

LOCK-OUT/TAG-OUT

COURSE OUTLINE

- **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.**
- **"Energy-related" injuries often occur when one person is working on a piece of equipment and someone else inadvertently turns on the power, starting it back up.**
 - To prevent situations like this from occurring, OSHA has enacted "Lock-Out/Tag-Out" regulations which describe the policies, equipment and procedures that employers and employees should use to safely set up, repair and maintain powered equipment.
- **The idea behind lock-out/tag-out is fairly simple.**
 - The object is to disable a machine while it's being serviced by isolating it from its source of power ("energy source") so it can't injure anyone who is working on or around it.
 - To do this, locks, tags and other mechanisms are placed on "energy isolation" devices, such as electrical switch boxes and valves.
- **The "lock-out" step shuts off or isolates the 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 include:**
 - Repairing circuits.
 - Cleaning and lubricating parts.
 - Clearing jammed mechanisms.
 - Rebuilding equipment.
 - Performing machine "setup".

- **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 program".**
- **This 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 on these procedures.
- **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 and valve clamps.
 - More specialized devices, such as wedges 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 people who are working on the machine, and can also indicate why the equipment is "out-of-service".
- **Remember, tags only provide information:**
 - Alone, they cannot secure energy isolation devices.
 - So they should be used with locks whenever possible.
- **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 shouldn't take 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, and durable enough stand up to any harsh conditions they are likely to be exposed to.**
- **Locks must also 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 amount of the energy associated with each one.
 - They must also be aware of the procedures and devices that are used to control these energy sources.
- **Other 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 need to understand the purpose of your facility's energy control procedures, and how they are used.
 - And they must be informed whenever lock-out/tag-out work is being done in their work areas.
- **However, affected employees are not permitted to restart or reenergize machines once they have been locked-out.**
- **When a piece of equipment needs to be locked out, there are several steps that should be taken.**
 - First the necessary people must be notified.
 - Then 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, such as electrical panels, circuit-breakers and valves, that you are working with.**
- **Some facilities store all lock-out/tag-out equipment in a central location, and there may be a lock-out/tag-out "log" in which authorized employees must sign the devices in and out.**
- **The procedures that you will need to follow will be described in your facility's written Lock-Out/Tag-Out Program.**
- **As you work, be sure that you follow your company's standard operating procedures.**
 - Consult your energy control program guidelines as needed.
- **The most common types of energy used to power equipment are electrical, hydraulic and pneumatic energy.**

- **Each of these types of energy can exist in two states, "active" and "stored".**
 - Active means that the energy is actually being used, like electricity turning a motor.
 - Stored means that the energy is waiting to be used, like the electric charge in a battery or capacitor.
- **After you complete all of 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 that you can use.**
 - For hydraulic or pneumatic equipment, you may have to adjust valves or install "blinds" in piping to stop fluid from moving within the system.
 - Electrical systems may require "grounding" to "drain off" stored electricity.
 - Various types of equipment may require you to release "spring tension" or dissipate extreme hot or cold temperatures, as well.
- **After getting rid of any residual energy you may still have to block off parts of the machine that could move while you are working.**
 - You may also need to 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.**
- **In some "special situations", additional procedures must be followed when locking and tagging out a machine.**
 - One of the most important of these occurs if you have a personnel change during the time the equipment is being serviced.

- **In these situations, it is important to maintain "continuity of responsibility".**
 - First, personnel from the new, incoming work shift must install their lock-out/tag-out devices.
 - Then, the locks and tags that were 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.**
 - In these cases, supervisors should be contacted before any lock-out/tag-out work is performed.
- **Another "special situation" occurs when a system must stay on while it is being serviced, because the functioning of the equipment is essential to the facility's normal operation.**
 - Again, you need to consult your supervisor if you encounter one of these.
- **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.
 - In addition to the force of the blast itself, arc flashes produce intense heat, and often a shotgun-like spray of molten metals as well.
- **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 buildup of corrosion on electrical terminals.
 - Fumes or chemical vapors in the air that can 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.
- **Another special situation occurs if the "buddy system" should 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 that are 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.
- **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 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, 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 employees 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 cannot be easily recalled.**
 - In these cases, the employee whose lock was removed must be told why it 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 undergoing a prolonged shutdown for rebuilding or major maintenance, situations can arise where a machine must be temporarily restarted.**
- **In these cases, this temporary startup 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 can then be 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".**
 - They should also be "signed in" in the lock-out/tag-out log if one is being used.
- **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 you are working with electrical systems you need to remember that 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 its point of operation before disconnecting it.
 - Be careful, because 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.
- **Some equipment may require you to remove fuses.**
 - In these cases, it's 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.
- **If there is more than one source of electric power to a machine, it may be easier (or necessary) to lock out a main panel.**
- **Once all the 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 voltmeter or similar device.**

- **If there are capacitors integrated into the electrical system, remember that they may contain stored electrical charges.**
 - So you will need to "ground" the capacitors before starting your work.
- **Performing lock-out/tag-out work on hydraulic and pneumatic equipment is different than doing it on 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 lock out these systems, you typically need to use a padlock and chain, or some type of "valve clamp" to make sure that the valves can't be turned.**
 - Once these devices are in place, you can install the tag.
- **Remember, just like "stored" electricity, existing pressure in hydraulic and pneumatic lines can also be hazardous.**
 - You should "bleed" any pressurized lines before beginning work.
- **Pipe dividers called "blinds" are useful when you're working with particularly complex hydraulic systems.**
 - Blinds enable you to "segment" the system.
 - Then you can bleed one "section" at a time for maximum safety.
- **A good way to test the effectiveness of your lock-out on hydraulic and pneumatic systems is to look for "downstream" valves that you can crack to see if any pressure still exists.**
- **There is one additional precaution that should 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 the equipment, these parts can often be affected by vibrations from nearby vehicle traffic or other machine operations.**
 - Wedges, blocks or pins can be used to secure moving parts in these situations.

- **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 shutdown of nearby machinery.

*** * * SUMMARY * * ***

- **Lock-out/tag-out is essential when you are working on most equipment and machinery.**
- **You need to 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 working knowledge of lock-out/tag-out procedures. These are the keys to everyone's safety when you're working on powered equipment!**