Michigan Tech

Michigan Technological University
School of Technology

Machine Shop Manual

Minerals & Materials Engineering
Building #12, Room 119 M & M

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The information in this booklet is intended as general safety and shop use guidelines. Any operation not covered in this text should be performed in accordance with the following standards:

- MIOSHA http://www.michigan.gov/dleg/0,1607,7-154-11407---,00.html
- NFPA (National Fire Protection Association) www.nfpa.org

If you have any questions, please ask a staff member or contact the MTU Occupational Safety and Health Services office at 7-2118. The MTU safety manual is accessible from the MTU web page: http://www.admin.mtu.edu/fm/oshs/

Team leaders are responsible for ensuring that MSDS sheets are obtained and properly filed for materials purchased by the team. Signs posted throughout the shop areas must be observed.

Enterprise Advisor Safety Responsibilities

The Advisor is ultimately responsible for all aspects of student safety during all activities related to their individual Enterprise.

Although the machine shop is supervised by shop staff and procedures have been established, it is possible for a project to involve unforeseen activities. Many teams have labs unrelated or in remote locations from the established fabrication areas. It is the advisor's responsibility when necessary to seek assistance from OSHS, or shop staff in establishing a safety procedure for a given activity.

An advisor must:

- Be aware of what activities his/her students are engaged in.
- Consider safety before allowing a given activity to take place.
- Ensure safety procedures are in place for the given activity.
- Ensure students are properly trained for the given activity, and are aware of the established safety procedures.
- Maintain documentation that training has taken place for each student involved in a given activity.
- Be sure students are supervised by qualified personnel in areas not directly supervised by shop staff. (When necessary)
- Enforce established safety rules and procedures.

Shop Orientation and Training Procedure

- Shop staff will provide orientation for team advisers and students. This will cover the safety and operating procedures outlined in this text.
- Students who have completed orientation will sign a checklist verifying they understand the shop safety and operating procedures. A current list of qualified team members will be sent to the shop staff.
- Students wishing to use the machine shop must check in with shop staff.
- Students will be required to take a written test for each type of machinery used. A training structure has been developed and will be phased in during this school year.

Emergency Procedures

Injuries
- All injuries (including minor) must be reported immediately to a staff member.
- Dial 911 for any campus emergency.

Fire
- Pull the nearest fire alarm.
- Leave the building.
- Call 911 from a safe location and give clear directions to the fire.
- Do not re-enter the building until the “all clear” is given by public safety.

Hazard Communication
- MSDS sheets for the machine shop are located next to the office door.

Spills/Leaks
- Report any flammable liquid spills to shop staff immediately, or call public safety at 911.
- All spills must be cleaned up immediately.
- Do not allow any liquid other than water to enter the floor drains.
- Floor dry, rags, or other clean-up materials must be disposed of properly. Do not throw these materials in the general trash.

Major Shop Hazards

Cuts, Abrasions
- Sharp edges on stock or work piece
- Cutting tools
- Pinch points
- Chips from machining operations

Burns
- Hot materials and work piece from welding, torch cutting and heat-treat operations
- Welding radiation (similar to sunburn)
- Electric shock

Eye Injuries
- Welding rays
- Chips from machining operations, broken tools
- Chemicals splashed in eyes, chemical fumes

Chemicals
- Skin and eye contact
- Inhalation of toxic fumes
- Explosion/fire

Slip and Fall Accidents
- Coolant and oil spills
- Air hoses - cords - welding cables - cluttered work area

General Shop Safety

General Safety

- *Always wear your safety glasses with side shields unless you are wearing more protective eye protection.* Safety glasses must always be worn under a full face shield or welding helmet.
- No children are allowed in the shop for any reason.
- Visitors are not permitted to work in the shop facilities.
- Do not enter the shop if you are under the influence of alcohol or any type of drugs (including some prescription and over the counter drugs).
- Report all injuries, close calls, or unsafe conditions immediately. Shop staff must fill out a Supervisors Incident and Injury Investigation Report.
- Practice good housekeeping. Keep floors free of trip and slip hazards. Keep workbenches free of clutter and properly store tools. Do not allow chips to pile up on machinery. Stop the machine and remove chips with a brush, not with an air hose or your hands.
- Do not operate equipment without permission.
- Never attempt to repair machinery. Ask shop staff for assistance.
- Do not remove machine guards or operate machinery without all guarding in place.
- Do not use an air hose to clean yourself or machinery.
- Never leave a machine that is in operation.

Proper Dress

The following items should NOT be worn in the shop areas except within the marked aisles:

- Loose clothing, jackets, long sleeves (except when welding)
- Rings, watches, bracelets
- Neck ties and necklaces should be tucked inside your shirt
- Headphones
- Sandals
- Shorts
- Nylon or synthetic clothing which can burn or melt
- Long hair must be secured in a hat or net.

Organization/Cleanliness

- Aisles must not be blocked or used for workspace at any time, as they are required for emergency exits and safe travel through the shop areas. Workbenches should be set back sufficiently to allow space for stools without placing the stools in the aisle. Materials must not protrude into the aisles. This applies during normal and after hours use.
- Access to fire extinguishers, eye wash stations, or electrical panels must not be blocked or hindered.
- Floors must be kept free of clutter.
- Benches should be cleaned off and tools properly stored daily.
- Machine shop equipment must be cleaned up after each use. Remove cutters and use a brush to remove chips.
- Sweep the floor around equipment that you have used.
- Sinks are for hand washing only; do not clean parts in the sinks.
- Spills should be cleaned up immediately. Leaking vehicles should be repaired promptly. Floor dry must be swept up daily.

Personal Protective Equipment

Eye Protection

- Safety glasses must comply with ANSI Z87.1-1989 and be worn at all times in both the assembly and machine shops, unless more protective eyewear is worn (for example goggles). Glasses worn on top of the head will be considered not wearing eye protection.
- Safety glasses must be worn under welding helmets and full-face shields.
- Prescription eyeglass wearers should wear Z87-1 goggles over non-Z87-1 prescription glasses.

Face Protection

- Face protection should be worn over safety glasses during certain operations.

Foot Protection

- Leather shoes should be worn, and fully enclose the foot.

Hand Protection

- Leather gloves should be worn for all welding operations.
- Proper gloves should be worn when handling chemicals. (Refer to MSDS)
- Gloves should not be worn during machining operations.

Hair Enclosures

- A hat, cap, or net shall be used by a person where there is a danger of hair entanglement in moving machinery or equipment, or where there is exposure to means of ignition.

Respirators

- Respirator or dust mask use requires the prior approval of OSHS.

Access

General Access Rules

- A shop staff person must be present during machine shop use.
- Between 5:00 P.M. and 8:00 A.M. access is limited to official Enterprise Space (machine shop, assembly shop, and Enterprise office space). All other areas of the building, except corridors, elevators, and restrooms, are off limits.

Work on personal projects is strictly forbidden

Facilities

Students are NOT permitted to alter the facilities in any way. This includes but is not limited to:

- Tampering with any electrical, plumbing or other building utilities
- Painting or otherwise marking any part of the facilities
- Fastening any object to the building

Parking

- Refer to student handbook for parking regulations.
- No personal vehicles are allowed in the building.
- Repair of personal vehicles is not allowed except as stated in the student handbook.
- Do not block the overhead doors.

Loading Dock

The area near the overhead door in the assembly shop is the loading dock for the building. Items left unattended will be removed or disposed of. NO PARKING is permitted in this area. Vehicles left in this area will be removed or towed at the expense of the team/owner with no further warning.

Assembly Shop Equipment

- Any equipment brought into the assembly shop area must receive prior approval from the shop staff.
- Teams are expected to properly maintain equipment in the assembly shop. A file should be kept with manuals, safety instructions and maintenance records for all tools and equipment owned by each team.
- Students are not permitted to operate the forklift, press brake, power shear, or overhead cranes.
- Shop staff must have access at all times to any cabinets etc. Keys or location of keys must be given to shop staff. In the event access is needed and keys are not available shop staff reserves the right to remove the lock.

Waste Disposal

The following items have special disposal procedures and do not go into the general trash. Please ask shop staff for assistance with these items:

- Liquids
- Waste rags
- Electronics
- Solid metals
- Batteries
- Tires

Oils which can go in the waste oil barrel include:

- Oils with a flash point greater than 120 degrees F
- Motor oil
- Diesel fuel
- Kerosene
- Brake fluid
- Power steering fluid
- Transmission fluid
- Lubricants (Non silicon)

The following liquids do not belong in the waste oil barrel. They must be kept in separate sealed and marked containers. An area is designated near the overhead door in room 109 for these to be picked up by OSHS. Markings should include contents, team, and date; an MSDS sheet must also be available.

- Any liquid other than motor oil, kerosene, or diesel fuel with a flash point less than 140 degrees F
- Gasoline
- Solvents
- Thinners
- Anti-freeze
- Silicon lubricants
- Oil rags should be disposed of in the oil rag can. All waste products must be properly labeled and contained. Open containers or pans of oils, etc. will be disposed of as hazardous waste. Teams will be charged for the disposal.

<u>Flammables</u>

Any transferring of gasoline or flammables must be done outside.

- Flammable liquids, aerosol cans, etc. must be stored in a flammable liquid cabinet in closed containers.
- Gasoline, paint thinner, etc. is not to be used as a fluid for washing parts.
- Gasoline must be stored in a FM or UL approved steel safety can. Vehicle tanks may contain fuel under the following conditions:
    - Tank must be properly capped (tin foil or rags are not proper caps).
    - Tank and fuel system must be leak free.
    - Any disconnected lines must be sealed with the proper fittings. (Spark plugs etc. are not proper fittings.)
    - Any tanks removed from vehicles must be stored empty.

Improperly stored fuel will be disposed of as hazardous waste at the expense of the teams. Tires are considered flammable. No storage of tires is permitted.

Engines

- Engine exhaust must be vented outside; the air handler is not a sufficient means of removing vehicle exhaust.
- Engines need to have a muffler attached before operating.

Paint/Fumes/Dust

Spray painting facilities do not exist. All painting must be by brush or roller except for the use of small spray cans on parts no larger than will fit in a shoebox.

- No painting is allowed in the machine shop.
- The use of any product creating flammable or otherwise hazardous dust or fumes must receive prior approval of shop staff.

Electrical

- Projects requiring electrical wiring must be reviewed by a qualified electrical inspector prior to being plugged into university power.
- Students are not permitted to perform any building electrical work. This includes but is not limited to changing fuses, resetting circuit breakers, or opening electrical panels for any reason.

Radios

- Radios are not permitted in the machine shop.
- Radios in the assembly shop must be kept at a volume that does not disturb others, and when asked, must be turned down or off.

Food

- Refrigerators, microwaves, coffeepots, etc. are not permitted in the shop areas. These items belong in the second floor break room.
- No food may be stored in the shop areas

Disciplinary Procedure

Discipline for failure to follow safety or operating procedures covered in this text is divided into two categories; individual issues and team issues.

Individual issues

These are issues involving a specific person whom has violated a safety or operating procedure. These would be issues such as; not wearing safety glasses, removing machine guarding etc.

- Discipline for individual violations ranges from immediate removal from the shop for the remainder of the day, to permanent loss of shop privileges. Any individual issues covered by University policy in the student handbook will be referred to the Dean of Student affairs.
    - *First offense*- a written formal warning will be given with a copy sent to the advisor. Certain issues such improper dress or failure to wear safety glasses will result in removal from the shop for the remainder of that day.
    - *Second offense*- Student will be asked to leave the shop until the advisor is contacted by shop staff. A decision will be made between shop staff and the advisor as to when that person will be allowed back into the shop areas.
    - *Third offense*- Will result in permanent loss of shop privileges.

Team issues

These are issues involving a team which has violated a safety or operating procedure. Most of these types of issues are housekeeping and storage related, such as; Oil spills on the floor not cleaned-up, leaking gasoline, improper storage of flammables etc.

- *First offense*- Shop staff will contact team leader, and advisor. Issues creating an immediate hazard will be handled by shop staff using whatever means necessary. This may include moving items outside, or disposing of them. Teams will be given two days to resolve issues not posing an immediate hazard. If these are not resolved within this time period they automatically become a second offense.
- *Second offense*- Shop staff will contact team leader, advisor and Enterprise governing board to determine the appropriate penalty.

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SofT Machine Shop Orientation Checklist

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Signature of Understanding

The Shop Safety and Operating Procedures Handout has been presented to me by:

_____

Signature of Team Adviser/Leader, Date

I have read and understand the handout and agree to follow the procedures contained therein. I understand that failure to follow these rules and procedures may result in disciplinary action up to and including permanent loss of access to the machine shop and fabrication areas.

_____

Name (Print)

_____

Signature, Date