and familiar with the safety-related work practices that pertain to their perspective work assignments including work techniques, approach boundaries, personal protective equipment. Competent person, supervisor and technicians, training will be conducted in order to meet requirements.

17.7.3 Frequency of Training: An employee must have the above awareness training in order to be considered qualified. Those considered qualified to work on or near energized equipment involves either contact or contact by means of tools or materials will be capable of working safely and will be familiar with the proper use of special precautionary work behaviors, personal protective equipment, insulating and shielding materials and insulated tools. New hires will be trained upon assignment. Refresher training will be conducted if a deficiency is identified.

Training for all affected employees will be conducted when there is a change in tasks or work area that require different safe work practices.

17.7.4 Work sites will have first aid, CPR, and AED trained T.A. Woods Company employees.

17.7.5 Demonstration of an employee's knowledge the installation, operation of equipment and specific work methods associated with energy sources.

17.8 COMPLIANCE

All work will be completed to standards. No short cuts are permitted. Conscientious observance of procedures is expected by competent person, qualified employees and non-qualified employees. Neglect of such responsibilities may subject a TAW employee or other to injury. Failure to follow these procedures will result in disciplinary action.