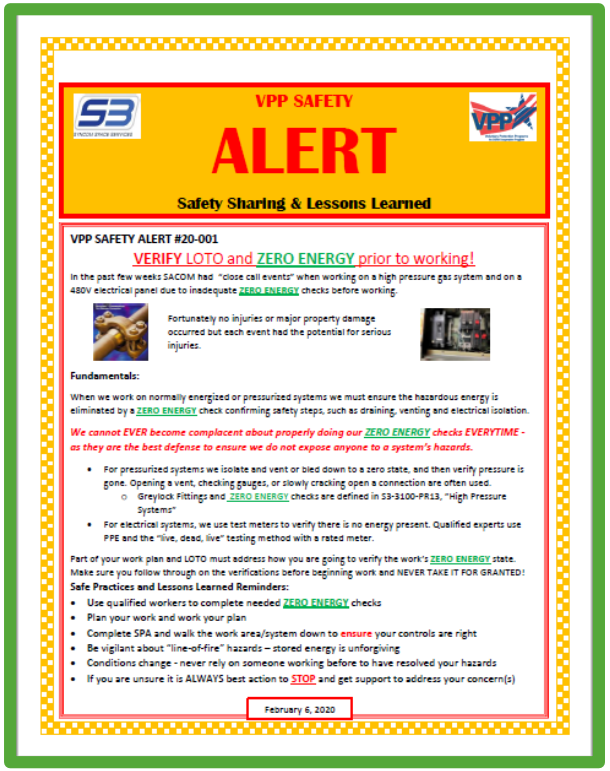
Lockout/Tagout Importance To YOUR SAFETY and Lessons Learned

"ZERO ENERGY STATE"

ZERO ENERGY STATE

- Plan your work and work your plan.
- Walk the work area/system down to ensure your controls are appropriate and your zero energy check is accurate.
- Never assume because someone was working the same job before you that they have done everything right **for you**. Always check!
- **Ask for help if you are unsure.**



VPP SAFETY

ALERT

Safety Sharing & Lessons Learned

VPP SAFETY ALERT #20-001

VERIFY LOTO and ZERO ENERGY prior to working!

In the past few weeks SACOM had "close call events" when working on a high pressure gas system and on a 480V electrical panel due to inadequate ZERO ENERGY checks before working.

Fortunately no injuries or major property damage occurred but each event had the potential for serious injuries.

Fundamentals:

When we work on normally energized or pressurized systems we must ensure the hazardous energy is eliminated by a ZERO ENERGY check confirming safety steps, such as draining, venting and electrical isolation.

We cannot EVER become complacent about properly doing our ZERO ENERGY checks EVERYTIME - as they are the best defense to ensure we do not expose anyone to a system's hazards.

- For pressurized systems we isolate and vent or bled down to a zero state, and then verify pressure is gone. Opening a vent, checking gauges, or slowly cracking open a connection are often used.
  - Greylock Fittings and ZERO ENERGY checks are defined in S3-3100-PR13, "High Pressure Systems"
- For electrical systems, we use test meters to verify there is no energy present. Qualified experts use PPE and the "live, dead, live" testing method with a rated meter.

Part of your work plan and LOTO must address how you are going to verify the work's ZERO ENERGY state. Make sure you follow through on the verifications before beginning work and NEVER TAKE IT FOR GRANTED!

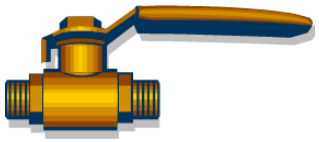
Safe Practices and Lessons Learned Reminders:

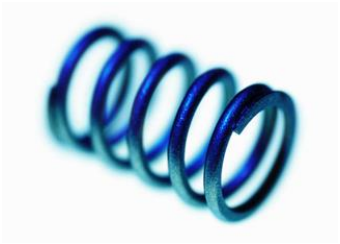
- Use qualified workers to complete needed ZERO ENERGY checks
- Plan your work and work your plan
- Complete SPA and walk the work area/system down to ensure your controls are right
- Be vigilant about "line-of-fire" hazards – stored energy is unforgiving
- Conditions change - never rely on someone working before to have resolved your hazards
- If you are unsure it is ALWAYS best action to STOP and get support to address your concern(s)

February 6, 2020

Types of Hazardous Energy

- Electrical
- Pneumatic
- Hydraulic
- Mechanical
- Thermal
- Vacuum
- Chemical
- Radiation
- Steam
- Spring-Driven
- Suspended Parts
- Wind





ALWAYS THINK ABOUT “LINE OF FIRE”

Your Duties as an Authorized Employee

- **Protect yourself by verifying and installing your own LO/TO device (red lock, with only one key – yours).**
- Notify affected employees before installing LO/TO devices and before removing LO/TO devices.

Your Duties as an Affected Employee

- Be aware of any Lockout/Tagout activities in your area. Ask questions.
- Do not attempt to operate or energize any equipment or system components that are Locked Out and/or Tagged Out.

Recent Examples of LO/TO Program Breakdowns at S3

Event #1-

At SSC, we discovered that an employee removed several his fellow employees' lockout/tagout locks when he found their keys uncontrolled near the work area.

- NEVER remove another person's lock/tag.
- Protect Yourself! Control your key to your lock.

Event #2

Recently at MAF, a contractor employee reached into a live electrical panel with a screwdriver to disconnect a wire, resulting in a dangerous Arc-Flash event. He did not properly perform LO/TO or ZERO Energy Check.

- The employee assumed the panel was deenergized because work in the area was performed the day before.
- NEVER ASSUME! Always check!

Event #3

S3 subcontractor employees were observed working in an electrical panel without Lockout/Tagout. Work was halted without incident.

- The workers did not perform lockout/tagout because they did not have the locks and tags in hand and rainy weather. Never let “inconvenience” threaten your life.
- Better pre-job planning would have identified the energy sources and ensured tools/equipment to control them were available.

How Injuries Occur During the Servicing of Equipment

A Bureau of Labor Standards study on injuries while servicing equipment revealed:

- 80%: failure to turn off equipment
- 10%: equipment activated by someone else
- 5%: failure to control potential energy
- Most of remaining 5%: failure to verify effectiveness of isolation

What is Lockout/Tagout (LO/TO)?

Lockout/Tagout is a technique used to prevent energy from being released during the servicing of equipment. This is accomplished by placing locks and tags on **energy isolation devices** *prior to starting work.*

When is LO/TO applied?

"…during the servicing of equipment".

- Adjusting
- Inspecting
- Modifying
- Replacing parts
- Tool changes
- Clearing jams
- Lubricating
- Cleaning

Energy Isolation Devices

"…accomplished by placing locks on energy isolation devices…"

Device that physically prevents the transmission or release of energy

Examples:

- Electrical disconnect switch
- Electrical breaker switch
- Hydraulic valve
- Pneumatic valve
- Line valve

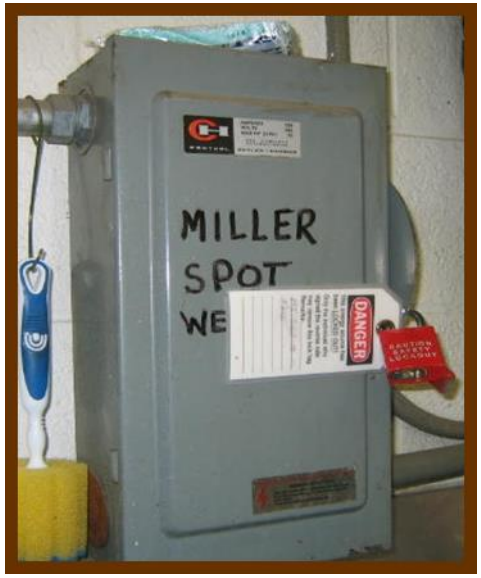
Pushbuttons, selector switches, and other control circuit devices are NOT energy isolation devices.

Exceptions to LO/TO

- Normal production operations
  - Routine, repetitive, and integral to production
  - Guards/safety devices not bypassed
  - Body part not placed in the point of operation or other dangerous area during machine cycle
  - Need to use alternative measures for protection of workers
- Cord & plug connected equipment
  - Plug is only source of energy
  - Plug is under continuous control of one worker

LO/TO Basics

- Preferred means of controlling hazardous energy is LOCKOUT IN CONJUNCTION WITH TAGOUT.
- Each isolation point must have both a lock and a tag.
- Locks and tags must be standardized and used only for LO/TO.
- Tags must indicate lock holder, job, and date of application.
- LO/TO locks must be RED and singularly keyed (one key, no duplicates).



Lockout Device

- Device that uses a positive means such as a lock to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.
- At S3 Sites, LO/TO Locks are RED, and singularly keyed: **YOUR LOCK, YOUR KEY**.

ALWAYS MAINTAIN CUSTODY OF YOUR KEY!

Lockout and Tagout

Perform a Hazardous Energy Control Procedure to identify energy sources and where to apply lockout/tagout.

- Always place a tag with the lock
- If it can be locked out, **lock it out**
- If lockout is not possible, tagout-only can be used if “full employee protection” can be afforded:
  - Responsible safety office shall inspect all instances where tagging without a lock will serve as isolation
  - Additional safety measures, such as removing fuses, lifting wires or guarding area are utilized
  - Tags attached at the same location as locks
  - Full compliance with all tagout-only provisions in 29 CFR 1910.147

LO/TO TAGS AT S3 SITES

SSC LO/TO TAG

MAF LO/TO TAGS

LO/TO TAGS ARE STANDARDIZED AND ONLY USED FOR LO/TO

Order of Operation for Application of Control

1- Preparation for shutdown- Perform a Hazardous Energy Control Procedure and use the Forms to identify energy sources, where to apply lockout/tagout and document ZERO Energy Checks.

2- Equipment shutdown in an orderly manner

3- Equipment isolation from energy sources

4- Lockout/tagout application

5- Stored energy relieved; control of reaccumulation

6- Verification of isolation- Test and then return to off or safe condition

Only after these steps are completed can you begin work.

Step 6- Zero Energy Check Verification of isolation (Test Out)

- Verify machine/equipment is deenergized.
- Verify machine/equipment is isolated by attempting to operate.
- Verify any exposed electrical points are safe (qualified electrician with meter).
- Return to safe/off status before beginning work.

29CFR1910.147(c)(8)

Only the authorized employees performing the servicing or maintenance may apply lockout/tagout.

Contractor Lockout/Tagout

- Contractors and other outside personnel:
  - On-site employer (NASA/S3) and outside employer (CONTRACTOR) inform each other of lockout/tagout procedures
  - Outside employers must understand and comply with on-site employer's energy control program requirements

At S3 we evaluate and determine if outside employer's LOTO program meets or exceeds our program before allowing their use of another LOTO program at our sites.

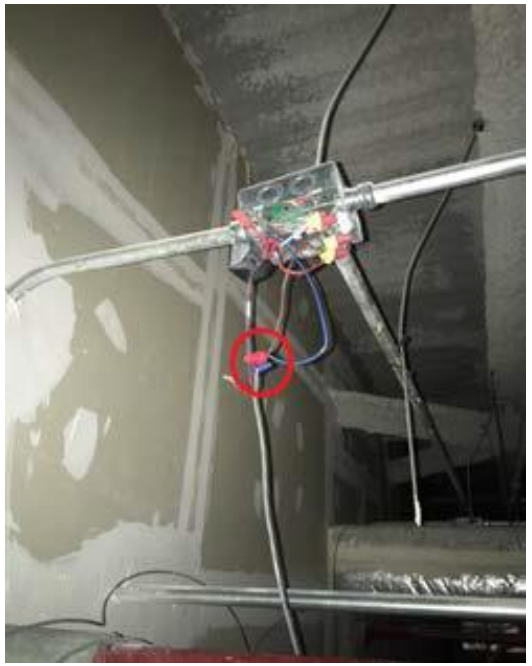
LOTO Prevents Accidents

The following are three examples where failure to lockout/tagout or perform “Zero Energy” checks resulted in accidents.

ACCIDENT #1

2016 Electrocution at Naval Facility

- A worker was responding to a routine trouble call to repair a light motion sensor. The worker contacted a live circuit (277 volts), and received a fatal injury.
- Investigation showed the worker did not deenergize the system and perform lockout/tagout, nor don the required PPE for performing electrical work.



ACCIDENT #2

2015 Arc Flash Injury at Los Alamos National Lab

- Worker entered the wrong cubicle on the energized section of a switchgear to clean the bus bars with a spray cleaner. The resulting arc flash severely injured the worker and eight of his fellow workers.
- Investigation showed the worker walked past a clearance tag for the correct cubicle and entered the adjacent (energized system) cubicle. He was not wearing the PPE required by the work documents.
- **A required "zero-voltage" check of the system was not performed.**

Figure 1-3. Clothing recovered after the arc flash event

ACCIDENT #3

2010 Injury at Steel Plant

- An inexperienced worker on a cutter machine at a steel plant had her leg severely pinched when the machine's retractable table unexpectedly closed.
- The worker was attempting to change blades on the machine and was unfamiliar with the process. She did not perform lockout/tagout of the table.
- Investigation showed the employee had not received lockout/tagout training, and did not know the requirement to lockout/tagout the machine.

Questions?