
Heavy Equipment Lockout Tagout (LOTO) for Engine Servicing

1.0 Objective & Intent

The objective of this Standard Operating Procedure (SOP) is to establish a mandatory, zero-exception Lockout/Tagout (LOTO) protocol for all engine servicing activities on heavy equipment within the facility. This procedure is designed to prevent the accidental startup or release of hazardous energy (mechanical, electrical, thermal, chemical, or gravitational) that could cause serious injury or fatality to maintenance personnel or nearby workers.

This SOP is required to ensure full compliance with WorkSafeBC Part 10 (De-energization and Lockout) of the Occupational Health and Safety Regulation. The specific risk mitigated is the uncontrolled release of energy from engine systems, including rotating components, high-pressure fuel or hydraulic lines, hot surfaces, and electrical circuits, which could result in crushing, amputation, burns, or electrocution.

2.0 Operational Scope

This procedure applies to all maintenance personnel, mechanics, technicians, and any authorized employees who perform servicing, repair, adjustment, cleaning, or inspection tasks on the engines of heavy equipment, including but not limited to forklifts, loaders, generators, and mobile plant machinery. It covers all engine types (diesel, gasoline, propane, natural gas) used in the facility.

This SOP applies to all locations within the facility where heavy equipment is operated or stored, including the main production floor, maintenance bay, outdoor yard, and warehouse areas. It does not apply to minor tool changes or routine adjustments that do not require removal of guards or exposure to hazardous energy, as defined by WorkSafeBC. All personnel must be trained and authorized in LOTO procedures before performing any engine servicing.

3.0 Hazard Identification & Mandatory PPE

- Rotating Machinery Hazard: Engine fan, belts, pulleys, and flywheel can cause severe entanglement or amputation if the engine starts unexpectedly.
- Electrical Shock Hazard: High-voltage ignition systems, battery terminals, and alternator circuits can cause electrocution or arc flash.
- Thermal Burn Hazard: Engine block, exhaust manifold, turbocharger, and coolant system can reach extreme temperatures and cause serious burns.
- High-Pressure Fluid Injection Hazard: Fuel injectors, hydraulic lines, and oil galleries can inject fluids through the skin under pressure.
- Chemical Exposure Hazard: Engine oil, coolant, battery acid, and cleaning solvents can cause skin irritation, respiratory issues, or chemical burns.
- Crush Hazard: Engine components and equipment can shift or fall during servicing, causing crushing injuries.
- CSA-Approved Steel Toed Boots with puncture-resistant soles
- Safety glasses with side shields (ANSI Z87.1) or full-face shield when working near pressurized fluids
- Cut-resistant gloves (ANSI A4 or higher) for handling metal parts and tools
- Chemical-resistant gloves (nitrile or neoprene) when handling oils, coolants, or solvents
- Hearing protection (earplugs or earmuffs) when engine is running or in high-noise areas

- Flame-resistant (FR) coveralls when working near hot surfaces or potential fuel leaks
- Hard hat when working under or around overhead equipment

4.0 Required Safety Equipment & Tools

- Lockout/Tagout (LOTO) Kit: Includes multiple padlocks (keyed differently), hasps, danger tags, and a lockout station with clear identification
- Personal lock and key for each authorized employee (unique key, no master key shared)
- Group lockout box (if multiple workers are involved) with a single key capture system
- Voltage tester (non-contact or multimeter) rated for the system voltage (e.g., 600V CAT III)
- Insulated tools (rated for electrical work) for disconnecting batteries and electrical components
- Engine-specific service manual with energy isolation points and lockout procedures
- Spill containment kit (absorbent pads, socks, and disposal bags) for fluid leaks
- Fire extinguisher (Class ABC or BC) rated for fuel and electrical fires, located within 10 meters of the work area
- Barricade tape or portable safety barriers to cordon off the work zone
- First aid kit with burn treatment supplies and eye wash station accessible

5.0 Step-by-Step Safety Procedure

1. Notify all affected personnel in the immediate area that engine servicing will commence and that the equipment will be locked out. Post a visible warning sign or use verbal communication to ensure no one attempts to operate the equipment.
2. Identify all energy sources for the engine: electrical (battery, alternator, ignition), mechanical (fan, belts, flywheel), thermal (exhaust, coolant), chemical (fuel, oil), and gravitational (engine mounts, overhead hoists). Refer to the equipment-specific LOTO procedure from the service manual.
3. Shut down the engine using the normal stop procedure (key off, throttle closed). Allow the engine to cool for a minimum of 15 minutes to reduce thermal energy and pressure in fuel and coolant systems.
4. Isolate and lock out the primary electrical energy source: Disconnect the battery negative terminal first, then the positive terminal. Apply a personal padlock and danger tag to the battery disconnect switch or cable clamp. Verify zero voltage using a non-contact voltage tester on the starter solenoid and ignition coil.
5. Isolate and lock out secondary energy sources: For fuel systems, close the fuel shut-off valve (if equipped) and lock it with a hasp and padlock. For hydraulic systems (e.g., power steering or lift cylinders), relieve residual pressure by cycling the control lever with the engine off. Lock out any hydraulic isolation valves.
6. Verify complete energy isolation: Attempt to start the engine by turning the key to the start position (the engine must not crank). If the engine does not start, return the key to the off position and remove it. Then, visually inspect all locked-out points to confirm locks and tags are secure and properly identified.
7. Release any stored or residual energy: Carefully loosen the radiator cap to release coolant pressure (use a rag and turn slowly). Depressurize the fuel system by loosening the fuel filter or using a pressure relief valve as per the service manual. Ground any static charge from the ignition system by touching a grounded metal surface with an insulated tool.
8. Set up the work area: Place barricade tape around the equipment to prevent unauthorized entry. Position the fire extinguisher within arm's reach. Lay out spill containment pads under any areas where fluids may be drained. Ensure adequate lighting and ventilation (open bay doors or use explosion-proof fans if fuel vapors are present).
9. Perform the engine servicing task (e.g., oil change, belt replacement, injector service) following the manufacturer's instructions and safe work practices. Do not remove any lock or tag during the procedure. If a lock must be removed temporarily, follow the shift-change or temporary removal protocol outlined in the facility LOTO program.
10. Complete the servicing and remove LOTO devices: Inspect the work area for tools, debris, and loose parts. Reconnect all components (battery terminals, fuel lines, etc.) in reverse order. Ensure all guards are reinstalled. Remove each personal lock and tag only by the authorized employee who installed it. Verify that all locks and tags are accounted for. Notify affected personnel that the equipment is ready for operation and perform a test run in a safe area.

Regulatory Disclaimer: This document is a generic safety template provided for educational and informational purposes only. It does not constitute professional engineering, legal, or regulatory compliance advice. The end-user assumes all liability for validating all safety protocols against specific machinery manufacturer manuals and local occupational health and safety regulations (e.g., WorkSafeBC, CSA standards) before deployment.