



Health, Safety and Environment Standard Operating Procedure

SOP-01 Lockout / Tagout

Produced by

HSSE – Facilities & GS Department

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SOP-01: Lockout / Tagout

1 Overview

1.1 Purpose

The purpose of this Health, Safety and Environment (HSE) Standard Operating Procedure (SOP) is to provide detailed procedures pertaining to the lockout / tagout program to control safety risks associated with hazardous energy.

1.2 Hazards and Risks

1.2.1 Hazard Definition

Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment could expose workers to the unexpected energization or start-up of the equipment or release of hazardous energy unless appropriate precautions are taken.

1.2.2 Risks and Potential Outcomes

The unexpected energization, start-up, or release of hazardous energy could result in serious injury to workers. Typically this could include:

- Electrocution
- Physical injury ranging from minor lacerations to amputation
- Crushing injuries
- Entrapment

1.3 Key Terminology

Table 1. Key Terms

Term	Definition
Hazardous energy	Unexpected energization or start-up of a machine or equipment, or release of stored energy
Energized	Connected to an energy source or containing residual or stored energy
Energy source	Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy
Energy isolating device	A mechanical device that physically prevents the transmission or release of energy
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 a safe position and prevent the energizing of a machine or equipment.
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

2 Scope

The requirements outlined in this SOP are applicable to all Qatar University (QU) employees, students, contractors, and visitors who are working for QU, and/or conducting work on QU premises. The following subsections outline some of routine and non-routine activities in which the conditions covered by this SOP may be encountered.

2.1 Routine

Hazardous energy could be encountered during the following routine activities:

- Maintenance of building mechanical equipment
- Servicing of electrical equipment

2.2 Non-routine

Non-routine activities in which uncontrolled hazardous energy could be encountered include:

- Installation of new equipment
- Maintenance of electrical distribution systems and components (e.g., transformers, power lines)

3 Roles and Responsibilities

FGSD (FGSD) is responsible for the correction of any operational deficiencies that are discovered. Facility deficiencies must be reported to FGSD.

The QU Departments are the primary organization responsible to implement and maintain sound lockout / tagout practices and that assure safety compliance in their respective areas.

3.1 Vice Presidents (VP), Deans, Directors, Managers, Head Sections/Units and Project Managers

VPs, AVPs, Deans, Directors, Managers, Head Sections/Units and Project Managers have the primary responsibility of directing and managing lockout / tagout procedures and therefore have responsibility for assuring sound safety practices and compliance within their Department/College. They are ultimately responsible for enforcing consequences arising from moderately serious and very serious incidents.

3.2 Employees, Contractors and Students

Employees, contractors and students are responsible for compliance with safety regulations and this SOP, as applicable.

3.3 Health, Safety, Security and Environment Office (HSSE)

The HSSE is responsible for incorporating Electrical Safety in the HSE induction program to all workers, faculties, and students.

4 Risk Prevention

The following general practices should be followed to minimize the potential risk associated with the release of hazardous energy from equipment and machines undergoing maintenance or servicing:

- Determine all possible sources of energy associated with the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags. Sources of energy can include electrical, mechanical, hydraulic, and pneumatic aspects of equipment.
- Disconnect and/or isolate the equipment from the energy sources.
- Apply lockout/tagout devices in accordance with a documented and established policy.
- Dissipate or restrain stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) by methods such as grounding, repositioning, blocking, bleeding down, etc.
- Verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. To verify residual electrical energy has been eliminated, use an adequately rated test instrument to test each phase conductor or circuit part to verify it is de-energized.

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 worker performing the servicing or maintenance does not require implementation of a lockout / tagout procedure

5 Safe Work Practices

Lockout is the preferred method of isolating machines or equipment from energy sources. All electrical equipment shall be locked out or tagged out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy isolating device when it is locked or tagged out.

A tagout system is to be used only if an isolating device cannot be locked out; or, it is demonstrated that a tagout system provides full worker protection.

Specific, written procedures must be developed for each piece of equipment that will require de-energizing prior to servicing or maintenance, whenever a worker is required to remove or bypass a guard or other safety device; or a worker is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

For cord and plug connected electric equipment, the worker performing the servicing or maintenance must maintain exclusive control of the plug. If that worker will not maintain exclusive control of the plug, then a tag shall be placed on the plug end of the cord to alert others that the unit is not to be connected to a source of electricity.

5.1 General Work Practices

- The lockout/tagout procedure shall be documented by the FGSD – Energy and Utilities Management Section and shall contain requirements to safeguard staff, contractors while they are working on or near de-energized circuits, parts or equipment in any situation where there is danger of injury due to unexpected energization of the circuit parts or unexpected start-up of the equipment. Procedures shall require preplanning to determine where and how electric energy sources can be disconnected to safely de-energize circuits and equipment that are to be worked on.
- Equipment shutdown procedures shall be included so that the electric equipment involved is safely shut down before circuits are de-energized.
- Staff shall be instructed in the safety significance of the lockout/tagout procedure (Name/Job Title of staff authorized to lockout/tagout). Each new or transferred affected staff and other staff whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout or tagout procedure (Names/Job Title of affected staff and how to notify).
- Contractors shall secure lockout / tagout permit for works that need de-energization or energization of equipment.

5.2 Specific Work Practices

Staff and contractors shall implement an orderly shutdown of machinery to avoid any additional or increased hazards resulting from equipment stoppage. The following is a list of steps to be used during shutdown.

5.2.1 Preparing for Shutdown

- Identify the types of energy and sources. Inspect carefully and locate and identify all isolating devices. Be certain which switch(es), valve(s) or other energy isolating devices control the equipment to be locked or tagged out. More than one energy source (electrical, mechanical, or others) may be involved. All type(s) and location(s) of energy isolating means must be found and managed.
- Notify affected staff of intent to service equipment. Affected staff must be notified by authorized personnel of the intent to service equipment. Notification shall be given before lockout/tagout controls are applied and should contain the name and job titles of authorized staff, location of equipment being serviced, and duration/date of service.

5.2.2 Shutting Down the Equipment

- Shut down equipment. If the machine or equipment is operating, staff shall shut it down by the normal stopping procedures (depress the stop button, open the switch, close valve, etc.).
- Deactivate energy. Disconnect the device from all energy sources and release all residual energies that may present a hazard. Inspect the equipment to ensure all energy sources are disconnected.
- Release all stored or residual energy. Release stored or residual energy, such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems and pressurized systems (air, gas, steam, or water). If energy is incapable of

being released, the staff shall reposition, block or utilize some other protective measure to prevent the release of residual energy while service is in progress.

- Attach locking and tagging devices. Attach a lock and tag, of designated color, type and descriptive warning, on each disconnecting means used to de-energize circuits and equipment on which work is to be performed. The lock shall be attached to prevent persons from operating the equipment. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use. Additionally, tags shall be attached to all points where equipment or circuits can be energized. If multiple staff are servicing the same equipment, each shall attach their own lock to a multiple lock plate.
- Verify that equipment is secure and deactivated. Test the deactivation of the equipment to ensure that equipment cannot be energized and potential energy sources secured. This should be done by:
 - Checking that no personnel are exposed.
 - Verifying the isolation of equipment by operating the push button or other normal operating controls. Secure all switches to prevent movement to the "on" or "start" position.
 - Checking pressure gauges to ensure de-pressurization of lines.
 - Inspecting electrical circuits to confirm zero voltage.

5.2.3 Preparing to Return Equipment to Service

After service has been completed and the machine is ready to be tested or returned to service the following steps must be followed.

- Remove all tools from the equipment. Inspect the machine(s) to ensure that non-essential materials have been removed and the machine is in operating order. Visual inspections shall be conducted to ensure:
 - Tools and equipment are removed and secured safe guards are in place; and
 - Blocks, pins and chain (used during the lockout) are removed.
- Verify all equipment components are fully assembled and operational and inspect the work area to ensure that all staff and contractors have been safely positioned or removed from the area.
- Inspect the controls to verify they are in the "off" position.
- Remove all locking and tagging devices. Each lock shall be removed by the authorized staff that applied it or under his/her direct supervision. If the authorized staff is absent from the work place then the lock or tag can be removed by a qualified person designated to perform this task provided that the immediate supervisor:
 - verifies that the staff member is not present and therefore unable to remove the lock;
 - makes all reasonable efforts to inform the authorized staff that the lockout/tagout device has been removed; and
 - ensures that the authorized staff knows the lockout/ tagout device has been removed before work resumes.
- Re-energize the equipment after completing the above steps.

- Notify affected staff that the servicing or maintenance is completed, and the machine or equipment is ready for use.

5.3 Use of Tagout Only

Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock. Therefore, the use of tagout procedures without a lock shall be permitted only in cases where equipment design precludes the installation of a lock on an energy isolation device(s).

The following requirements apply when only tagout procedures are used:

- Tags are not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.
- Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
- Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
- Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
- Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

5.4 Lockout / Tagout Devices

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided for isolating, securing or blocking of machines or equipment from energy sources. Locks and tags used for this purpose shall be unique, readily identifiable as lockout/tagout devices, and used for no other purpose.

5.4.1 Lockout device requirements

Lockout devices shall meet the following requirements:

- A lockout device shall include a lock (either keyed or combination).
- The lockout device shall include a method of identifying the individual who installed the lockout device.
- A lockout device shall be permitted to be only a lock, if the lock is readily identifiable as a lockout device, in addition to having a means of identifying the person who installed the lock.
- Lockout devices shall be attached in such manner and substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
- Where a tag is used in conjunction with a lockout device, the tag shall contain a statement prohibiting unauthorized operation of the disconnecting means or unauthorized removal of the device.
- Lockout devices shall be suitable for the environment and for the duration of the lockout.

- Whether keyed or combination locks are used, the key or combination shall remain in the possession of the individual installing the lock or the person in charge, when provided by the established procedure.

5.4.2 Tagout devices

Tagout devices shall meet the following requirements:

- The device shall include a tag together with an attachment means.
- Tagout devices shall be readily identifiable as tagout devices and suitable for the environment and duration of the tagout.
- A tagout device attachment means shall be capable of withstanding at least 224.4 N (50 lb) of force exerted at a right angle to the disconnecting means surface.
- The tag attachment means shall be non-reusable, attachable by hand, self-locking, non-releasable, and equal to an all-environmental tolerant nylon cable tie.
- Tags shall contain a statement prohibiting unauthorized operation of the disconnecting means or removal of the tag. Acceptable statements include:
 - DO NOT START
 - DO NOT OPEN
 - DO NOT CLOSE
 - DO NOT ENERGIZE
 - DO NOT OPERATE

6 Training

All persons who could be exposed or affected by the lockout/tagout process shall be trained to understand the established procedure to control the energy and their responsibility in the procedure and its execution.

Refer to **QU HSEMS Section 11.0: Training and Competency Procedure** for additional information regarding training processes.

6.1 Initial Training

New or reassigned employees shall be trained to understand the lockout/tagout procedure as it relates to their new assignments.

Training is to be provided to ensure that the purpose and function of the program are understood by staff and contractors (knowledge, skills, application, use, removal). Training shall include:

- Recognition of hazardous energy sources, type and magnitude of energy available, the methods and means for isolation and control.
- Purpose and use of the procedure.
- Instructions regarding specific procedures and prohibition concerning starting locked and/or tagged equipment.
- When tagout procedures are used, training shall include the limitations of the tags.

6.2 Retraining

Retraining shall be provided

- Annually or when there is a change in job assignments, or change in machines, equipment, or process that present a new hazard, or a change in energy control procedures.
- When inspections reveal a need, or whenever the employer sees a need.
- To re-establish proficiency and introduce new or revised control methods.

6.3 Training Documentation

- The employer shall document that each employee has received the training required by this section.
- The documentation shall be made when the employee demonstrates proficiency in the work practices involved.
- The documentation shall contain the content of the training, each employee's name, and the dates of the training.

7 Document Control

This SOP is a controlled document. The controlled version of this procedure is located on the QU Electronic Documentation Management System.

Any printed copies of this controlled document are reference copies only. It is the responsibility of all of those with printed copies to ensure their copy is kept up to date.

Refer to ***QU HSEMS Section 16.0 – Document Control and Record Retention***.

8 References

NFPA 70E, Standard for Electrical Safety in the Workplace, National Fire Protection Association, 2015 Edition.

US Occupational Safety and Health Administration Regulations, 29 CFR 1910.147.