THOMPSON RIVERS UNIVERSITY | Risk & Safety Services

Safe Work Procedure

Tools, Machinery & Equipment

RSS 18.20.3

Program/Services	Safe Work Procedures		Department: Risk and Safety Services
Personal Protective Equipment or Devices Used • Safety Glasses • Work Gloves • Work Boots • Hard Hats • Close fitting clothing or protective clothing	**Training Requirements** • Training is required prior to operating any machine.	**Applicable Documents**	**Effective Date:** April 17, 2019 **Date Reviewed** Revision Date: Aug. 23, 2024 — Revision #: 3 — Authorized: Safety Advisor

ELECTRICAL HAZARD	COMPRESSED GASES	PINCH POINTS	HIGH SOUND LEVELS	FOOT INJURY	LASER HAZARD
 Do not attempt to service electrical wires.	 • Do not drop • Do not keep near heat	 Use LOCK-OUT procedures when performing maintenance or conducting any work within 12” of an exposed pinch point. **NEVER** put your hands or feet near an exposed pinch point or gears!	 **HEARING PROTECTION** is required when working in designated. Required when Sound levels exceed 85 dB areas.	 Approved protective footwear is required when there is the risk of foot injury due to slipping, uneven terrain, and abrasion, crushing potential, temperature extremes, corrosive substances, puncture hazards, electrical shock, and any other recognizable hazard.	 Wear suitable eye protection

PROCEDURES

- Protect workers from contact with hazardous power transmission parts.
- Ensure workers cannot access a hazardous point of operation.
- Safely contain material ejected by the work process that could be hazardous to the worker.
- Ensure fixed guards cannot be removed without the use of tools.
- Require any tool, machine or equipment that is removed from service is identified so that it cannot be returned to service until repaired or made safe for use.

All powered equipment, except portable tools and mobile equipment, will have:

- Starting and stopping controls within easy reach of the operator.
- Control functions identified.
- Inadvertent activation of controls prevented by location, design or shielding.
- Two-handed control equipment is only if both hands use the controls simultaneously.

Physical hazards associated with tools, machinery, and equipment will be marked.

Mechanical Power Transmission Parts

- Rotating parts that can be contacted will be guarded.
- All gear and chain sprockets will be completely enclosed. If not practicable will have band-type guards with flanges extending below the root of the teeth
- Rotating spokes will be guarded on accessible sides.
- All reciprocating or oscillating parts will be guarded.
- Drive belts will be guarded in the event it fails.
- In-running nip points located less than 2.5 m (8 ft.) above the floor will be guarded.

Brake Press and Shear

Point of operation safeguarding

- The point of operation of the brake press and shear must be safeguarded to prevent injury to the operator or any other worker.
- A hand feeding or extraction tool will not be used as a substitute for point of operation safeguarding.
- A guillotine or alligator shear will have a guard or other device which protects the operator from flying particles or material emanating from the shears.
- The point of operation a manually powered press, shear or cutter must be effectively guarded.
- The safeguarding for the point of operation of the brake press may be removed if custom or different bends are being done with each cycle of the machine, provided that safe work procedures are written and followed, and safeguarding is replaced upon completion of such custom work.

- If the brake press is being used in a production mode the keys for all control selector switches must remain under a supervisor's control.

Feed-Rolls and Metal-Forming Rolls

- Feed-rolls must have a guard or safety device to prevent the operator from contacting any in-running nip points.
- The feed-roll guard must be effective for the material thickness being processed, and the clearance between the guard and the material passing through the feed-rolls will not exceed 6 mm (1/4 in).
- If the work process on metal-forming rolls precludes the use of guards, an emergency stopping system will be installed across the machine, and also across the rear (offside) of the machine if a worker is exposed to the hazard on that side. The emergency stopping system will activate automatically when contacted.

Machine Tools

- Cutting/cooling fluids, metal chips, scarf or turnings from machine tool work must be contained.
- Contact with the operator by lathe dogs (lathe carriers) that extend beyond the circumference of a lathe chuck must be prevented.
- The use of hand-held strips of abrasive cloth to polish lathe stock is prohibited; tools designed for the purpose must be used.
- Workers must be protected from stock projecting from the lathe.
- A shaper/planer bed opening must be covered or guarded to eliminate shearing hazards.
- Workers must be protected against contact with moving parts, including stock, by the use of safeguard(s) at the furthest point of travel of the carriage or table of a shaper, planer, surface grinder or similar equipment.

Powder Actuated Tools

- Low-velocity powder actuated tools (less than 100m (330 ft.) per second) must be used unless there is no lower velocity tool on the market capable of doing the fastening task.
- The tool has to be designed so the operator can select the power level appropriate to perform the work and has to have two distinct operations to activate it.
    - Depressing the baseplate into the firing position.
    - The final firing movement.
- The tool must be marked with the manufacturer’s name or trademark, model and serial number. Any guards or accessories must be marked with the manufacturer’s name or trademark.
- When being stored a powder actuated tool must be unloaded and the tool and charges are securely stored and only accessible to qualified, authorized people. Charges of different power levels and types must be kept in different compartments/containers.
- Only qualified workers may handle or use a powder actuated tool or charge.

When using or servicing a powder actuated tool the operator must have available:

- The manufacturer’s operating instructions.
- The power load and fastener charts for the tool.
- Any equipment needed for tool use or field servicing, including PPE.

- The tool cannot be used in an explosive or flammable atmosphere**.**
- The tool must not be pointed at a person.
- The tool may only be loaded when it is being prepared for immediate use, and if work is interrupted must be unloaded.
- In the event of a misfire, the tool must be held firmly against the work surface for at least 5 seconds and the manufacturer's instructions followed. The tool must be kept pointed so it will not cause injury for any person until the cartridge has been ejected.
- A fastener cannot be driven into very hard or brittle materials, such as cast iron, glazed tile, hardened steel, glass block, natural rock, hollow tile, and most brick.
- The fastener may only be driven into easily penetrated or thin materials or materials of unknown material if the receiving material is backed by a material that will prevent the fastener from passing through.
- The fastener must not be driven into steel within 13 mm (1/2 in) of an edge, or within 5cm (2 in) of a weld except for special applications permitted by the manufacturer**.**
- The fastener may not be driven into masonry materials except when in the following circumstances as recommended by the manufacturer:
    - Within. 7.5 cm (3 in) of an unsupported edge with a low-velocity tool, or
    - Within 15 cm (6 in) of an unsupported edge with a medium or high-velocity tool.
- A fastener must not be driven:
    - Into concrete, unless material thickness is at least 3 times the fastener shank penetration.
    - Into any spalled area, or through existing holes, unless a specific guide means, as recommended and supplied by tool manufacturer, is used to assure positive alignment.

Chain Saws

- The chain saw must have a chain brake that activates automatically if the event of kickback regardless of the position of the powerhead or operator's hands. A chain saw manufactured before 1 January 1999 that has a guide bar more than 66 cm (26 in) does not have to have a chain brake.
- The chain must be stopped but the operator moves from cut to cut unless the next cut is in the immediate area and the operator can safely move to the next cutting position.

Automotive Lifts and Other Vehicle Supports

- The operation, inspection, repair, maintenance and modification of an automotive lift, a portable automotive lifting device (PALD) or other vehicle support will be carried out according to the manufacturer's instructions or the written instructions of a professional engineer.
- TRU will keep maintenance, inspection, modification and repair records for each automotive lift which will be kept at the specific lift and in the Mechanic office**.**
- The lifts will be inspected and tested monthly unless required to be done more frequently by the manufacturer.
- The rated capacity will be marked on each automotive lift, portable automotive lift, PALD or other vehicle support and will not be exceeded.
- If the rated capacity in 8.4 depends on the concurrent use of 2 or more devices, the number of devices required to achieve the rated capacity must be clearly marked on the devices.

- Controls for automotive lifts must require continuous pressure by the operator when raising or lowering the unit, and the control must return to the neutral position when released.
- Before a runway type automotive lift is used:
- Manual wheel chocks must be used as the primary means to prevent vehicle movement;
- Automatic or fixed stops, or a combination of them, must be provided and used as a secondary means to prevent the vehicle from inadvertently rolling off either end of the runway.
- A swing- arm automotive lift must have swing-arm pivot restraints if:
    - No part if the rigid superstructure is under the raised vehicle.
    - The lift has 2 or more superstructures and the clearance between the rigid parts of the superstructure is, or more than, 1.3m (51 in.) on each side of the vehicle.
- Swing-arm pivot restraints required above must be designed and maintained to prevent unintentional removal or disengagement of the swing-arm pivot restraints when a vehicle is being supported by the automotive lift.

Pneumatic Nailing and Stapling Tools

- A hand-held pneumatic nailing or stapling tool capable of driving fasteners larger than 1.2 mm (0.05 in. or 18 gauge ASWG) must not activate unless the tool requires 2 actions to operate, one of which is being placed against the work surface.
- The trigger of a pneumatic nailing or stapling tool must not be taped or otherwise secured in the "on" position, or hold in the "on" position while moving between operations.
- The air supply to the pneumatic nailing or stapling tool must be disconnected before adjusting or servicing the tool.

Abrasive Blasting and High-Pressure Washing

- TRU will conduct a risk assessment before any abrasive blasting or high-pressure washing activity which may cause the release of a harmful level of an air contaminant from a surface or coating containing a toxic heavy metal or asbestos.
- Abrasive blasting of materials containing crystalline silica will not be used at TRU.
- An abrasive material must not be reused if it:
    - Becomes contaminated with any harmful impurities including metals such as lead, chromium, nickel or mercury.
- Does not apply to a fully enclosed, vented cabinet designed to recirculate the abrasive material.
- Used abrasive blasting materials which contain substances designated as a carcinogen, reproductive toxin, sensitizer or highly toxic (and have a designation of L endnote) must be removed from the workplace using effective procedures designated to minimize the generation of airborne dust and suitable PPE.
- Removal under must take place by the end of each shift unless:
    - The risk assessment establishes that the risks from removal exceed the risks from leaving the materials in place,
    - No workers will be exposed to the materials before removal occurs, or
    - The materials cannot be separated from the environment in which the abrasive blasting has taken place.
- If removal is delayed, a risk assessment will be conducted to establish the risks from delaying the removal if needed written safe work procedures will be developed.
- Engineering controls – enclosure or local exhaust ventilation with dust collection will be used to maintain airborne contaminant levels below exposure limits, where practicable.

- Exhaust ventilation will be used when abrasive blasting is conducted within a structure, the process will be isolated in a separate, properly ventilated enclosure or cabinet to minimize worker exposure to air contaminants generated by the process.
- When abrasive blasting, or similar operation, is conducted inside an enclosure or cabinet the exhaust ventilation will:
    - Maintain the air pressure below the air pressure outside the enclosure or cabinet, so as to prevent the escape of air contaminants from the enclosure or cabinet to other work areas, and
    - Minimize worker exposure inside the enclosure.
- If abrasive blasting, high-pressure washing or a similar operation is conducted by a worker outside a cabinet, written safe work procedures addressing the hazards and necessary controls will be prepared and implemented.
- When abrasive blasting, high-pressure washing or similar operation is conducted outside a structure, the process must be restricted to a work zone which is identified by signs or similar means as being a contaminated area.
- Only properly protected workers who are necessary to perform the work are permitted inside an enclosure or a restricted work zone where abrasive blasting, high-pressure washing or similar operation is conducted.
- The operating controls for a sandblasting machine or jetting gun must be
    - Located near the nozzle in a position where the operator's hands will be when using the device unless hand operated controls are not practicable in which case foot operated controls will be used,
    - Of the continuous pressure type that immediately stops the flow of material when released, and
    - Protected from inadvertent activation.
- Jetting guns will not be modified except as authorized by the manufacturer.
- Objects must not be handheld while it is being cleaned or cut a jetting gun.
- High-pressure hoses, pipes, and fittings will be supported to prevent excessive sway and movement.
- The nozzle or jetting gun operator will wear personal protective clothing and equipment on the body, hands, arms, legs, and feet, including the metatarsal area, made of canvas, leather or other material which will protect the worker's skin from injury in the event of contact with the flow from the nozzle.
- A suitable respirator will be worn whenever abrasive blasting or similar operation is conducted outside a cabinet.

Welding, Cutting, and Allied Processes

- Effective local exhaust ventilation will be used at all fixed work stations to minimize worker exposure to harmful air contaminants produced by welding, burning or soldering.
- A coating on metal which could emit harmful contaminants (such as lead, chromium, organic materials, or toxic combustion products) will be removed from the base metal, whenever practicable before welding or cutting begins.
- Containers which have held a combustible substance will be thoroughly cleaned before any welding or burning operation is carried out on the container.
- Burning, welding or other hot work will not be done on any vessel, tank, pipe or structure, or in any place where the presence of a flammable or explosive substance is likely until:
    - Tests have been made by a qualified person to ensure the work may be safely performed, and
    - Safe work procedures have been adopted, which includes additional tests made at intervals that will ensure the continuing safety of the workers.
- Welding, including regulators, automatic reducing valves and hoses will be used only for the gas for which it is designed.
- The operator will ensure that welding and burning equipment is free from defects, leaks, oil, and grease before use.

- Flashback arrestors will be installed on each hose in an oxy-fuel system, between the torch and the regulator to prevent reverse gas flow and to arrest a flashback.
- Receptacles for electrode stubs are provided and must be used.
- Arc welding will not be carried out unless other workers who may be exposed to radiation from the arc flash are protected by adequate screens, curtains or partitions or wear suitable eye protection.
- Screens, curtains or partitions near an arc welding operation are made of or have been treated with a flame-resistant material or coating, and have a non-reflective surface finish.
- Workers involved in welding or burning operations must wear:
    - Flame resistant work clothes,
    - Gauntlet gloves of leather or other suitable material and arm protection,
    - A leather apron or other suitable material for heavy work,
    - Eye and face protection against harmful radiation, particles of molten metal, and while chipping and grinding welds and
    - Substantial safety footwear made of leather or other suitable material.

- A respirator will be worn if an effective means of natural, mechanical or local exhaust ventilation is not practicable:
    - During short duration welding, burning or similar operations, and
    - During emergency work

- All recently welded or flame cut work will be marked "HOT" or effectively guarded to prevent contact by a worker if a worker not directly involved in the hot work is likely to enter the work area.
- At least one suitable type and capacity fire extinguisher will be available where welding or cutting is done.
- Fire extinguisher locations are marked and made known to workers.

Painting, Coating, and Work with Plastics and Resins

- When practicable a less hazardous substance or work process will be substituted for a higher hazard substance or process.

- If alternatives exist, a substitute for a paint containing toxic heavy metal components will be used.
- A toxic or flammable chemical or chlorofluorocarbon will not be used as a propellant in spraying operations.
- Spraying a flammable or another hazardous product is prohibited in the general work area unless effective controls have been installed to control the fire, explosion and toxicity hazards.
- When practicable, a coating will not be applied to material about to be welded.
- Work areas or enclosures where hazardous materials are handled or used will have suitable signs or placards warning workers of the hazards within the identified restricted access area and stating the precautions for entry into the area.
- When practicable, the ventilated spray booth or other enclosure designed to control worker exposure will be used during.
    - Any operation or process which involves spraying paint or resin,
    - Lay-up or molding of reinforced plastic, or
    - Any application of a paint, coating or insulation containing a sensitizer such as an isocyanides compound, or similar operations using very toxic materials.

- The air velocity through a horizontal flow spray booth, a vertical flow, down-draft booth or other enclosure required by 14.7 must be at least:
    - 50 cm/s (100 fpm) if the cross-sectional area is 14 m2 (150 ft2) or less, and
    - 25 cm/s (50 fpm) if the cross-sectional area is greater than 14 m2 (150 ft2).

- In outdoor applications of materials listed in section 14.8, an air velocity across the work area of at least 0.25 m/s (50 fpm) must be assured, by mechanical means if necessary, to carry vapors and aerosols away from the breathing zone of a worker.
- The ventilation system used to control airborne contaminants will have electrical and mechanical systems designed to control all potential ignition sources.
- A ventilation system subject to heavy concentrations of overspray from the operation will have an arrester filter.
- An arrester filter will be maintained in good operating condition and replaced when the pressure drop across the filter exceeds the design criteria.
- Each worker who is or may be exposed to an airborne contaminant generated by a spray operation involving a sensitizing agent will be provided with and wears a supplied-air respirator.
- Empty, non-returnable containers which contained isocyanates will be decontaminated by filling them with water and allowing them to stand for a minimum of 48 hours, without being sealed, stoppered or closed, after which they must be pierced to prevent re-use.
- Emissions from operations involved in heating plastics to temperatures which may release thermal decomposition products will be removed from the workplace by local exhaust ventilation when there is a risk of harm to a worker from exposure to these emissions.
- A foam installation process performed indoors will be controlled or contained so that unprotected workers are not exposed to emissions by using an enclosure, portable local exhaust ventilation, or scheduling arrangements.
- A foam installation process performed outdoors and relying on natural ventilation must be done in an area restricted to authorized personnel wearing adequate personal protective equipment.

Cleaning & Maintenance

- Manufacturer's instructions will be followed in the cleaning and maintenance of tools, machinery, and equipment.

SUMMARY OF CHANGES

Revision #	Date	Change (include section #)	Issued By
1	03/04/2014	NEW	OHS Officer
2	04/17/2019	Review, Revision and New Format	Safety Officer
3	08/23/2024	RSS update	Safety Advisor