

# **MAJOR PROGRAM POINTS**

## **"LOCK-OUT/TAG-OUT"**

**Training for THE OSHA  
LOCK-OUT/TAG-OUT STANDARD**

**Quality Safety and Health Products, for Today...and Tomorrow**

# Outline of Major Points Covered in the "Lock-Out/Tag-Out" Course

The following outline summarizes the major points of information presented in the course on "Lock-Out/Tag-Out". The outline can be used to survey the course before taking it on a computer, as well as to review the course when a computer is not available.

- **Powered equipment and machinery make our jobs easier, and help us to be more productive.**
  - The machines that we use can run on a number of different forms of energy.
  
- **While this energy helps us to do things we could never do by ourselves, because of its great power it can also be dangerous and we need to be careful when we work around it. For example:**
  - Energy-related injuries often occur when one person is working on equipment and someone else inadvertently turns on the power, putting the equipment back into operation.
  
- **To help guard against these situations, OSHA has enacted "Lock-Out/Tag-Out" regulations.**
  - These regulations apply to most industrial and commercial situations, and protect people who are working on set-up, repair or maintenance of equipment from the energy that is used to run these machines.
  - OSHA estimates that these laws save over 100 lives and prevent over 60,000 injuries each year.
  
- **The concept of lock-out/tag-out is fairly simple.**
  - The object is to disable the machine that's being serviced by isolating it from its energy source (its source of power).
  - To do this, locks, tags and other mechanisms are placed on "energy isolation" devices, such as switch boxes and valves.

- **Lock-out/tag-out basically involves using your common sense.**
  - The lock-out step shuts off or isolates a machine's source of energy.
  - "Tagging" the machine tells other people the type of work that is being performed on the machine.
  
- **Situations where lock-out/tag-out procedures should be used occur more often than we realize. They include:**
  - Repairing circuits.
  - Cleaning and oiling machinery.
  - Cleaning jammed mechanisms.
  - Rebuilding equipment.
  - Performing machine "set-up".
  
- **So that employees will know how to deal with these situations safely, the OSHA lock-out/tag-out regulations call for all facilities to implement an "Energy Control Plan".**
  
- **This plan must include a written "Lock-Out/Tag-Out Program" consisting of two major components.**
  - Lock-out/tag-out procedures for all of the powered equipment and machinery in the facility.
  - A plan for training employees about these procedures.
  
- **As we have discussed, there can be a number of different types of energy associated with the machinery and equipment we work with. The most common are:**
  - Electrical.
  - Hydraulic.
  - Pneumatic.
  
- **Each of these types of energy can exist in two states:**
  - "Active"
  - "Stored."
  
- **Energy is "active" when it is being used to perform work, such as when an electric current flows through a machine to turn rotors and gears.**

- **However, energy can also exist in a "stored" state, waiting to be used.**
  - An example of this is the electricity that's held in capacitors, which are used in many machines.
- **Any type of energy can be dangerous in both its "active" or "stored" forms.**
  - We need to remember to use lock-out/tag-out procedures when working with all types and states of energy.
- **There are many types of lock-out "devices" that can be used to isolate a piece of equipment from its energy source. The most common are:**
  - Padlocks.
  - Chains.
  - Valve clamps.
- **More specialized devices, such as wedges, key blocks and pins are often used with hydraulic or pneumatic systems.**
- **Tag-out devices provide visual warnings that work is being performed on a machine or piece of equipment.**
  - The tags identify the person or persons who are working on the machine.
  - They can also indicate why the equipment is "out-of-service."
- **Remember, tags only provide information.**
  - Alone they will not secure energy isolation devices.
  - So whenever possible they should be used with locks, not by themselves.
- **If you are involved in activities requiring lock-out/tag-out procedures your employer will provide the locks, tags and other devices you will need.**
  - These must be identified as lock-out/tag-out devices only.
  - They cannot be used for any other function, and may not be shared with other workers.

- **You should also never use "non-designated" devices for lock-out/tag-out. For instance:**
  - You cannot remove a padlock from a locker or toolbox and use it to lock out an electrical panel.
- **Lock-out/tag-out devices must be easy to identify, as well as durable.**
  - They should be able to stand up in your normal operating environment.
- **Finally, locks must be difficult to remove, so that they can't be taken off by accident.**
- **Only certain employees in your facility will be "Authorized" to install lock-out/tag-out devices.**
  - These employees must be able to recognize hazardous energy sources, as well as the type and magnitude of the energy associated with each one.
  - They must also be aware of the methods and devices that are used to control these energy sources.
- **People who work with or around the machines and equipment that are serviced in lock-out/tag-out situations are designated by OSHA as "Affected" employees, since they may be affected by the work that is being done.**
  - These employees must know the purpose of your facility's energy control procedures and how they are used.
  - They must also be informed whenever lock-out/ tag-out work is being done in their work areas.
- **"Affected" employees are not, however, permitted to restart or re-energize machines once they are locked-out.**
- **When a piece of equipment needs to be locked out, there are several steps that should be taken.**
  - First, all the necessary people must be notified.
  - Once this is done, you can proceed with locking out and tagging the machine's energy sources.

- **You should use the lock-out/tag-out mechanisms that are designed for the energy isolation devices you are working with.**
  - Remember, common energy isolation devices include things such as electrical panels, circuit-breakers and valves.
- **As you work, make sure to consult your facility's written Energy Control Plan and follow company policy.**
- **We've discussed how energy can exist in both "active" and "stored" states.**
  - So after you complete your initial lock-out/tag-out procedures, you may need to "dissipate" energy that is still stored in the machine that you are working on.
  - How you do this will depend on the type of system you're dealing with.
- **There are a number of techniques you can use.**
  - For hydraulic or pneumatic equipment you may have to release built-up pressure by adjusting valves or installing "blinds" in piping, to stop fluid from moving within the system.
  - Electrical systems may require "grounding" to "drain off" stored electricity.
  - For any type of equipment you may need to release "spring tension" or dissipate extreme cold or heat.
- **After dissipating any residual energy you may still have to:**
  - Block off parts that could move while you are working.
  - Install additional lock-out/tag-out mechanisms to complete the lock-out of the system.

- **Once you have performed all of your lock-out/tag-out and "energy dissipation" procedures, you should test the machine to make sure that it won't operate.**
  - For electrical systems, you may first want to use a voltmeter to double-check that no electricity is flowing.
  - Next, press all "Start" buttons and throw all switches and levers that would normally be used to activate the equipment.
  - After you have determined that your lock-out procedures are working, return all of these switches to their "Off" position.
  
- **In most situations, work can then begin on the equipment you are servicing.**
  
- **There are some "special situations" where additional procedures must be followed when locking and tagging out a machine.**
  - One of the most important of these occurs when you have a personnel change during the time you're servicing the equipment.
  
- **In these situations, it is important to maintain continuity.**
  - First, personnel from the new, incoming work shift must install their lock-out/tag-out devices.
  - Then, the locks and tags installed by the departing work shift should be removed.
  
- **Other "special situations" arise when multiple pieces of equipment are powered by the same energy source, or when the piece of equipment you're working on is "linked" to other equipment.**
  - Here, supervisors should be contacted before any lock-out/tag-out work is performed.
  
- **Another "special situation" occurs when you encounter systems that must stay on while they are being serviced because the functioning of the equipment is essential to the facility's normal operation.**
  - In these cases, "hot work" guidelines need to be followed.

- **While they don't normally occur with 120 volt systems, if you are working with higher voltages you need to be aware of the possibility of an "arc flash."**
  - Arc flashes occur when a short circuit is created in the air between two points where electricity is being conducted, or between one point of electricity and the ground.
- **Arc flashes can be extremely dangerous.**
  - They are essentially explosions, and in addition to the force of the blast itself, produce intense heat, and a shotgun-like spray of molten metals.
- **Arc flashes can be caused by a number of things, including:**
  - Accidental contact with "live" parts or wires.
  - Having an object that conducts electricity, like a metal tool, come into close proximity to a high amp source of current.
  - Sparks generated by opening breakers or replacing fuses.
  - Deteriorating insulation or the build-up of corrosion on electrical terminals.
  - Fumes or chemical vapors in the air that make it easier to conduct electricity.
- **Energy sources, control panels and other equipment where the risk of an arc flash exists are often marked with specific warning labels.**
  - So be sure to look for them whenever you are doing an electrical lock-out.
  - If you see an arc flash warning, consult your supervisor to determine the proper procedures for working on the system.
- **Sometimes a "Buddy System" must be used when you're performing lock-out/tag-out procedures, particularly when the power source is not in sight of the operating portions of the machinery.**
  - In these situations, one person works on locking out the power, while the "Buddy" observes and tests the machinery.

- **There are also times where a group of people work together on a locked-out machine.**
  - In these cases, lock-out/tag-out devices designed to permit more than one worker to simultaneously lock out the same power source must be used.
  - Each authorized employee must affix their own lock and tag to this group lock-out/tag-out device.
  - If a number of groups are going to be working on the same machine, one employee can be authorized to represent each group.
  
- **Outside personnel, such as contractors, can also become involved in lock-out/tag-out operations.**
  - If contractor personnel are working in the area, facility representatives need to inform them of any internal lock-out/tag-out activities that are going on which could affect them.
  - If the contractors themselves are performing lock-out/tag-out work, they must inform facility representatives of their lock-out/tag-out activity.
  
- **Once the work on a locked out machine is completed, whether it is set-up, maintenance, or repair proper lock-out/tag-out "release procedures" must be followed to return it to service.**
  - First, you need to remove all nonessential tools and other materials from around the machine.
  - Next, clear any affected personnel from the immediate area.
  - Then you should check to make sure that the machine is ready to operate (this includes verifying there is no load on any electrical circuits).
  
- **Each employee who installed a lock-out/tag-out device on the machine must then personally remove the device.**
  - In emergency situations management personnel can be authorized to remove a device, but only when the original employee is unavailable and can not be easily recalled.
  - When this happens, the employee whose lock was removed must be told why the lock was removed before he resumes his work.

- **Once all the lock-out/tag-out devices have been removed, the equipment should be test run.**
  - If you cannot start the equipment and verify that it is functioning correctly from the location where the lock-out/tag-out devices have been installed, you should use the "Buddy System" for this testing.
  
- **During some lock-out/tag-out procedures, such as when equipment is going through a prolonged shut-down for rebuilding or major maintenance, situations can arise where a machine must be temporarily restarted.**
  - In these cases, this temporary start-up should be handled exactly as a normal release and restart.
  - First, lock-out/tag-out devices are removed and the release procedure is followed.
  - The machine is then restarted.
  
- **Once the temporary restart has been accomplished, normal procedures must again be followed to resecure the lock-out/tag-out devices and isolate the machine's energy sources.**
  
- **At the completion of any type of lock-out/tag-out procedure, the locks and tags that have been used must be returned to their "home." Some facilities have special routines that must be followed.**
  - If this is the case, the devices are typically stored in a specific location, and employees are required to sign in the return of each device in a "Lock-Out/Tag-Out Log."
  - If you have any questions as to your return procedures, they can be found in your facility's written Lock-Out/Tag-Out Program.
  
- **Now that we have taken a look at general lock-out/tag-out procedures and some special situations that we may encounter, let's look at some of the rules for performing lock-out/tag-out on specific types of power systems.**

- **When working with electrical systems, remember, the object of lock-out/tag-out is to eliminate the electricity that normally flows to the equipment that is being serviced.**
  - The specific steps you need to take for each piece of equipment in your facility will be spelled out in your facility's written Lock-Out/Tag-Out Program.
  - But there are some general principles that should always be followed no matter what machine you are working on.
- **First, identify all of the equipment's energy sources.**
  - Shut off the equipment at the point of operation before disconnecting it.
  - Be careful. Explosions can occur when power is disconnected while lines are "under load".
- **The switches on most switch boxes or panels are located on the right hand side.**
  - To cut the power, stand to the right of the switch box, turn your head away from the box, and use your left hand to move the switch to the "Off" position.
  - Then, use a padlock and tag, and appropriate lock-out/tag-out procedures, to isolate the energy source.
- **Remember, most boxes have two places that you can attach a lock.**
  - One will lock the box shut while the other will lock the power off.
  - Make sure that you put your lock on the correct one.
- **If there is more than one source of electric power to the machine, it may be easier (or necessary) to lock out a main panel.**
- **Some specialized equipment may require you to remove fuses.**
  - In these cases, it is not enough to just pull the fuse out of the box.
  - The box must also be locked and tagged.
  - If you find out that you can't use standard lock-out devices on the fuse box, consult your supervisor.

- **Once lock-out/tag-out procedures have been completed on the electrical system, you should try to start and operate the equipment.**
  - If your lock-out has been done correctly, you shouldn't see any movement.
- **You also need to test the circuitry with a volt-meter or similar device.**
- **Don't forget! If there are capacitors integrated into the electrical system they may contain stored electrical charges.**
  - So make sure that you check the machinery you are about to service to see if it has circuits that include capacitors.
  - If it does, you will need to "ground" the capacitors before starting your work.
- **Hydraulic and pneumatic equipment has to be treated differently than electrical machinery.**
  - With these types of systems, lock-out/tag-out usually involves pipes and valves.
  - In these situations, the hazard is the potential high-pressure release of steam, gas, hydraulic fluid or other liquids.
- **To adequately lock-out these systems, you need to use a padlock and chain, or some type of "valve clamp."**
  - Once these devices are in place, you can install the tag.
- **Remember, just like stored electricity, existing pressure in hydraulic and pneumatic lines can be hazardous as well.**
  - So you should bleed any pressurized lines before beginning work.
- **Pipe dividers called "blinds" are useful when you're working with particularly complex systems.**
  - Installing blinds segments piping, allowing you to do sectional bleeding.
  - This provides the ultimate protection in these situations.

- **A good way to test the effectiveness of your lock-out on hydraulic and pneumatic systems you are working on is to look for "downstream" valves that you can crack to see if any pressure still exists.**
- **There is one additional precaution that should also be taken when you are working with hydraulic or pneumatic equipment.**
  - These systems often include heavy moving parts.
  - During lock-out, you need to make sure that they can't slip.
- **Because of the nature of hydraulic and pneumatic equipment, these parts can often be affected by vibrations from nearby vehicle traffic or other machine operations, as well.**
  - Devices such as wedges, blocks or pins can be used to combat both of these situations, by holding the moving parts securely in place.
- **You may also need to physically isolate locked-out hydraulic and pneumatic machinery to make sure that their moving parts aren't jostled free by passing forklifts or other equipment.**
  - Barricades or other devices can be used to help limit this type of traffic.
  - In some cases, you may even need to arrange for the shut-down of nearby machinery.

**\* \* \* SUMMARY \* \* \***

- **Lock-out/tag-out is essential when you are working on most equipment and machinery.**
- **You must identify all of the energy sources for the equipment you're working on.**
- **Each worker must attach their own lock-out/tag-out device at a power source.**
- **Equipment and systems must be tested after locks and tags are in place.**

- **The person removing the last lock-out device must make sure that the work on the machine is completed, and that it's safe to operate.**
- **Common sense, communication and a good knowledge of lock-out/tag-out procedures. These are the keys to everyone's safety when you're working on powered equipment!**