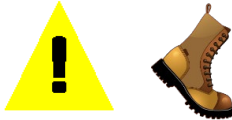


Safe Work Procedure

LOCKOUT & ZERO-ENERGY PROCEDURES

Program/Services Facilities Services (Electrical, Mechanical, Plumbing, HVAC), Trades Programs, Research Labs, Science Labs, Nursing Labs, Studios, Culinary, Warehouse Operations, Contractors working on TRU equipment.		Document ID RSS 18.18.5	Department: Risk and Safety Services
Personal Protective Equipment or Devices Used CSA-approved protective footwear Safety glasses Work gloves (mechanical or cut-resistant, as needed) Personal lockout locks Multiple lock attachments (scissor clips) Lockout tags (information tags only — not used <i>in place</i> of locks)	Training Requirements TRU Lockout Training provided by supervisor or qualified instructor Hands-on demonstration of lockout device use Verification of understanding Annual refresher or retraining after incident / improper use	Applicable Documents TRU Lockout Program Lock Removal Form (RSS10.15.3) Equipment-specific manuals or isolation procedures	Creation Date: 23 January 2014
			Effective Date: January 2026
			Next Review: January 2027
			Revision no. 5 Reviewer: Safety Technician

HAZARD IDENTIFICATION — VISUAL SUMMARY

ELECTRICAL HAZARD	PINCH POINTS	STORED ENERGY (GRAVITY / SPRINGS / HYDRAULIC / PNEUMATIC / ELECTRICAL)	CRUSHING HAZARD (GENERAL)	HOT SURFACES / THERMAL BURNS
				
Do not work on energized electrical equipment. Follow lockout/tagout procedures. Older fixtures may have degraded or missing circuit labels; treat all circuits as unidentified until verified.	Isolate all energy sources before maintenance or clearing jams. Keep hands and body clear of moving or rotating components.	Release or isolate all forms of stored energy before servicing. Apply full lockout procedures and verify zero energy before beginning work. Dual-feed fixtures (e.g., standard + night-lighting) may energize unexpectedly.	Maintain a safe distance from moving equipment or falling objects.	Avoid contact with heated equipment or surfaces; wear heat-resistant gloves when needed.
ENTANGLEMENT HAZARD (CLOTHING/HAIR)	SLIPS / TRIPS	FOOT INJURY	IMPACT INJURIES	
				
Wear close-fitting clothing. Keep clear of rotating or moving components. Tie back or contain long hair.	Keep floors clean and dry; remove oil, grease, and debris.	Wear CSA-approved protective footwear at all times in shop areas.	Wear appropriate PPE such as CSA-approved footwear and impact-rated eye or body protection. Maintain safe positioning and control of tools and materials to avoid being struck.	

PURPOSE

This Safe Work Procedure outlines the standardized steps for placing TRU equipment and machinery into a zero-energy state using approved lockout procedures, ensuring that workers, students, and contractors are protected from hazardous energy during maintenance, repair, or servicing activities.

PRE-USE REQUIREMENTS (if needed)

- Complete TRU-approved lockout training and be authorized by your supervisor.
- Review equipment-specific isolation points before starting work.
- Inspect lockout devices (locks, scissor clips, tags) for damage.
- Identify all hazardous energy types (electrical, hydraulic, pneumatic, gravity, thermal, chemical).
- Notify affected workers that lockout will occur.
- Ensure the area is clear of slip/trip hazards and provides safe access to isolation points.
- Conduct a pre-task hazard assessment specifically for legacy fixtures, degraded wiring, and missing or unreadable labels.
- Assume the potential for multiple electrical feeds until each circuit is positively identified.
- Inspect fixture condition (insulation, wiring integrity, ballast housing, or driver connections).
- Review updated panel schedules, circuit maps, and any notes indicating dual feeds or atypical wiring.
- Confirm you have heat-resistant labeling or alternative circuit ID methods available if needed.

OPERATING RULES

- Only trained and authorized persons may perform lockout.
- Personal locks are for individual use only; do not share keys or devices.
- Apply a personal lock to *each* energy-isolating device you control.
- Do not rely on tags alone — locks must be used.
- Never bypass interlocks or defeat safety devices.
- Maintain control of your key at all times.
- No one other than the lock owner may remove a personal lock (except through the emergency lock removal process).
- Workers must not rely on existing labels when labels are missing, heat-degraded, or otherwise unreadable.
- Mixed-circuit or dual-feed lighting rows must be locked out at all known feeds before work begins.
- Treat each fixture as potentially energized until individually verified, especially in older buildings.

SAFETY RULES

- Always perform voltage testing on each individual fixture before accessing internal wiring, even after lockout verification at the panel.
- When multiple energy sources or dual circuits may exist, apply locks to all associated breakers until testing confirms correct isolation.
- Do not open or service fixtures with significantly deteriorated wiring or insulation until the area is stabilized or the fixture is isolated from all feeds.
- Treat all equipment as energized until verified zero-energy.
- Do not place any body part near moving components unless all energy is isolated.
- Block, bleed, or mechanically secure stored energy sources.
- Never perform maintenance while equipment is capable of motion.
- Do not lockout using panel-door latches or non-approved isolation points.
- When in doubt, STOP and consult your supervisor or RSS.

HOUSEKEEPING

- Maintain clear access to isolating devices.
- Remove tools, debris, and materials from around the work area.
- Ensure walkways remain free from tripping hazards.
- Replace guards and covers before removing locks.
- Document any missing, damaged, or heat-degraded labels and report them immediately for corrective action.

HANDLING PROCEDURES

A. Standard 6-Step Lockout Procedure (WorkSafeBC Model)

1. Identify

- Locate the equipment, review the energy sources, and identify all isolation points.

2. Shut Down Equipment

- Follow manufacturer or TRU shutdown methods; ensure all motion stops.

3. Isolate Energy Sources

- Turn off, close, or disconnect all electrical, mechanical, hydraulic, and pneumatic energy.

4. Apply Locks

- Apply your personal lock and a scissor clip (if needed) to each energy-isolating device.
- Attach a completed information tag (not used as a lockout device).

5. Release Stored Energy

- Bleed hydraulic or pneumatic lines.
- Discharge capacitors.
- Block gravity hazards or secure moving parts.

6. Verify Zero-Energy

- Attempt to start the machine using normal controls.
- Visually confirm no movement or energy present.
- For complex equipment, verify pressure gauges, valves, and electrical indicators.

A zero-energy state is confirmed when all forms of hazardous energy (electrical, mechanical, hydraulic, pneumatic, gravity, thermal, chemical, stored or residual) have been isolated, released, blocked, or controlled, and the worker has verified the absence of energy by test-start, gauge checks, visual inspection, or system indicators.

B. Plug-In Equipment

Lockout is not required if:

- The equipment is connected by a removable plug, and
- The worker maintains exclusive control of the plug.

Requirements:

- Unplug equipment.
- Test start to confirm de-energization.
- If multiple workers are involved, apply a plug lock box and personal locks.

C. Group Lockout

Used when multiple people or multiple isolation points are involved.

Requirements:

- Two qualified workers isolate all energy sources.
- Keys for isolation locks are placed in a lockbox.
- Each worker attaches their personal lock to the lockbox.

- Work begins only when all workers have locked the box.
- Lockbox is removed only after all individual locks are removed.

D. Lock Removal (Normal + Emergency)

Normal:

- Remove locks only after verifying:
 - Guards replaced
 - Tools removed
 - Components reassembled
 - Personnel clear
- Restore power safely.

Emergency Removal:

If the lock owner is unavailable:

- Supervisor attempts to contact lock owner (document times).
- Supervisor inspects equipment and verifies it is safe to remove the lock.
- A second person (manager or RSS) witnesses lock removal.
- Lock Removal Form is completed and forwarded to RSS.
- Lock owner is notified immediately upon next shift.

E. Multi-Feed Verification

When servicing lighting or equipment in older facilities or where legacy wiring exists:

- Treat the entire fixture row or circuit group as multi-feed until testing confirms otherwise.
- Identify and lockout both standard and night-light feeds or any known alternate feeds.
- Perform a fixture-level voltage test:
 - Test the incoming conductor(s)
 - Test neutral
 - Test chassis/ground reference
 - Confirm zero-energy before handling any wiring
- If any anomaly is detected (partial voltage, backfeed, unexpected conductor), stop work and re-assess energy isolation.

HAZARD CONTROLS — DETAILED TABLE

Hazard	Control Measure
Compressed Gases	Isolate gas supply; close valves; bleed lines; secure cylinders upright.
Crushing Hazards	Block or secure equipment; avoid placing body under unsupported components.
Cuts / Punctures	Wear appropriate gloves; avoid sharp edges when accessing panels.
Electrical	Isolate electrical sources; apply lockout devices; verify zero-energy; treat equipment as energized until verified. Older fixtures may have degraded labeling or multiple feeds. Verify each fixture individually using approved voltage testing equipment after locking out <i>all possible sources</i> .
Entanglement	Secure hair/clothing; avoid rotating parts; verify full stop before work.
Equipment Defect	Remove defective equipment from service; report defects; do not lockout defective devices improperly. Aging fixtures may contain deteriorated insulation or brittle conductors. Do not manipulate wiring until testing confirms zero-energy and components are stable.
Falling Objects	Secure attachments; maintain clear zone beneath elevated components.
Foot Injury	Wear CSA-approved footwear; maintain clear floor space.
Hot Surfaces / Thermal Burns	Allow cooling; wear heat-resistant gloves if necessary.
Impact Injuries	Maintain safe positioning during isolation; avoid stored energy release paths.
Improper Blocking / Cribbing	Use approved blocks; ensure stable support of raised components.
Incorrect Positioning	Use proper lifting points; verify components are secured before isolation. Mixed circuits (standard + night-lighting) may energize fixture components unexpectedly. Lock out all known feeds and verify independently.
Pinch Points	Apply lockout before accessing gears/belts; maintain distance from moving parts.
Slips / Trips	Keep the area clean and dry; maintain adequate lighting.
Stored Energy (Gravity / Springs / Hydraulic / Pneumatic / Electrical)	Release, block, bleed, or secure all stored energy before work; verify zero-energy. Capacitors, drivers, and ballasts may retain charge. Confirm zero-voltage at all conductors and components before handling.
Trapping Hazards	Confirm all components are secured; do not position between moving parts.
Working Alone	Follow TRU Working Alone procedures; students must not perform lockout alone.

RECORDS/VERIFICATION OF UNDERSTANDING

- Supervisors maintain records of lockout training and Verification of Understanding.
- Lockout checklists and Lock Removal Forms must be retained as per TRU policy.
- Retraining required after incidents, close calls, or misuse.
- Document any instance of multiple feeds, degraded labeling, damaged insulation, or unexpected energized components and forward to Facilities management for engineering review.

WORKING ALONE

Students are strictly prohibited from working alone in any lab or shop. If an employee anticipates isolation during work activities, a Working Alone assessment and check-in procedure must be implemented per TRU policy.

Workers must not perform troubleshooting of mislabeled, deteriorated, or multi-feed circuits while working alone.

ANNUAL REVIEW

Risk and Safety Services (RSS) will complete a review of this Safe Work Procedure annually to ensure it remains current and effective. The Joint Occupational Health and Safety Committee (JOHSC) may be consulted during this review.

A review will also occur if:

- Regulatory requirements change.
- The procedure is reported to be ineffective.
- An incident occurs involving operation.
- Review must be updated if deficiencies in labeling, circuit mapping, or unexpected energized conductors are identified during field work.

APPLICABLE OCCUPATIONAL HEALTH AND SAFETY REGULATION (OHSR)

SWP Section	Requirement Met	WorkSafeBC Regulation Reference
Training Requirements	Lockout training; verification of understanding	OHSR 3.23–3.25
Lockout & Zero-Energy Requirements	De-energization & lockout of equipment	OHSR 10.2–10.12
Electrical Safety	Electrical isolation, safe work practices	OHSR 19.1–19.10
General Machinery Safety	Safe machinery; manuals; equipment inspection	OHSR 4.3, 4.5
Stored Energy / Mechanical Hazards	Release of stored energy; control of motion	OHSR 12.2, 12.10
PPE Requirements	Eye protection, gloves, footwear	OHSR 8.2–8.11, 8.14–8.17
Housekeeping	Clean work area; safe access	OHSR 4.39–4.42
Working Alone	TRU Working Alone Policy	OHSR 4.20.1 – 4.22, 23

SUMMARY OF CHANGES

Rev#	Date	Change	Issued By
1	23 Jan 2014	NEW	OHS Officer
2	17 APR 2019	Review, Revisions and New Format	Safety Officer
3	18 APR 2023	Review and revise to include zero-energy.	Safety Manager
4	23 AUG 2024	RSS Update	Safety Advisor
5	15 JAN 2026	Full rewrite to align with new TRU SWP template; removed redundant policy content, updated hazard list, control measures, and OHSR references.	Safety Technician