

Lockout/Tagout & Isolation Awareness

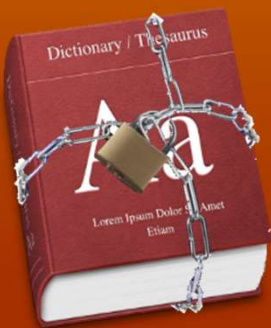
The Safety Cat





What is Lockout?

- To “**lock something out**” means to physically place a lock on an energy-isolating device in accordance with a developed & implemented procedure
- By locking something out you are essentially achieving a **zero energy state** prior to servicing or maintaining equipment, machinery or processes





What Energy do We Lockout?

Hazardous Energy may include any of the forms listed below, or any other energy that can cause harm

- ⚡ Electrical
- ⚡ Mechanical (*2 types*)
- ⚡ Hydraulic
- ⚡ Pneumatic
- ⚡ Chemical
- ⚡ Thermal
- ⚡ Gravitational
- ⚡ Radiation
- ⚡ Magnetic



Training



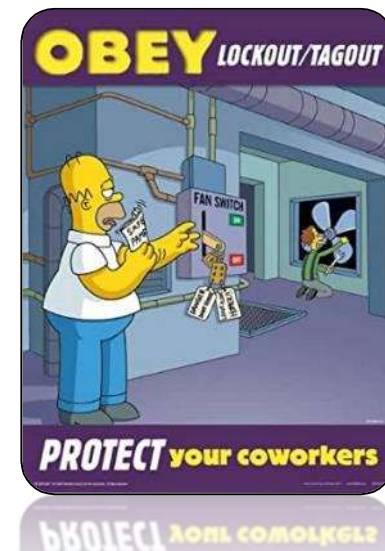
- **Anyone** who is/potentially exposed to hazardous energy needs to be trained – **or** – under the **direct supervision** of a trained/competent person
- Training must be completed **prior** to working with hazardous energy & associated devices
- The “*depth & scope*” of the training program must be determined by the **Employer** for the **specific workplace**



What is Lockout?



- Sometimes known as Hazardous Energy Control Program
- Lockout is the **isolation of energy** from a system (*machine, equipment, or process*) which **physically locks** the system in a safe mode
- The placement of a **Lockout device** on an **energy-isolating device** in accordance with an **established procedure**
- A developed & implemented Hazardous Energy Control Program is **essential** in **minimizing risk & preventing** injury/fatality





What is Tagout?

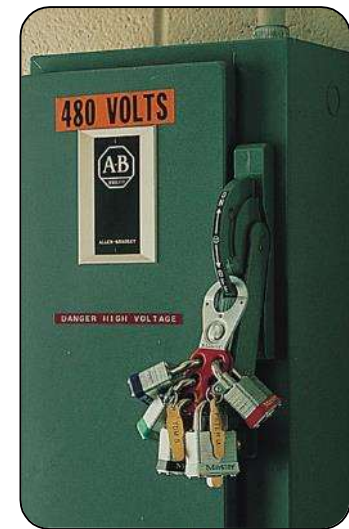
- Tagout is a **labelling process** that is used when Lockout is required but, may be used when Lockout is **not feasible**
- The process of Tagging-out a system involves **attaching** a Tag or label that includes the following information:
 - 🔒 **Why** the lockout/tagout is required (*repair, maintenance, etc...*)
 - 🔒 **Time & date** of application of the lock/tag
 - 🔒 **Name** of authorized person who attached the tag & lock to the system
 - 🔒 Expected length of **time** for the task
 - 🔒 Possibly a **photograph** of the Worker



What is Isolation?



- Disconnecting or making the equipment **safe to work on** involves the **removal** of all energy sources: **isolating** a mechanical device from its power-source
- The process or fact of isolating a system from another system by **removing** the **dependence** of another system
- The state of being isolated: **stand-alone**
- **Isolation** shall provide positive protection from exposure to hazardous energy &/or moving parts





What is Group Lockout?

- An **number** of Authorized & Trained Workers need to apply their personal Lock & Tag to an energy-isolating device to achieve a **zero-energy state**
- **Each Worker** must achieve the **same** LOTO-I protection as-if they were individually locked-out: each & every Worker **must attach** a lock
- As a general rule, the **first lock on** should be the **last lock off**
- Multiple-Worker LOTO-I devices
 - 🔒 Hasp
 - 🔒 Device with multiple lock-points
 - 🔒 Lock Box, etc...



Lockout Risks



Failure to Lockout while servicing & maintaining equipment has the potential to cause **severe harm**:

- 🔑 **Electrocution** from contact with live circuits or stored electrical energy
- 🔑 **Lacerations, amputations & crushing injuries** resulting from entanglement with moving parts
- 🔑 **Burns** from contact with hot parts & materials
- 🔑 **Fires & explosion**
- 🔑 **Overexposure** to chemicals due to released or trapped gases or liquids

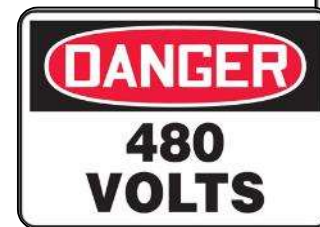


Working Live ~ Special Provisions



When working-live, special provisions must be in-place

- ✦ **Adequate Grounding** with a visible mechanism
- ✦ **Adequate Procedures** to ensure equipment is not inadvertently energized
 - 🔒 Rubber gloves, mats, shields, shock-resistant footwear, etc... **<300 Volts**
 - 🔒 If **over 300 Volts**, a suitably equipped & trained rescuer: CPR
 - 🔒 Insulated tools
 - 🔒 **“Guarantee of Isolation”** authorization
 - 🔒 Safe **working distance** is maintained



Group Lockout Boxes



- Group Lockout boxes are used for **multiple Workers** on 1 piece of equipment, **or**
- **1 Worker** using **multiple** Lockout devices
- Keys to **Lockout** devices are placed in the **Lockout box**
- Each Worker on the crew places their own **personal lock** on the box, **or**
- A **Supervisor** places their lock on the Lockout Box & each Worker must get their key back from the Supervisor





Energy Sources ~ Mechanical ~ Potential

MGH
Mass (Kg)
+ Gravity
(acceleration)
+ Height

Potential energy can be thought of as **stored energy** that has the potential to return to its original position

Stored energy can be **found in**

- 🔑 Springs
- 🔑 “stretched” items (*elastic*)
- 🔑 Presses
- 🔑 Counterweights
- 🔑 Raised or supported loads





Energy Sources ~ Pneumatic

PSI
*Pounds Per
Square Inch*

Pneumatic energy sources come from **compressed-air** systems, such as

- Rams
- Cylinders
- Pressure reservoirs
- Accumulators





Energy Sources ~ Magnetic



- ⚡ Every electrical current is **associated** with it a **magnetic field** & every changing magnetic field creates its own electrical current
- ⚡ Magnetic & electric energy **together** are known as **Electromagnetic** energy
- ⚡ The magnetic energy generated can be **used** to **attract** other metal parts (*or keep them apart*) or can be used to generate electricity & store power



Elements of a LOTO-I Program



Specific elements of a Hazardous Energy Control program

- General Control Methods
- Specific Controls
- Lockout Devices
- Lockout & “*Un-lockout*” steps
- Special circumstances & what to do
- Alternate Control Methods



Safety is a Marathon without an End... ..let Me Help You Run!!!

General Energy Control

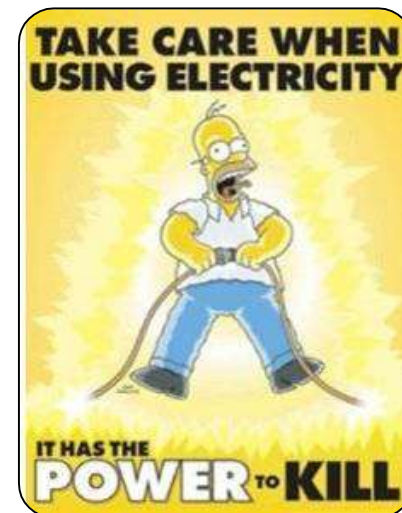


- When Workers & Contractors are exposed to hazardous energy, Employers must **develop & implement** a hazardous energy control program
- The **intent** of the program is to ensure risks are **identified, eliminated** or **minimized** before work is performed
- A requirement for Lockout is the development of **Specific Lockout** procedures
- Each piece of equipment should have a **detailed step-by-step process** identifying how Lockout will be achieved
- To be **effective**, all energy-isolating devices must be able to be **adequately locked out** or **secured** in an energy isolating position

Machine~Specific Energy Control



- Procedures should be kept **up-to-date** & **readily available** to Workers, posted at the machinery or process if possible
- It is essential that Lockout procedures are **verified** by a competent person
- There is **no room for error** when it comes to the control of hazardous energy



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Lockout Devices ~ Locks



Locks should be **standardized** by either their:

- 🔑 **Colour**
- 🔑 **Shape**
- 🔑 **Size or specific markings** (*engraved*)

Locks must be made by a **reputable manufacturer** to help ensure that locks can not be tampered with & only opened by the key provided

Lock-Sets should be **discouraged**
(*multiple locks with 1 key*)



Lockout Devices ~ Blocking



Insert **Blocks** or **Chocks** for moving or raised parts, disconnect springs (*only if safe to do so*), etc... to ensure potential moving parts are physically restrained or disconnected

- Ensure the Block can **support** the **total weight** resting on it
- Blocks **should not** be removed until all Lockout-applicable work is **completed** & will need to be integrated into the step-by-step Lockout removal process



Upstream vs Downstream



Upstream means the LOTO-I device is between the work location (*You*) & the source of energy

- You are working on a light-switch, the LOTO-I device is **between** You & the circuit-breaker/panel – ***the switch would not be live***

Downstream means the LOTO-I device is between the work location (*You*) & the equipment/fixture

- You are working on a light-switch, the LOTO-I device is **between** You & the light fixture – ***the switch would be live*** because You are between the LOTO-I device & the circuit-breaker/panel = ***You are in danger!***



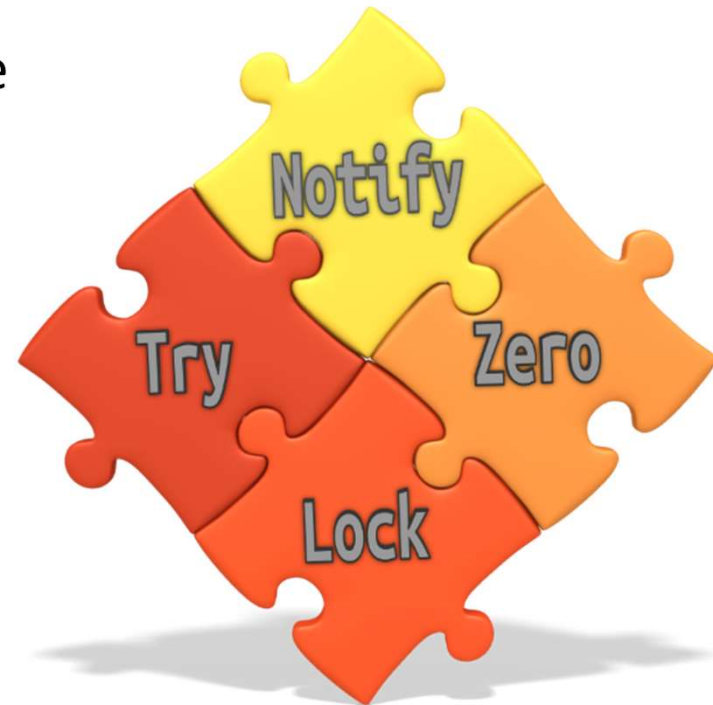


Lockout Steps ~ 1-4 of 8

Although procedures should be **specific** to the equipment, there will always be a **similar action sequence** to follow when achieving energy isolation

The first four (4) steps are

1. **Notify**
2. **Zero**
3. **Lock**
4. **Try**





Lockout Step 2 ~ Zero

Achieve Zero Energy by

- **Determine** the type of energy/ies you need to lock out
- **Locate** the energy source (*upstream / downstream*)
- **Locate** the energy-isolating device (*switch, etc...*)
- **Select** the appropriate Lockout Device
- **Turn off** the power supply/ies
- **Watch** for capacitor lights to go-out
- **Wait** for mechanical movement to stop





Lockout Step 4 ~ Try

Try

- **Lock**, pull on the lock firmly to make sure it's locked
- **Power**, push the button, pull the level, throw the switch & make sure the equipment does not turn on
- **Residual**, is there any left-over electricity in a Capacitor or Battery, energy in a spring, compressed air or fluid, movement of a mechanical part, etc...
(loop-back to Zero step for residual energy/ies)





Un-Lockout Steps ~ 6-8 of 8

The last three (3) steps of the **specific action sequence**

6. **Prepare**
7. **Un-Lock**
8. **Notify**



Special Circumstances



Shift Changes

- There are certain **situations** that may arise where a Supervisors lock, or **designated lock** is needed to ensure energy isolation is continuous through a shift change
- A Worker or Contractor has **completed their shift** but the work is not complete & other Workers are coming in to finish the work



Special Circumstances



Cutting-Off Locks

Prior to cutting off a lock you **must ensure** that

- The authorized individual **has left** work
- Reasonable **attempts** are made to **contact** the individual
- If contacted, the authorized individual **returns** to remove their locks & tags



Alternate Control Methods



Alternate control methods can be broken down

- 🔑 **Engineered Safeguards**
- 🔑 **Warning & Alerting Devices**
- 🔑 **Administrative Controls**
- 🔑 **Communication & Training**

