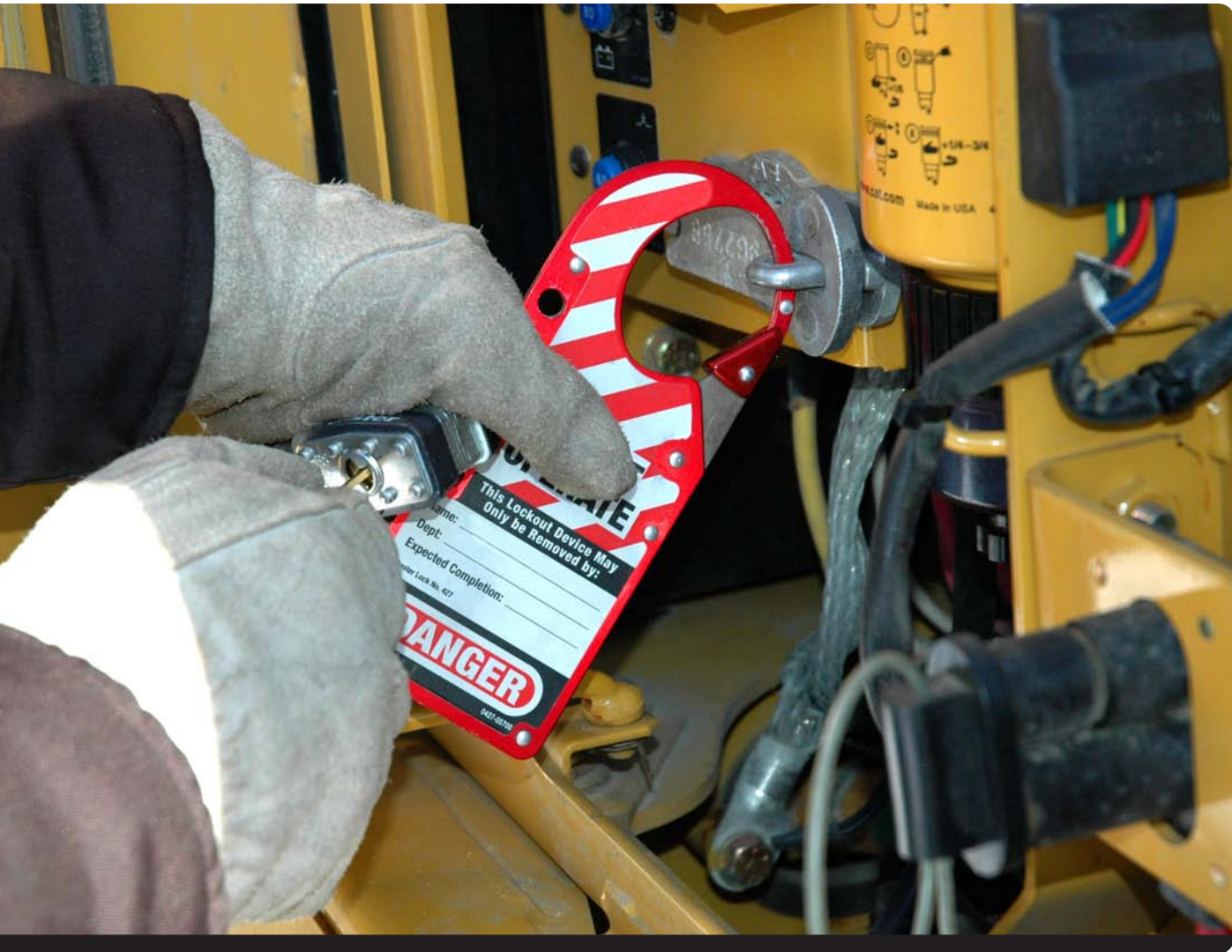


# Mobile Machine Lockout



information guide



**OFSWA**

Ontario Forestry Safe Workplace Association

Partners on the *Road to Zero*

## WHAT YOU NEED TO KNOW

### The problem

Analysis of several fatalities and critical injuries including leg amputations in recent years has identified a common element in all of these types of situations: Operators or service technicians are taking shortcuts and ignoring the hazards of unexpected energy release while they are working on machines.

Workers have had limbs amputated by continuous rotation blades and grapples that were suddenly activated. Some suffered fatal injuries when caught up in machinery and others were seriously injured when raised implements suddenly came crashing down on them.

The shutdown, lockout and zero-energy state information in this guide can provide valuable orientation and information for forestry mobile machine mechanics and operators who work on these machines in any of the following areas:

- Mechanical harvesting operations
- Gravel pit and road construction activities
- Traditional cut and skid harvesting
- Haul truck loading
- Onsite whole-tree chipping and slashing
- Machines used in reforestation and scarification
- Mill yard loading and unloading.

All of the machines used in these areas are very sophisticated and require high levels of power and heavy-duty energy systems to get the job done. Their implements are heavy, their cutting edges are razor-sharp and their unique mechanical and hydraulic motion and lifting capacity are complex and powerful.

Routine maintenance and minor repairs are usually the job of the operator. More technical and complicated repairs are the responsibility of the heavy mobile machine mechanic.

Any of these workers can be exposed to deadly hazards from unanticipated machine start-up or movement or they can be exposed to high levels of electrical, hydraulic and kinetic energy if these powerful forces are not eliminated before maintenance or repair work is started.

## The Solutions

### Safe operating procedure (SOP)

Safe operating procedures for proper machine shutdown, lockout, and procedures for ensuring a zero-energy state in all energized systems, must be developed and followed to the letter each and every time a worker is exposed to these hazards. The procedures must be unique to the machine. They must also be consistent with the requirements of the occupational health and safety legislation and regulations and the manufacturer's service and repair procedures as described in the machine's operator manual or shop service manuals.

Operators and mechanics must be properly trained in the operation of the machine, methods of repair and maintenance and all related hazards must be identified. Regular supervision by a competent supervisor is a key element in ensuring that everyone complies with the SOP requirements.

### Know the machine

Each type of machine has its own unique operating features and maintenance requirements. That is why, from the very start, the operator or the mechanic must understand the requirements for the machine being worked on. The operator's manual should be available on the machine at all times and the shop manual must be available at service garages and with mobile service trucks.

### Parking and shutdown

Wheeled and tracked machines should be parked on level ground, preferably over gravel or mineral soil to avoid fire hazards. Level ground will help secure wheeled machines and provides a level platform from which to enter, exit and work on and around the machine.

Lower all raised implements to the ground. If they cannot be lowered, a second person must assist in very carefully blocking the implement with material that is strong enough, preferably hardwood, and properly placed to prevent the implement from suddenly shifting or falling.

Allow the machine to idle down for a few minutes so that the cooling systems can reduce the higher operation temperatures of the machine components to normal levels.

Apply the parking brake. Place the transmission in the manufacturer's specified park position. Engage all hydraulic safety locks. Ensure that all operating controls are in the inoperable position. Then turn off the ignition and remove the key. Turn the master switch to the off position and, if equipped with a key, remove the master switch key. Place a lockout tag on the master switch and lock the master switch.



### Approaching the danger zone

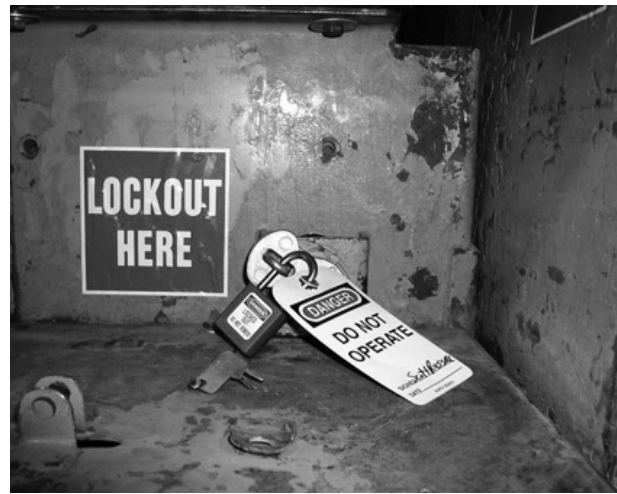
Often a mechanic is called to the field to provide repair and maintenance service onsite. The danger zone procedures that relate to approaching machines must be adhered to. Service trucks should not enter the danger zone of machines that are still operating. The service truck should not be parked within the danger zone of the machine that is undergoing maintenance or repair until the machine is properly shut down and locked out.

Approaching and entering a danger zone require communication with the machine operator to ensure that the operator knows there is someone on foot nearby and proper shutdown can start. The machine must be stopped and all implements lowered to the ground. Enter the danger zone only after this shutdown phase has been completed and on a signal to proceed from the operator.

### Lockout and tag

Locking out the machine and tagging it as *Do Not Operate* or *Lockout* is an essential precaution against someone starting the machine while someone else is working on it. It also prevents an unattended machine from being put into use while undergoing repairs or maintenance that would jeopardize its safe operation.

Some companies and machine operators have installed a metal box in the area of the cab or door. After the machine has been properly shut down, the key is placed in this “lockout box” and locked with the operator’s personal lock. A lockout tag is then placed on the lock. The lockout tag contains information that identifies the person conducting the lockout and the reason for lockout. The ignition key cannot be used by anyone other than the person who safely stored it in the lockout box.



Some companies, maintenance personnel or operators have also devised methods to lock out the master switch using a scissor lock.

### Retained energy and zero-energy state

Safely parking, shutting down and locking out do not eliminate all the hazards that may be confronted during repair and maintenance. Serious energy hazards still lurk within the machine’s components and energy systems. Depending on the type of work that needs to be done, you must be aware of where this potential energy might appear and how you can control or eliminate it. This is known as ensuring a zero-energy state.

Be sure that no parts of the machine can move. Some machines are equipped with chains and lock pins or bars to hold moveable parts of the machine in place (for example, the lock bar on the articulating joint of a grapple skidder or safety chains on the boom of a delimber). These must be put in place according to the machine manufacturer’s recommendations before repairs and maintenance can begin.

## Kinetic energy

Kinetic energy, the energy of motion, can be seen in rotating blades or chipping discs as well as in a large heavy circular saw seen on a slasher. The heavy weight and high speed of these sharp moving objects can freewheel or coast for several minutes after the machine has been shut down. Wait for these moving parts to come to a full stop before approaching them or before opening any guards, access panels or shields.

There are two main types of kinetic energy in mobile machines.

### **Thermal energy**

Thermal energy or heat will occur in and around the engine and exhaust equipment, as well as in the machine coolant system. Wait until these areas cool down to a safe level and ensure that coolant pressures are eliminated before you start work in these areas.

### **Electrical energy**

The electrical systems of these machines are complex and very hazardous if not dealt with safely. Cables, wiring, relay boxes and connectors can all be a source of very powerful electrical energy. The master switch that was turned off when the machine was shut down disables the transfer of energy to the starting system and other components. Starting the machine or operating various controls cannot occur if the master switch is off. But the electrical systems and their many components can still hold retained electrical current. Be extra safe and disconnect the energy system at the battery. Follow the manufacturer's electrical system maintenance and repair recommendations for the machine you are working on.

## Potential energy

The potential energy of heavy raised objects that are not properly secured can cause serious injury if they suddenly fall. Many of these machines have heavy access panels, screens or guards that need to be positioned correctly. Make sure that any retaining pins, holding chains or lift pistons are properly engaged before entering the area. If raised hydraulic implements are unavoidable because of the nature of the repairs or maintenance, they must be safely blocked or otherwise supported to prevent them from suddenly falling to the ground. There is one main type of potential energy in forestry mobile machines.

### **Hydraulic energy**

Stored hydraulic energy in extremely high-pressure hydraulic systems can cause machine components to move when you least expect it. Stored hydraulic energy can also cause the uncontrolled escape of hazardous fluid if the containment system is tampered with or springs a leak while still under pressure.

Hydraulic systems will vary from machine to machine and have various methods for bleeding this energy off. Systems will also vary between machines made by the same manufacturer depending on the model and model year. Follow the manufacturer's recommended procedures and safeguards for eliminating hydraulic energy in the system for that specific machine before doing any work in these areas.

Sometimes it is necessary to have the hydraulic system under pressure in order to check for leaks that are not obvious. Usually these are pinhole leaks and pressurizing the system is the only way to find the damage and replace a hose or connector before a major hydraulic fluid loss occurs. When carrying out this task, never use your hand to feel for pin-hole leaks. The fine stream from pin-hole leaks is under extremely high pressure that's powerful enough to inject the fluid right into the tissue of your hand, causing serious and painful injuries. Always use a piece of cardboard or metal, along with leather gloves and eye protection, to identify these leaks.

### Start-up

*Only* the person who performs the lockout can reverse the procedure that will enable the machine to be started. Often energy has been isolated by mechanical means. These steps must be safely reversed before the lockout is removed and the machine is started.

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