

TCMARINE - Sample

Lock-Out Tag-Out (LOTO) procedure

1. Preparation & Planning

- Identify all machinery and equipment involved (e.g., CNC lathes, radial drilling, overhead cranes, jib cranes, forklifts).
 - Review technical specs (e.g., ABB robotic arms, 10–5 ton overhead cranes) to locate all potential energy sources — electrical, hydraulic, pneumatic, mechanical
 - Notify affected workers/departments (machining, fabrication, thermal arc spray, diesel engine overhaul).
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2. Notification

- Clearly communicate the intent to perform servicing or maintenance.
 - Post signs in workshops featuring heavy machining (33,000 sq ft production area) to alert personnel
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3. Shutdown

- Power down the equipment using standard procedures: main circuit breakers for lathes/mills, crane motor disconnects, forklift ignition off.
 - Tag each energy source in line with their distinct power demands—e.g., cranes driven by 10–5 ton motors, CNC machines with heavy electrical loads
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4. Isolation

- Isolate all energy sources: lock breakers, close valves, block mechanical movement.
 - For hydraulic or pneumatic systems (e.g., in fabrication or arc-spray equipment), bleed or cap residual pressure.
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5. Lock-Out & Tag-Out

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- Use padlocks with unique tags stating: “Do Not Operate – Under Maintenance,” name of technician, date/time.
 - Ensure locks are secured on electrical panels, crane disconnects, and any isolated valves.
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6. Energy Release & Verification

- Drain/hydraulic systems to remove stored energy.
 - Verify energy zero state: attempt machine startup; check no voltage on circuits; confirm crane can't move; test spindle/motor inertia is minimal.
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7. Maintenance/Service Work

- Proceed once verified.
 - During work on precision machines (e.g., crankshaft grinder with ± 0.0001 mm accuracy, line boring tools), ensure only trained staff handle.
 - Use proper support equipment — overhead cranes, jibs, forklifts—with LOTO in place.
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8. Interlock for Multi-Step Jobs

- For tasks requiring shifting energy sources (e.g., switching from crane lifting to milling), each re-energization requires repeat of LOTO procedures.
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9. Re-Energization

- After work, inspect tools, reinstall guards, position removable components.
 - Ensure all personnel are clear and informed.
 - Remove locks/tags only by authorized individuals as internal verification confirms safe state.
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10. Final Checks & Restart

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- Gradually reapply energy; first electrical, then hydraulic or mechanical.
 - Test functionality at low speed; observe for leaks or unusual behavior.
 - Resume normal operations only after successful testing.
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Additional Best Practices for TCMARINE

- Maintain a register of LOTO procedures for each machine (e.g., SPARK CW61140, SANCO SHM-13040R).
 - Provide regular staff training on LOTO and energy control.
 - Audit equipment hangers, overhead cranes, forklifts to ensure tags and locks are working.
 - Integrate LOTO into broader QEHS certification system for consistent quality and safety
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Summary of LOTO Steps

Step Action

- 1 Plan & identify energy sources per device (electrical, hydraulic, pneumatic, mechanical)
- 2 Notify affected personnel and areas
- 3 Shut down machine using official procedures
- 4 Isolate all energy sources
- 5 Lock and tag each isolation point
- 6 Release stored energy and verify zero energy
- 7 Perform maintenance with LOTO in place
- 8 Re-isolate for multi-energy source tasks, if needed
- 9 Remove locks/tags only after safe verification

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Step Action

10 Re-energize stepwise and test before full operation

By aligning with TCMARINE's complex machinery and equipment footprint—spanning heavy lathes, cranes, fabrication gear, and precision grinders—this LOTO procedure ensures full compliance, maximizes safety, and supports seamless integration into TCMARINE's QEHS and operational protocols.

Managing Equipment Maintenance and Safe Work Procedures

1. Inventory & Equipment Specifications

Maintain a master registry including:

- **Machine ID, Type & Model** (e.g. ABB IRB4600 robotic cladding, SPARK CW61140 lathe up to 16 m)
- **Technical specs:** precision, swing, capacity, etc. to guide maintenance requirements
- **Location & Year in Service** (e.g. installed during 2013/2016 expansions)

Why it matters:

Baseline data ensures maintenance schedules are tailored and traceable.

2. Preventive Maintenance Scheduling

Set up a calendar system (e.g. CMMS or spreadsheet) with:

- **Daily checks:** lubrication, visual inspections, clean work surfaces, hydraulic leaks.
- **Weekly inspections:** check dimensional equipment (jigs, film readings), coolant levels, filter changes.

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- **Monthly tasks:** calibration of measuring tools (mag particle, hardness testers), crane test-loads.
 - **Quarterly servicing:** spindle alignment, precision adjustments, laser optics cleaning.
 - **Annual overhaul:** full inspection including electrical, hydraulic system flush, certified crane & overhead lifter recertification.
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3. Calibration & Testing Control

- Use dedicated calibration equipment for dimensional and surface inspections (e.g., crankcase flatness, parallelism, twist)
 - Maintain documented records for each tool, including calibration dates and tolerances.
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4. Safe Work Procedures (SWP)

Aligned with QEHS policy (zero injury, safe working conditions)

A. Risk Assessment

- Prior to any job, conduct a JSA/Hazard ID, focusing on pinch/strike points near heavy machinery (e.g. 20 t capacity cranes).
- Identify hazards: rotating parts, lasers, grinding wheels, overhead cranes.

B. PPE Requirements

- Mandatory items: safety glasses, hearing protection, steel-toe boots, gloves, welding face shields as needed.
- Special PPE for specific tasks: respiratory protection during thermal arc spraying

C. Lockout/Tagout (LOTO)

- Establish procedures to isolate energy sources for machines undergoing maintenance.
- Only trained personnel may apply LOTO tags and release systems.

D. Machinery Operation

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- Verify guarding installed on lathe, boring, and grinding machines.
- Ensure operators are certified and trained on each machine type and tool.

E. Crane & Lifting

- Use only certified operators for overhead cranes (10 t & 5 t units).
- Perform daily pre-shift checks (hoist function, wire rope wear).
- Never exceed rated load; always use proper rigging.

F. Hot Work & Surface Repairing

- Follow welding/spraying procedures to avoid burns and fire.
 - Set hot work permits, fire watches, and use ventilation for thermal arc spray work
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5. Maintenance Execution & Record Keeping

- **Maintenance Log** for each machine: include date, responsible technician, tasks, measurements, parts replaced, and next due date.
 - **SWP Checklist** for each job: hazard ID, PPE used, step-by-step procedures, signatures.
 - Store records digitally or physically, clearly indicating compliance with QEHS.
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6. Training & Competency

- Conduct regular in-house training (QEHS section mentions “workers’ consultation and participation”)
 - Ensure all staff are trained on: machine operation, hazard ID, LOTO, PPE, and emergency protocols.
 - Maintain a training log with attendance and competency verification.
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7. Incident & Non-Conformance Response

- Document any incident or near-miss (aligned with "zero major accident" from QEHS).

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- Perform root-cause analysis and update SWP to prevent recurrence.
 - Review corrective actions during weekly safety meetings.
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8. Continuous Improvement

- Quarterly audits of maintenance schedules, records, and condition assessments.
 - Gather feedback from machine operators and technicians for improvements.
 - Update procedures or retrain staff based on audit findings or incidents.
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9. QEHS Integration

- This SMP (Safety & Maintenance Protocol) directly supports TCMARINE's QEHS Policy:
 - Ensures **quality** via calibration and maintenance.
 - Protects **environment** by preventing leaks & waste.
 - Supports **health** and **safety**—preventing injuries and major accidents
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Summary Table

Component	Description
Inventory	Detailed registry of machine specs & locations
PM Schedule	Daily to annual tasks per equipment type
Calibration	Ensure precision and recordkeeping
SWP	Risk assessment, PPE, LOTO, operation, hot work
Record Logs	Maintenance, SWP checklists, incident reports
Training	Regular competence training & logs
Audit & Review	Quarterly reviews & continuous feedback

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By implementing this structure, TCMARINE will ensure safer, more reliable machinery operations, full traceability, and alignment with their quality, environmental, health, and safety objectives.



Sources