

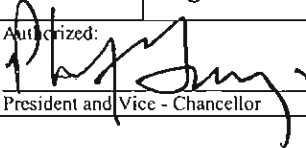


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| | Submitted: Risk Management Support Group | Approved:  Vice President, Administration | Authorized:  President and Vice - Chancellor |

1 PURPOSE


- 1.1 To define best practices for access to and the safe installation and use of machine tools and general machine shop safety practices in University machine shops.
- 1.2 To ensure compliance with the Occupational Health and Safety Act and the Criminal Code.

2 SCOPE

- 2.1 All individuals (staff and students) who are required to work in University Machine Shops.

3 RELATED DOCUMENTS


- 3.1 Occupational Health and Safety Act and Regulations for Industrial Establishments R.R.O. 1990.
 - 3.2 The Criminal Code of Canada
 - 3.3 Ontario Fire Code.
 - 3.4 CSA Standard Z432-94 Safeguarding of Machinery.
 - 3.5 CSA Standard Z114-M1977, Safety Code for Woodworking.
 - 3.6 CSA Standard CAN C22.2 No. 745-1-95 Safety of Portable Electric Tools Part 1.
 - 3.7 CSA Standard CAN C22.2 No. 745-2-95 Series, Safety of Portable Electric Tools Part 2.
 - 3.8 CSA Standard CAN C22.2 No. 144-1997, Ground Fault Circuit Interrupters.
 - 3.9 CSA Standard W117. 2-94 Safety in Welding and Cutting and Allied Processes.
 - 3.10 CSA Standard CAN /CSA-Z 94. 3.2007 for Eye and Face Protectors Protection.
 - 3.11 CSA Standard CAN/CSA Z432-04, Safeguarding of Machinery
 - 3.12 CSA Standard CAN/CSA Z1452-02, Code for Power Press Operation Health, Safety and Guarding Requirement
 - 3.13 ANSI Standard Z358.1 Emergency Eyewash and Shower Equipment.
 - 3.14 ANSI B11.1, Safety Requirements for the Construction, Care, and Use of Mechanical Power Presses.
 - 3.15 ANSI B11.3 Safety Requirements for the Construction, Care and Use of Mechanical Power Press Brakes.
 - 3.16 ANSI B11.4 Safety Requirements for the Construction, Care and Use of Shears.
 - 3.17 ANSI B11.6 Safety Requirements for the Construction, Care and Use of Lathes.
 - 3.18 ANSI B11.7 Safety Requirements for the Construction, Care and Use of Cold Headers and Cold Formers.
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- 3.19 ANSI B11.8 Safety Requirements for the Construction, Care and Use of Drilling, Milling and Boring Machines.
- 3.20 ANSI B11.9 Safety Requirements for the Construction, Care and Use of Grinding Machines.
- 3.21 ANSI B11.10 Safety Requirements for the Construction, Care and Use of Metal Sawing Machines
- 3.22 ANSI B11.13 Safety Requirements for the Construction, Care and Use of Single-and Multiple Spindle Automatic Screw/Bar and Chucking Machines.
- 3.23 ANSI B15.1, Safety Standard for Mechanical Power Transmission Apparatus.
- 3.24 National Safety Council- Safeguarding Concepts Illustrated.
- 3.25 American Conference of Industrial Hygienists, Industrial Ventilation Manual-A manual of Recommended Practice.
- 3.26 McMaster University RMM #100 Workplace & Environmental Health and Safety Program.
- 3.27 McMaster University RMM # 300 Safety Training and Orientation Program.
- 3.28 McMaster University RMM # 301 Standard Operating Procedures (SOP's) Program.
- 3.29 McMaster University RMM # 306 Lockout / Tagout Safety Program.
- 3.30 McMaster University RMM # 313 Head Protection Program.
- 3.31 McMaster University RMM # 310 Eye Protection Program.
- 3.32 McMaster University RMM # 312 Foot Protection Program.
- 3.33 McMaster University RMM # 403 Noise Control and Hearing Protection Program.
- 3.34 McMaster University RMM # 311 Respiratory Protection Program.
- 3.35 McMaster University RMM # 304 Working Alone Program.
- 3.36 McMaster University RMM # 501 Hazardous Materials Management Systems including WHMIS Program.
- 3.37 McMaster University RMM # 201 Hot Work Program.

4 DEFINITIONS

- 4.1 **Authorized Persons** – Individuals who have been trained and certified as being competent to work safely on a specific machine, tool or other work related task in a machine shop.
 - 4.2 **Competent Person (OHSA)** – means a person who:
 - (a) is qualified because of knowledge, training and experience to organize work and its performance,
 - (b) is familiar with the OHSA and the regulations that apply to the work, and
 - (c) has knowledge of any potential or actual danger to health or safety in the workplace.
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- 4.3 **Employer**- A person who employs one or more workers or contracts for the services of one or more workers and includes a contractor or subcontractor who performs work or supplies services and a contractor or subcontractor who undertakes with the owner, constructor, contractor or subcontractor, to perform work or supply services.
- 4.4 **Ensure** – take every reasonable precaution to achieve the stated objective.
- 4.5 **Machine Tool** – any fixed or portable power tool used in a machine shop to form, shape or penetrate material e.g. steel, wood plastic etc.
- 4.6 **Shall** – A legal term meaning must.
- 4.7 **Supervisor** – Person who has charge of a workplace or authority over a worker.
- 4.8 **Worker** – A worker is a person who has entered into or is employed under a contract of service or apprenticeship, written or oral, express or implied, manual labour or otherwise
- 4.9 **Acronyms**

JHSC – Joint Health and Safety Committee

CJHSC – Central Joint Health and Safety Committee

EOHSS – Environmental and Occupational Health Support Services

LOTO – Lockout /Tagout

MOL – Ministry of Labour

OHSA - Occupational Health and Safety Act

RMSG – Risk Management Support Group (EOHSS, Faculty of Health Sciences Safety Office, Employee Health Services, Senior Health Physicist, Workplace Health and Benefits, Parking and Security Services and Director of Workplace Health and Benefits)

RMM – Risk Management Manual

SOP – Standard Operating Procedure

FHSc – Faculty of Health Science Safety Office

5 RESPONSIBILITIES

5.1 Role of Senior Managers (Directors / Deans / Chairs / Department Managers):


Senior Managers shall:

- provide the resources and direction necessary to support and maintain an effective Machine Shop Safety Program that is commensurate with the size and usage of the shop; and
- ensure that a competent person is appointed as Shop Supervisor or Manager.

5.2 Role of Machine Shop Supervisor / Manager:

Shop Supervisors shall:

- implement and manage the sections of the Machine Shop Safety Program that apply to the shop being supervised;


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- implement machine-specific competency testing and general shop safety orientations before permitting unsupervised use of shop facilities by authorized individuals;
- provide orientation and on-going training for all persons authorized to use machine shop tools and facilities (See Section 6 Machine Shop Safety Program Procedures and Appendix A Machine Shop Safety Rules);
- conduct a Pre-start Assessment and implement appropriate operating and safety procedures for all new machine tools;
- ensure that only authorized individuals are assigned to work on machine tools;
- ensure that machine tools are maintained in a safe working condition;
- ensure that users of machine shop tools and facilities comply with all safety regulations and procedures;
- establish machine specific Lockout / Tagout SOPs (See McMaster University RMM # 306 Lockout / Tagout Program);
- enforce the use of personal protective equipment required for the safety of authorized users of machine shop tools and facilities;
- authorize and implement SOP for all after- hours access and use of machine shop facilities (See McMaster University RMM # 304 Working Alone Program) ;
- establish and enforce an SOP that specifies that individuals do not work alone with designated machine tools (See McMaster University RMM # 304 Working Alone Program);
- ensure that documented safety inspections of the work area are conducted on a regular basis;
- provide appropriate personal protective equipment as required e.g. eye protection, respirators etc;
- maintain up to date training records for all persons approved to work in a machine shop;
- maintain up to date inventories of all hazardous materials stored in a machine shop;
- ensure that all injuries and incidents involving damaged equipment and or facilities are documented and reported to the appropriate RMSG Office; and
- ensure that emergency procedures are posted in the machine shop.

5.3 Authorized Individuals:

Persons authorized to use Machine Tool and Machine Shop Facilities shall:

- observe all safety rules and best practices related to the use of machine tools and machine shop facilities;
 - provide information regarding trade certification and training;
 - wear protective equipment and clothing as prescribed for the task;
 - report to the supervisor any machine that is malfunctioning or missing a point of operation safeguard;
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- work in compliance with all Machine Shop SOPs e.g. LOTO ,Working Alone;
- maintain work area in a clean and safe condition; and
- report to the supervisor all injuries and incidents having the potential to injure or damage equipment.

5.4 **Role of the Risk Management Support Group**

The RMSG shall:

- conduct periodic audits of the effectiveness of the Machine Shop Safety Program.

5.5 **Role of EOHSS and FHSc Safety Office:**

EOHSS and FHSc Safety Office shall:

- update the Machine Shop Safety Program as required by new legislation and or best practices; and
- provide advice regarding the development of SOPs for work involving machine tool Lockout / Tagout and Working Alone.

5.6 **Role of the Joint Health and Safety Committee**

The JHSC shall:

- review SOPs related machine shops e.g. Lockout / Tagout and Working Alone;
- assess the effectiveness of the Program as part of the safety inspection process; and
- review emergency plans for the machine shop.

5.7 **Role of the Central Joint Health and Safety Committee:**

The CJHSC shall:


- Review and make comment on the Machine Shop Safety Program on a regular basis.

6 **PROCEDURES**

6.1 **Training.**

Training shall include but not be limited to the following:

- 6.1.1 A review of Machine Shop General Rules (See Appendix A).
 - 6.1.2 A review of the individual machine tool and the hazards associated with each specific machine tool.
 - 6.1.3 A review of the machine tool specific safety rules (See Appendix A).
 - 6.1.4 A review of the safeguards and the hazards they are intended to guard against.
 - 6.1.5 A review of the circumstances under which safeguards can be removed and who may remove them.
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- 6.1.6 Lockout / Tagout (LOTO) Procedures.
- 6.1.7 Use and care of personal protective equipment.
- 6.1.8 Workplace Hazardous Materials Information System (WHMIS).
Emergency Procedures i.e. medical, fire, chemical spills etc.

6.2 Workshop Design

Spatial Arrangements

- 6.2.1 **General Location.** Machines shall be located and operated such that they do not interfere with the general scheme of traffic. Equipment or storage areas for raw material shall not impede designated aisles and access to designated fire exits.
- 6.2.2 **Kickback Protection.** Machines, the operation of which may result in kickbacks, shall be located such that no employee is working in line with a possible kickback unless a suitable barricade is erected.
- 6.2.3 **Clearances.** Clearances on each working side of any machine shall be greater than the size of the largest material being processed.
- 6.2.4 **Access for Maintenance.** Adequate clearance shall be provided for maintenance of the machine.
- 6.2.5 **Securing Machines.**
 - (i) **Mounting Machines.** Machines shall be firmly mounted on substantial floors or foundations. Smaller units shall be secured to benches, tables, or stands of adequate strength. Such units shall be designed to prevent tipping.
 - (ii) **Vibration.** Machines which cause vibration or cause excessive noise shall be cushioned as recommended by the manufacturer.


6.3 Floors and Aisles

6.3.1 Floors:

- (i) Floors shall be maintained and shall be free of trip hazards such as holes, unevenness, loose boards etc.
- (ii) Openings or pits in the floor shall be guarded to prevent any person from falling into such an opening.
- (iii) Floor surfaces shall be treated and maintained to minimize slipping hazards.
- (iv) Edges of non-slip mats shall be beveled to minimize trip hazards.

6.3.1 Aisles.

- (i) All places where work is performed shall have safe means of access and egress.
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- (ii) Aisles shall be of a width to allow pedestrian traffic to bypass material loads safely.
- (iii) Aisles shall be kept free of obstructions and spilled materials.
- (iv) Aisles shall not be slippery from wear or humidity.

6.4 Lighting

- 6.4.1 Lighting shall be provided and shadow and glare reduced to a minimum.
- 6.4.2 Illumination shall be sufficient for general safety and ordinary visual needs.
- 6.4.3 Lighting fixtures shall be located and guarded such that there will be no hazard to persons should there be accidental breakage of the lamp or fixture.
- 6.4.4 Where failure of primary lighting can result in hazards to any person, emergency lighting shall be provided.

6.5 Ventilation

6.5.1 General Exhaust System.


- (i) Machine shops shall be adequately ventilated and heated. Adequate supply air shall be maintained.
- (ii) General exhaust systems shall not be used as a substitute for local exhaust systems for the removal of contaminants.

6.5.2 Local Exhaust System.

- (i) Where a process may produce dust, mists, fumes, or vapors that are hazardous or may form explosive mixtures, the hazardous material shall be removed by means of a local exhaust system at the point of generation of the contaminant.
- (ii) Local exhaust systems shall remove contaminated air directly outside and shall not be mixed with the general building ventilation system.
- (iii) The use of portable filtered local exhaust systems must be approved by EOHSS or FHSc.

6.5.3 Dust Collectors.

- (i) Dust collectors shall be installed in compliance with the Occupational Health and Safety Act, Industrial Regulations Section 65, and the Ontario Fire Code Section 5.10.
 - (ii) A collector that collects magnesium or other fine dust of an easily ignitable nature shall be located outdoors or in a room used solely for the housing of dust-collecting equipment. Such room shall be separated from the rest of the building by a dust-tight partition with a minimum fire-resistance rating of one hour and equipped with explosion venting to the outdoors.
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- (iii) A dust collector need not meet the above requirements if it uses an inert liquid as a medium to collect dust; is used for wood-working and has less than 0.47 cubic meters per second capacity; will safely contain explosions; or will resist explosions and has effective explosion venting to the outdoors.
- (iv) A dust collector shall be maintained in accordance with the manufacturer's guidelines.

6.6 Material Storage

- 6.6.1 **Stock Materials.** Stock materials such as lumber and piping shall be secured against tipping or falling. Cylindrical material stored on its side shall be piled symmetrically and each unit in the bottom row shall be chocked or wedged to prevent motion. All materials shall be piled in a manner that will prevent the pile from shifting and creating a hazard whether materials are being added to or removed from the pile.
- 6.6.2 **Hazardous Materials.** Hazardous materials shall be stored in compliance with the McMaster University RMM #501 Hazardous Materials Management Systems including WHMIS Program.
- 6.6.3 **Scrap Material.** Scrap materials shall be contained in bins or containers such that they do not present a hazard.

6.7 Electrical Installations


- 6.7.1 All electrical equipment and installations shall be certified by the Canadian Standards Association or the Ontario Hydro Inspection Department.
- 6.7.2 Power supplies and breaker panels shall be unobstructed.

6.8 Sound Levels

- 6.8.1 **Engineering Controls.** The level of noise exposure shall be controlled at source where possible such that it does not exceed the prescribed limit of eighty five (85) decibels. Engineering controls shall be used to reduce noise levels.
- 6.8.2 **Signs.** Prescribed clearly visible warning signs shall be posted at the approach to an area where the sound level is more than eighty five (85) decibels.

6.8.3 Machine Controls


- 6.8.4 **Power Control.** A conspicuously identified mechanical or electrical power control shall be provided on each machine within easy reach of the operator which will enable the operator cut off the power from a safe operating position. Machines that automatically start on the resumption of power after a power interruption, must be clearly identified and wherever practicable steps taken to modify the starters to prevent such restarts.
 - 6.8.5 **Start-up Control.** Start-up controls shall be located in a safe position within easy reach of the operator's normal working position and away from the line of operation. The start-up control design shall minimize the chance of the control being operated accidentally.
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- 6.8.6 Disconnect Switch. Every electrically driven machine tool shall have a main disconnect switch that can be locked in the "off" position before making adjustments or repairing the machine.
- 6.8.7 Foot-operated Controls. Foot-operated controls and levers shall be located or protected such that they cannot be shifted or accidentally tripped. Each foot-operated control shall be covered by an inverted U-shaped metal guard securely fastened and of such a size to prevent an accidental start-up or stoppage of the machine.
- 6.8.8 Emergency Stop Controls. An emergency stop control on a power-driven machine shall be conspicuously identified and be located within easy reach of the operator.
- 6.8.9 Operating Controls as Machine Guards. An operating control that acts as a guard for a machine not otherwise guarded shall be in a location where the safety of the operator is not endangered by moving machinery, be arranged so that it cannot be operated accidentally, and not be made ineffective by a tie-down device or other means.
- 6.8.10 The machine tool and feed speed shall be appropriate for the work in progress.

6.10 Machine Guarding

- 6.10.1 General Requirements. Every machine that has exposed moving, rotating, electrically charged or hot parts or that processes, transports or handles material that could constitute a hazard to an employee shall be equipped with a machine guard that:
 - (i) prevents the person from coming into accidental contact with the parts or material;
 - (ii) prevents access by the person to the area of exposure to the hazard during the operation of the machine; or
 - (iii) where practicable, makes the machine inoperative if the person or any part of his/her clothing is in or near a part of the machine that is likely to cause injury.
 - 6.10.2 Nip Hazards. Every machine that has an in-running nip hazard or part that may endanger the safety of a person shall be equipped with and guarded by a guard or other device that prevents access to the pinch point.
 - 6.10.3 Process Material. A machine shall be shielded or guarded so that the product, material being processed or waste stock shall not endanger the safety of any person.
 - 6.10.4 Belts, Pulleys, Gears, Shafts, Sprockets, and Drive Chains. All belts, pulleys, gears, shafts, sprockets, drive chains, and moving parts shall be guarded in such a manner to protect persons from becoming entangled.
 - 6.10.5 Anti-kickback Devices. Machines that are susceptible to kickbacks shall be equipped with anti-kickback devices such as in-feed rolls or anti-kickback fingers.
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- 6.10.6 Removing Guards. To the extent that is reasonably practicable, a machine guard shall not be removable. Removable guards shall require a tool to remove the guard.
- 6.11 **Grinding Wheels**
- 6.11.1 Grinding wheels shall be used in compliance with Section 29, Industrial Regulations, Occupational Health and Safety Act.
- 6.11.2 Section 30: A work rest for a grinding wheel shall,
- (a) have a maximum clearance of three millimeters from the grinding wheel;
 - (b) be in a position above the centre line of the grinding wheel; and
 - (c) not be adjusted while the grinding wheel is in motion, R.R.O. 1990, Reg. 851, s. 30.
- 6.11.3 Section 29: A grinding wheel shall be,
- (a) marked with the maximum speed at which it may be used;
 - (b) checked for defects before mounting;
 - (c) mounted in accordance with the manufacturer's specifications;
 - (d) operated at a speed which does not exceed the manufacturer's recommendations;
 - (e) provided with protective hoods that enclose the wheel as closely as the work will permit;
 - (f) operated only by workers protected by eye protection; and
 - (g) stored where it will not be subjected to:
 - (i) extreme heat or cold; or
 - (ii) damage from impact, R.R.O. 1990, Reg. 851, s.29.
- 6.11.4 Airborne Contaminant Control. Users shall be protected from airborne contaminants caused by the grinding operation by means of an engineered ventilation system or other method as deemed appropriate by the appropriate RMSG office.
- 6.11.5 Starting the Wheel. New abrasive wheels and used wheels that have been remounted shall be run at operating speed with the safety guard in place for at least one minute before applying work. This is to be documented on a machine log. During this time no one shall stand in front of or in line with the wheel. Wheels that are out of balance shall not be used.
- 6.11.6 Side Grinding. Side grinding shall only be performed with wheels designed for that purpose.
- 6.11.7 Wheel Discard Size. Wheels shall not be worn down to a size that allows the mounting flange assembly to contact the work piece or fixture.
- 6.11.8 Wheel Breakage. All incidents of wheel breakage shall be reported to the shop supervisor.
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6.12 Fire Safety

6.12.1 Fire Extinguishers. Fire extinguishers shall be suitable for the three classes of fires common to machine shops:

Class A Combustibles (paper, wood, cardboard)

Class B Liquid fuels (solvents, oil-based paints, gasoline)

Class C Electrical fires

6.12.2 Class D extinguishers for flammable metals shall be supplied if determined appropriate by the Fire Prevention authority.

6.12.3 Storage and Use of Flammable Liquids. Flammable liquids shall be managed in accordance with the McMaster University RMM #501 Hazardous Material Management Systems Program including WHMIS Program.

6.12.4 Oily Rags. Oily rags shall be kept in approved waste containers.

6.13 Welding and Cutting.

6.13.1 Welding and cutting operations shall be performed in compliance with the Ontario Fire Code, National Fire Protection Association Guidelines, and CSA Standard 117.2-06, Safety in Welding, Cutting, and Allied Processes.

6.13.2 Welding and cutting operations shall be performed by authorized personnel.

6.13.3 Permits. All welding and cutting operations require authorization in the form of a Hot Work Permit except in designated approved hot work areas or approved work instructions or procedures in accordance with McMaster University RMM #201 Hot Work Program.

6.13.4 General Precautions. Precautions to be taken prior to cutting/welding operations:

- (i) Where practicable, the object should be moved to a safe location.
- (ii) If the object cannot be moved, all movable fire hazards in the vicinity shall be moved to a safe location or covered by noncombustible material.
- (iii) If (i) & (ii) cannot be accomplished, guards such as welding curtains shall be used to confine heat, sparks, and slag to protect immovable fire hazards.
- (iv) If requirements of items (i) through (iii) cannot be satisfied, then the cutting or welding shall not be performed.

6.13.5 Special Precautions. Special precautions for cutting and welding:

- (i) Whenever there are holes, openings, or cracks in floors, walls, etc., adequate precautions shall be taken to prevent combustible materials on other side from igniting.
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- (ii) Suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use.
- (iii) Gas welding/cutting: Prior to use, the welder will perform a visual inspection of the welding equipment. The welder shall:
 - ensure that compressed gas cylinders are secured in an upright position;
 - inspect full length of hoses. Any hose with evidence of wear or damage shall be removed from service;
 - inspect regulators and their associated gauges;
 - ensure that regulators and gauges are in proper working order and that the gauges are clearly visible;
 - ensure that defective gauges and regulators are removed from service;
 - ensure that cylinders are kept far enough away from the welding operation to prevent hot slag, sparks, or flame from reaching them;
 - ensure that torches be inspected for leaking shut off valves, hose couplings and tip connections and that defective torches are removed from service; and
 - ensure that oxygen cylinders and fittings are kept free from oil and grease and are not handled with oily hands or gloves.


6.13.6 Fire Watch. A fire watcher shall be required for all cutting and welding operations in locations where a fire may develop. These may be but are not limited to areas where:

- (i) Combustible material is located within 35 ft. of operation and cannot be removed or protected;
- (ii) Wall or floor openings are located within 35 ft. of operation
- (iii) Combustible materials may be ignited by conduction or radiation of heat through a floor, wall, ceiling or roof.

NB. A Hot Work permit must be obtained for all work described in this section. (See McMaster University Hot Work Program RMM # 201).

6.13.7 Ventilation. Ventilation shall be provided for all welding and cutting operations to reduce the hazards associated. Special ventilation procedures or respiratory protection may be required for operations involving:

- (i) Fluorine compounds
 - (ii) Zinc
 - (iii) Lead
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- (iv) Beryllium
- (v) Cadmium
- (vi) Mercury
- (vii) Cleaning Compounds
- (viii) Stainless Steel
- (ix) Aluminum (ozone generation)

6.13.8 Personal Protective Equipment.

- (i) Eye Protection. Persons in the welding workplace shall wear appropriate eye and face protection to protect against radiant energy and spatters. Such protection shall be in conformance with CSA Standard Z94.3-07, Eye and Face Protectors.
 - (ii) CSA approved goggles or safety glasses with side shields shall be worn by welders and assistants in addition to other eye and face protection.
 - (iii) During arc welding and cutting, helmets or hand shields with appropriate filter lenses and cover plates shall be used. During gas welding, resistance welding, and oxygen cutting, goggles shall be worn. During brazing and torch soldering, face shields or goggles or safety glasses shall be worn.
 - (iv) Contact lenses shall not be worn.
 - (v) Respiratory Protection. Welders shall be protected from fumes and gases by an appropriately engineered ventilation system. Where this is not possible, appropriate personal respiratory protection shall be used as prescribed by the appropriate RMSG Office.
 - (vi) Skin Protection. Clothing shall be worn to protect the welder from sparks, radiation, and spatter. Such clothing shall be flame resistant and free from oil or grease. Synthetic fabrics that can melt or burn shall not be used.
 - (vii) Protective clothing shall consist of:
 - flame resistant gauntlet gloves;
 - apron or leggings;
 - cape or shoulder cover when welding or cutting overhead;
 - fire resistant skull cap;
 - fire resistant ear plugs when sparks may enter the ears;
 - CSA approved safety boots;
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- clothing shall not have rolled cuffs, pockets, or rolled up sleeves. Sleeves and collars shall be buttoned; trousers shall overlap boots;
- flammable or combustible materials, e.g. matches, shall not be carried on a person where sparks or spatter may come in contact;
- clothing shall be fitted to the body so as to prevent entanglement in any machine. Additional protection may be used to restrain loose fitting clothing; and
- supervisors shall have final authority over access to tools and equipment.

6.14 **Housekeeping.**

6.14.1 Aisles, workstations, access to emergency equipment, and exits shall be kept free of obstructions at all times.

6.14.2 Machines shall be brushed off and wiped down after use or at the end of each day.

6.14.3 Scrap materials shall not be allowed to accumulate and shall be removed from the work area promptly.

6.14.4 Compressed air shall not be used to clean persons or equipment.

6.14.5 Floors shall be cleaned regularly and maintained free of debris.

6.14.6 Spills shall be cleaned up immediately.

6.15 **First Aid.**

6.15.1 Training. Shop supervisors or their designate shall have a current first aid certificate. In addition, it is recommended that all shop employees be certified in first aid. It is also recommended that at least one person be certified in cardio-pulmonary respiration (CPR).

6.15.2 First Aid Kit. A first aid kit shall be readily accessible to all shop users at all times of occupancy. Such kit shall contain items as prescribed by the WSIB First Aid Regulation 1101. The supervisor shall ensure that the first aid kit is maintained.

6.16 **Emergency Planning and Training.**

6.16.1 Supervisors shall develop written emergency plans in consultation with the appropriate RMSG office. Such plans shall be available to all shop occupants. Such plans shall be reviewed whenever new procedures, materials, or equipment are introduced or at least annually. Such plans shall include but not be limited to the following:



- (i) Medical Emergencies. Supervisors shall develop a medical emergency plan in consultation with the appropriate RMSG office.
- (ii) Hazardous Material Spills. Supervisors shall develop plans for control of hazardous material spills. Appropriate spill control materials shall be available at all times when the shop is occupied.
- (iii) All persons using hazardous materials shall be trained in spill control and cleanup for the various types of materials used.
- (iv) Evacuations. Supervisors shall develop plans for shutdown of equipment and orderly evacuation of personnel in the event of an evacuation alarm. Such plans shall be developed in consultation with Security Services.
- (v) Power Failures. Supervisors shall develop action plans in the event of a power failure.
- (vi) Fire. Supervisors shall develop a fire emergency plan in consultation with EOHSS.


6.16.2 Training. All shop personnel shall be trained in the implementation of the emergency plan. Such training shall include but not be limited to the following:

- (i) location of the written plan;
- (ii) use of fire safety equipment;
- (iii) familiarization with audible alarms;
- (iv) evacuation routes and assembly points;
- (v) emergency telephone numbers;
- (vi) location of critical power switches;
- (vii) location of critical valves e.g. natural gas and compressed air;
- (viii) hazardous material spill control procedures;
- (ix) incident reporting procedures;
- (x) shutdown of equipment as necessary e.g. after power interruption.

6.17 Industrial Hygiene


6.17.1 Personal Protective Equipment (PPE): All PPE shall be worn as prescribed.

6.17.2 Eye Protection. All persons, including visitors, entering the machine shop shall wear eye protection appropriate to the hazard. All such eye protection shall be CSA approved. For impact hazards, safety spectacles may be worn. For liquid chemical protection, chemical splash goggles shall be worn. For more specialized eye protection such as welding lenses or protection from laser hazards, persons

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shall consult the appropriate Program or CSA Standard (See RMM # 310 Eye Protection Program).

- 6.17.3 Foot Protection. Persons exposed to foot injury hazards shall wear foot protection appropriate to the hazard. Foot protection shall comply with CSA Standard Z195-M92. Closed toed shoes shall be a minimum requirement (See RMM #312 Foot Protection Program).
 - 6.17.4 Protective Clothing. A workshop coat shall be worn whenever there is a potential exposure to hazardous materials or radiant energy. Persons working near possible points of entanglement shall not wear loose clothing and shall roll up long sleeves, and cover or tie back long hair.
 - 6.17.5 Hearing Protection. Where it is not practicable to reduce sound levels below eighty five decibels, then persons exposed to such sound levels shall be provided with and wear hearing protection as prescribed by the appropriate RMSG office (See RMM #. 403 Noise Control &Hearing Preservation Program). The supervisor shall provide instruction on the use and care of hearing protection, based on the manufacturer's guidelines.
 - 6.17.6 Respiratory Protection. Persons requiring respiratory protection shall be assessed by the appropriate RMSG office (See RMM # 311 Respiratory Protection Program).
 - 6.17.7 Head Protection. Persons exposed to potential head injury hazards shall wear CSA-approved head protection (See RMM # 313 Head Protection Program).
 - 6.17.8 Sanitary Facilities. Every machine shop shall have hot and cold water for washing, soap, and paper towels or hand dryer.
 - 6.17.9 Eyewash Stations. Where a person is exposed to a potential hazard of injury to the eye due to contact with a biological or chemical substance, an eyewash fountain conforming to ANSI Standard Z358.1 Emergency Eyewash and Shower Equipment (See RMM #310 Eye protection Program) shall be installed in the machine shop.
 - 6.17.10 Emergency Deluge Showers. Where a person is exposed to a potential injury to the skin due to contact with a substance, a quick-acting deluge shower shall be provided. Such shower shall conform to the ANSI Standard Z358.1 Emergency Eyewash and Shower Equipment.
 - 6.17.11 Eating Facilities. No food or drink shall be taken into, left or consumed in the workshop.
 - 6.18 **Hazardous Materials Management**
 - 6.18.1 Hazardous materials and hazardous waste shall be managed in compliance with the Ontario Fire Code, Occupational Health and Safety Act and Regulations, and McMaster University RMM # 501 Hazardous Materials Management System including WHMIS Program and McMaster University RMM # 502 Hazardous Waste Management Program.
 - 6.18.2 Paints, Varnishes, and Finishes. Paints, varnishes, and other surface finishes shall be used only in a manner that ensures that users shall not be exposed to hazardous
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concentrations of vapors and that vapors are not re-entrained into the building air supply system.

6.18.3 Stock Materials. Toxic materials such as beryllium metal, lead metal, and asbestos board or sensitizers such as certain hardwoods and epoxy hardeners shall not be used without permission of the supervisor. A written hygiene plan shall be developed before commencing work with such materials and for designated substances an assessment as per the Regulations.

6.18.4 Cutting Oils. Exposure to cutting oils shall be minimized by appropriate work practice and respiratory protection where appropriate.

6.19 **Procedures for Use of Equipment**

6.19.1 Shop Rules. Supervisors shall be responsible for making shop users aware of all rules and for enforcement of such rules. Individual supervisors shall formulate rules specific to the shops for which they are responsible (See Appendix A. Examples of Shop Rules).

7 **RECORDS**

7.1 Supervisors are responsible for the maintenance of up to date training records for all persons approved to work in a machine shop.

7.2 Supervisors are responsible for the maintenance of up to date inventories of all hazardous materials stored in a machine shop.



Appendix A

Machine Shop Rules

General Shop Rules

- A. Machines and tools shall be cleaned after each use.
- B. Tools shall be returned to the appropriate storage area clean and in good condition.
- C. Damaged tools shall be reported to the supervisor and taken out of service immediately.
- D. Users shall select the proper size and type of tool for the work.
- E. Floors shall be kept clear of scrap and excessive litter. Spills shall be cleaned up immediately.
- F. Work shall be mounted in a vise, clamp, or holder whenever possible.
- G. Edged tools shall be handled carefully and shall be sharpened regularly.
- H. Machines shall be stopped when taking measurements. Lockout/ Tagout procedures shall be followed when repairing machines or changing blades.
- I. Cuttings and chips shall be removed by using brushes or pliers.
- J. Machine users shall not wear jewelry or gloves. Long hair shall be tied up.
- K. Long sleeves shall be rolled up.
- L. Ear protection shall be worn when noisy machines are operating.
- M. Eye protection shall be worn by all persons entering the work area.
- N. Shorts shall not be worn in the work area.
- O. Closed toed shoes shall be the minimum required foot protection.
- P. Compressed air shall not be used to clean tools, machines, or persons.
- Q. Persons shall not engage in horseplay or cause distractions.
- R. Supervisors shall have final authority over access to tools and equipment.
- S. All injuries and "near misses" shall be reported immediately to the supervisor.

Lathe

- 1. Eye/face protection shall be worn.
 - 2. All work shall be solidly clamped with an appropriate size work-holding device.
 - 3. Boards shall be laid across the ways when changing chucks to protect fingers and the lathe bed.
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4. The machine shall be stopped before taking measurements.
5. Chips shall be removed with pliers. Compressed air shall not be used to clean the machine.
6. All work shall be solidly supported. Work shall not be permitted to project too far from the chuck without support from the tail stock center.
7. The lathe shall not be stopped by reversing its direction of rotation.
8. Tools shall not be run into the chuck or lathe dog.
9. The chuck shall not be run on or off the spindle by using power.
10. Automatic feed shall not be engaged until the user is aware of the direction and speed of the carriage or cross-feed.
11. Tools shall not be placed on the lathe ways.
12. The key (T-handle) shall never be left in the chuck; it shall be placed in the designated storage location before starting the machine.
13. Files shall be used only with handles.
14. If vibration or odd noise develops, the machine shall be stopped immediately.
15. Work piece surfaces shall not be touched while the machine is running.

Mill

1. Eye protection shall be worn.
2. Heavy attachments such as the vise, dividing head, or rotary table shall not be moved without help.
3. Chips shall be removed with a brush, not the hand. Compressed air shall not be used to clean the machine.
4. The machine shall be stopped before removing chips.
5. Users shall not reach over or near the rotating cutter.
6. The holding device shall be solidly mounted to the table and the work firmly held before commencing work.

Grinder

1. Eye protection shall be worn.
 2. Users shall keep hands clear of the rotating grinding wheel.
 3. The wheel shall be stopped before making adjustments.
 4. Work shall not be forced against the wheel.
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5. The wheel shall not be operated at a speed that exceeds the posted limit.

Shear

1. Eye protection shall be worn.
2. Cutting capacity of the shear shall be posted and adhered to at all times.
3. Scraps shall be removed promptly and deposited in the appropriate scrap bin.

Drill Press

1. Eye protection shall be worn.
2. The bit shall be mounted securely and the key shall be removed immediately.
3. Work shall be appropriately clamped.
4. The drill spindle shall be allowed to stop of its own accord.
5. The machine shall be cleaned of chips and cutting fluid after use.
6. Gloves cannot be worn.

Band Saw

1. Eye protection shall be worn.
2. The upper guide assembly shall be adjusted to 1/4 inch above the work.
3. Stock shall be held flat on the table, special precautions must be taken with round stock
4. The machine shall be stopped before making adjustments or measurements.
5. Proper speeds and blades shall be used for the material being cut and the machine must be at full speed before starting to feed in work.

Jointer

1. Eye protection shall be worn.
 2. Stock shall be at least 12 inches long. Stock to be surfaced shall be at least 3/8 inch thick unless special feather boards are used.
 3. Work shall be fed such that the knives will cut with the grain. Stock that has knots, splits, or checks is not acceptable.
 4. A push stick shall be used when planing a flat surface. Hand pressure shall not be used over the knives.
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5. A 4 inch margin of safety shall be maintained between the hands and the cutting tool.

Wood Lathe

1. Eye protection shall be worn.
2. Before the machine is started, spindle work shall have the cup center properly imbedded, the tailstock and tool rest shall be securely clamped, and proper clearance for the rotating stock verified.
3. Before the machine is started for faceplate work, the faceplate shall be checked to ensure it is tight against the spindle shoulder and that the tool support has proper clearance.
4. Turning speed shall be appropriate for the work. Low speed shall be used to rough out work.
5. Wood with knots and splits shall not be turned. Glued up stock shall be cured at least 4 hours.
6. The tool rest shall be kept close to the work. The machine shall be stopped before moving the tool rest.
7. The tool rest shall be removed for sanding and polishing operations.
8. A scraping cut shall be used for all faceplate work.
9. The spur and cup centers shall be removed when not in use.
10. The cup center shall be lubricated regularly.
11. Tools shall be kept sharp and held firmly in the proper position.
12. Work sleeves shall be rolled up. Jewelry and watches shall not be worn; long hair shall be tied back.

Table Saw

1. Eye and hearing protection shall be worn.
 2. Push sticks shall be used when appropriate to maintain a 4 inch margin of safety between the hands and the cutting blade.
 3. Operators shall stand to one side of the operating blade and shall not reach across it.
 4. The position of the stock shall be controlled either by the fence or the miter gauge. They shall not be used in combination as this will cause binding and kick back. Stock shall not be cut free hand. The table shall be large enough to support the work.
 5. Stock should be free of knots, splits, and warps.
 6. The saw shall be stopped before making adjustments to the fence or blade.
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7. Small scrap cuttings shall not be allowed to accumulate; a push stick shall be used to push them away.
8. Dado or special blades shall be removed and stored in the designated area after use.
9. The saw shall be cleaned after use and scraps placed in the appropriate scrap bin. The floor shall be vacuumed clear of sawdust and scraps.
10. The splitter and guard shall not be removed without permission of the supervisor.
11. The dust collector shall be turned on before commencing work.

Belt Sander

1. Eye protection shall be worn.
2. The belt shall be free of tears or defects and correctly mounted. The belt shall track in the center of the drums and platen.
3. Small irregular pieces shall be held in a hand clamp or special jig.
4. Work shall be supported against the table when sanding the end grain of narrow pieces.
5. A pad or push block shall be used when sanding thin pieces on the belt sander.

Portable Circular Saw

1. Eye protection shall be worn.
2. The switch shall be in the OFF position before plugging in.
3. Stock shall be well supported such that the kerf will not close and bind the blade during or at the end of the cut.
4. The depth of the cut shall be adjusted to the thickness of the stock plus 1/8 inch.
5. The saw base shall be placed on the stock with the blade clear before turning the switch on.
6. The saw shall be unplugged while changing blades or making adjustments and when not in use.
7. The operator shall stand to one side of the cutting line during the cut.

Portable Electric Drill

1. Eye protection shall be worn.
 2. The switch shall be in the OFF position before plugging in.
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3. Appropriate drill bits shall be used for the type of work. The bit shall be mounted securely in the chuck. Drill bits shall be kept sharpened.
4. Stock to be drilled must be held in a stationary position such that it cannot be moved during the operation.
5. The drill shall be aligned with the direction of the hole during the operation.
6. The drill shall be withdrawn several times when drilling deep holes in order to clear the cuttings.
7. Unplug when not in use.
8. The drill shall be unplugged when changing bits.
9. Drill bits shall be removed from the drill when work is finished and shall be stored in the designated area.

Portable Router

1. Eye and hearing protection shall be worn.
2. The switch shall be in the OFF position before plugging in.
3. The bit shall be securely mounted in the chuck to a depth of at least 1/2 and the base shall be tight.
3. The work piece shall be securely clamped.
4. The router base shall be placed on the work or template with the bit clear of the stock before turning on the power. The router shall be firmly held to overcome starting torque.
5. When the cut is complete, the router shall not be lifted from the work until motor has stopped.
6. The router shall be unplugged when mounting bits or making major adjustments and when not in use.
7. The router shall be held with both hands when operating. It shall be fed smoothly through the cut in the correct direction.

Saber Saw

1. Eye protection shall be worn.
 2. Appropriate blades shall be used for the work.
 3. The saw shall be unplugged when changing blades or making adjustments and when not in use.
 4. The base of the saw shall be placed firmly on the stock before starting the cut.
 5. The switch shall be in the OFF position before plugging in.
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6. The motor shall be turned on before the blade contacts the work.
7. Curves shall be shallow enough to prevent twisting the blade.
8. The work shall be well supported. Care shall be taken not to cut into the supports.

Portable Angle Grinder

1. Wear P.P.E. including eye protection, hand protection and arms covered (with flame resistant material). No loose clothing
 2. Choose appropriate wheel for the job. (Cutting wheels for cutting and grinding wheels for surface grinding).
 3. Grinder shall be unplugged when changing wheels.
 4. Ensure that the wheel is tightened.
 5. Work piece shall be well secured.
 6. Ensure grinder is switched off and resting with the wheel up before plugging in the tool.
 7. Ensure that the guard is in place, tight and appropriately adjusted.
 8. Ensure that the tool has fully stopped before putting the tool down.
 9. Unplug when not in use.
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