



ZERO ENERGY STATE

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Unexpected release of stored energy can injure or kill. Before a piece of machinery is left unattended, or is repaired or maintained, it must be put into a zero energy state (ZES). ZES is a condition in which all sources of energy have been removed or neutralized.

Forms of energy that must be neutralized on logging machinery are:

- **Mechanical Energy:** a moving object, a falling object, a spring under tension or compression. Some examples are: a swinging or falling boom, a track-tensioning spring.
- **Pressure Energy:** trapped (contained) air pressure, trapped (contained) oil (hydraulic or fuel) pressure. Some examples are: air pressure in an airline, hydraulic oil pressure in a hydraulic line, a pump, a cylinder, or an accumulator, or freon in an air conditioner unit.
- **Electrical Energy:** stored or generated voltage. Some examples: a battery, a capacitor, static electricity, a running alternator or generator.
- **Chemical Energy:** interaction between, or ignition of, substances. Some examples: acid burns, explosion of battery gases, burning fuel oil, or cold-start ether.

OSHA regulates “The Control of Hazardous Energy (lockout/tagout)” in its standard 29CFR, 1910.147. If a piece of equipment is in need of repair or is being repaired, it should be put in ZES and locked or tagged out as described in this standard. (See Loss Control Overview LCO-2, *Lockout – Tagout Overview*.)

When shutting down your machine, be sure to leave it in zero energy state and:

- Park on firm, level ground with the wheels chocked.
- Put the booms, attachments, or blades fully extended and on the ground.
- Place the outriggers (if any) in the down position, but not supporting the machine weight.
- Shut engine off, remove the key, and put it in your pocket.
- Relieve all pressure in the controls and hydraulic circuits by moving all controls after the engine is shut off. This may require leaving the key turned on if the controls are electrical.
- Turn off the master battery switch, if present on the machine.

When readying the machine for major servicing or repairs:

- Perform the above shut down procedures.
- Park on firm level ground with the wheels chocked.
- If working on the booms, attachments, or blades, use hydraulic cylinder mechanical lockouts.

Please follow equipment manufacturers’ recommendations for safe operation and maintenance procedures.

- Some machines have pressure stored in accumulators. Be sure to discharge accumulators before working on them or on the circuits they are connected to. Skin contact with leaking oil under pressure can cause injury.
- Disconnect the positive battery connection. Discharge capacitors.

Equipment varies by manufacturer and application. Your equipment may require additional steps. Check the machine's manual for proper ZES procedures. The manual may use different terminology for zero energy state.

PUT THE MACHINE IN ZERO ENERGY STATE.

Prepared by the Southwide Safety Committee of the Forest Resources Association, Inc.