SAFETY GUIDELINES FOR CAREER AND VOCATIONAL ARTS EDUCATION PROGRAMS
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GUIDE INTENT

This guide is intended to be a reference document that complements other printed materials on this subject that are produced and made available at the state and national level.

Industrial committees, whose members are actively engaged in these occupations and who represent a major part of trade and industrial education in the state of Washington, have validated this safety guide. Career and technical education program course objectives should prepare students to meet these safety standards. Workers meeting these standards, as established by industry, will have the best safety record in the world of work.

This document is solely for informational purposes. It does not purport to be exhaustive of its subject matter. Neither the authors of this material nor the Board of Health of The Summit County Combined General Health District make any warranty as to the accuracy or completeness of the information contained in this document. The authors and the Board of Health of The Summit County Combined General Health District further assume no liability or responsibility for loss or damage suffered due to reliance on this material.

INTRODUCTION

The safety mistakes a student/technician/instructor makes today could have future ramifications both personally and environmentally. This guide is designed to help sanitarians; school instructors/teachers instill safety awareness in their students. It is also intended help sanitarians alert the school district staff to their areas of responsibility and, at the same time, to reduce accidents and exposure to litigation.

Effective safety awareness education leads to safer attitudes and safety consciousness, which, in turn, lead to safer working practices and accident prevention within the CTE laboratory.

In addition to the traditional safety point of view in both, personal and area safety, new emphasis should be considered in COMPONENT safety, in that new, sophisticated, and computerized equipment must be well cared for because of high replacement costs. One will find that safe operators that save people will also save equipment.

A more recently recognized safety problem concerns hazardous waste and hazardous waste disposal. An unsafe act today could have serious effects years from now.

Safety consciousness requires that the student be educated in safety generally and specifically. The teacher, in working to develop a positive attitude toward safety, should teach the student to ask “Is what I am about to do unsafe in any way to myself, to others, or to property?” It is essential that the instructional methods lend themselves to positive safety attitude development. This includes (1) a clean and orderly working environment, (2) the awareness of possible accident situations where respect replaces fear, (3) the importance of rules and regulations, (4) the necessity to teach the correct way to perform the first time, (5) the knowledge and skills in the use and the proper maintenance of tools and machines, (6) the reinforcement of safe operating procedures, and (7) proper respect for hazardous wastes and hazardous waste disposal.
The Safety Guide for Career and Technical Education (CTE) was developed by participation from industry representatives who represent Washington Industrial Safety and Health Act (Labor and Industries/ WISHA), Department of Health (DOH), Office of Superintendent of Public Instruction (OSPI), and CTE advisory committee.

We encourage all users of the guide to recognize that the practices specified or recommended include some that may be already required by code or law and others that are recommendations.

Student participation greatly increases the effectiveness of any safety education program. Students should be actively involved in planning and presenting programs and demonstrations that involve the subject of safety as well as the care and maintenance of tools and machines.

PURPOSE

- To reduce and eliminate accidents in educational shops, labs, and the workplace by:
  - Having instructors aware of dangers and risks to themselves, the students, and visitors.
  - Providing the instructors with knowledge to be able to make the lab, shop, classroom, or workplace a safe environment.
  - Providing recommendations to improve the safe environment for learning or working.
  - Providing examples of important records and forms for evidence of compliance.
  - Providing a basic understanding of the educator’s legal responsibilities.
  - Provide a framework for teachers to include safety awareness or safety training in their curriculum and daily instructional practices.

SECTION I DUTIES OF INSTRUCTOR

DUTY TO INSTRUCT

“An instructor who does NOT instruct properly could place a student in a dangerous situation where the lack of appropriate information might contribute to an accident.”

“A prudent instructor must ANTICIPATE and EXPLAIN/DEMONSTRATE any problems that could arise for each experience and instruct proper safety to the students.”

DUTY OF SUPERVISION

Instructors are responsible for APPROPRIATE BEHAVIOR on the student’s part.

If one student hurts another, it is the instructor who is the responsible adult.
Instructors must teach and maintain CLASSROOM CONTROL.

The instructor is IN LOCO PARENTIS—you are the local parent and the responsible adult during the educational experience.

**DUTY TO MAINTAIN**

Instructors are responsible for seeing that EQUIPMENT is kept in safe working order.

Instructors must take reasonable and prudent steps to prevent accidents from happening.

As a professional, it is reasonable and prudent that you maintain relatively clean, uncluttered facilities. Properly working tools and equipment, safety signs, posters, and floor markings where applicable, safety guards, the wearing of Personal Protective Equipment (PPE), etc., are examples of reasonable and prudent measures and examples of requirements to protect all persons in the shop environment. Should there be a facility, tool or equipment concern that you as the professional feel does not allow safe education to take place in a reasonable and prudent manner immediately contact your supervisor to resolve how to bring the article in question back into reasonable and prudent compliance.

It is crucial that you, as a professional, obtain and keep current your credentials and training so that you, in turn, may provide your students with a quality, safe learning experience. It is your responsibility to obtain the necessary training, experience, degree, etc. Non-licensed and non-endorsed instructors employed with assignments involving career and technical education classes should NOT operate tools, equipment and machinery, nor allow their students to do the same.

It is reasonable and prudent for a professional instructor to provide all students with adequate safety training. This could include, but is not limited to:

- Safety demonstrations—attentively watched by all.
- Safety videos.
- The proper and adequate wearing of personal protective equipment (PPE) appropriate to the industry or program area.
- Safety quizzes and tests, etc.
- Students demonstrate proficiency in facility, tool, and equipment safety to the instructor, who uses his or her professional assessment in allowing the student to utilize shop facilities.

Training by example is of utmost importance. A reasonable and prudent instructor will adhere to the standards imposed by Law as a professional imposes these same standards upon his or her students. Impressionable minds are quick to see the level of dedication or lack thereof in their instructor. It is imperative that you personify the example of safe and enjoyable learning that you desire your students show you.

If there is ambiguity, doubt, disapproval, or curiosity concerning any issue of personal and student training, education and preparedness, contact another instructor, your supervisor, or OSPI education specialist that can give you the appropriate information in allowing you to obtain and maintain a reasonable and prudent effort to keep students safe while learning.
MANAGING RISK

The school, as the employer, needs to provide the teacher with the basic requirements for equipment, training, and time for that training.

Teachers are responsible for seeing that equipment in the lab or shop is kept in safe operating condition, according to applicable State and Federal laws.

Teachers are responsible for providing instruction and demonstrating the safe and proper operation procedures for each piece of power equipment, portable power hand tools, hand tools, cleaning, and/or finishing procedures.

Teachers must plan ahead and be aware of potential dangers and problems.

Teachers must have and maintain order and control in the classroom and/or lab (shop).

Teachers must teach a proper degree of respect for the dangers that are inherent in the lab or shop.

Teachers should never leave students unattended.

Teachers cannot delegate the responsibility of a class to a student.

Students must have received and demonstrate or show they have read and understand a copy of the safety rules for each piece of equipment that they may use.

Students must pass a general shop safety test with a score of 100 percent.

The teacher should keep safety test scores until the student is 21 years old.

Students need to sign a document that they will not use any equipment until they have passed a safety test, have observed a demonstration on that piece of equipment, and have the instructor’s permission.

Parents should sign a parent awareness document before the student uses any equipment.

Do not underestimate the seriousness of an accident. Call 911—and provide emergency care until medical responders arrive.

After the pressure of an event has subsided, complete an incident report stating the facts of what occurred and submit to district risk manager (or appropriate district official). Go over the report with the student for a learning experience. Keep your own copy of records and affidavits.

CTE directors, administrators, principals, counselors, and teachers must be reasonable and prudent in seeing that classes are not overloaded.

Appropriate Tools and Equipment

Identifying appropriate tools and equipment for your lab, it is important that you understand both the curriculum and the student body that you are teaching. You need to have appropriate standards and the
Select appropriate activities for both the curriculum and the students you will be teaching. Choose the appropriate tools and equipment to teach each course. Get your principal’s and your district CTE director’s approval of your curriculum, standards and the objectives, activities, and the tools and equipment for the courses you are teaching.

Remember: *Any piece of equipment that is in need of maintenance or in need of repair should not be used until properly maintained and repaired. Disable it or remove it. No student or individual should be allowed to use a piece of equipment or a tool without the proper instruction on safety and operation. Do not allow tools or equipment to be used without the proper supervision.*

**SECTION II    GENERAL SAFETY PRACTICES**

**HAZARDOUS WASTE**

- You must be prepared to handle a spill of hazardous waste or materials BEFORE it happens.
- Product warning label and MSDS are the best sources of information to prepare you for a spill.
- No matter how small the spill, the instructor must be informed immediately.
- It is against the law to pour hazardous materials or wastes down a drain or dump them into a sewer.
- Hazardous waste generated in general industrial shops can include solvents and solvent waste, batteries (leads) and battery acid, paint waste, and chemical waste.
- The MSDS can tell you how to dispose of the product.

*Hazardous Waste Disposal*

To access a Guide to Environmental Issues from the U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response go to: [http://www.epa.gov/Epadocs/guide/](http://www.epa.gov/Epadocs/guide/)

The guide offers basic information on numerous environmental topics. Frequently asked questions are answered in plain English, and an extensive glossary gives non-bureaucratic definitions for more than 200 environmental terms. The guide includes synopses of federal environmental laws and six pages of telephone numbers and hotlines.

**EYE PROTECTION INFORMATION**

Phototropic (photochromic) lenses change depth of tint when exposed to varying degrees of ultraviolet light—that is, they darken when exposed to sunlight and fade when removed from the sunlight.

These lenses do comply with current American National Standards Institute (ANSI) Z87.1 standards with limitations.

Photochromic lenses have limitations in operations requiring critical visual acuity or fast reaction to visual stimuli, particularly in operations where the wearer passes from outdoors to indoors in the course of his/her work activity. Also, these types of lenses should not be used as a substitute for the proper protection in hazardous optical radiation environments, for example, certain laboratory and shop operations such as welding or foundry work.
If an individual must wear tinted lenses, as prescribed by an eye specialist, industrial quality eye and face protection devices appropriate for the hazard involved should also be worn.

**Posting of Eye Hazardous Areas**

The entrance to all shops, laboratories or other areas that require industrial quality eye protection should be posted with a sign indicating the requirements. In addition, machines, equipment or process areas and laboratories requiring operators to wear specific eye and face protection should be posted with warning signs.

**Visitors must wear the protective devices that are required in the area. Extra devices should be available at all times to lend to visitors.**

**Fitting and Maintenance**

Safety eyewear must be fitted properly. It should be the responsibility of the person in charge of dispensing safety glasses or goggles to see that properly fitted and adjusted eyewear is provided for each individual.

Lenses of eye protectors must be kept clean. Restricted vision due to dirty lenses is sometimes a contributing factor to accidents. Eye protective devices that are shared shall be disinfected between uses.

**Cleaning and Disinfecting Procedures**

The following cleaning procedures are recommended in the ANSI Z87.1. Products shall be cleaned according to the manufacturer’s instructions. If none are available, clean with mild soap and warm water solution by soaking the device in the soap solution maintained at 120°F for 10 minutes. Rinse thoroughly and allow to air dry. Use appropriate glove protection and other personal protective equipment as required of hazardous and combustible standards apply.

To disinfect, completely immerse the protector for 10 minutes in a solution of modified phenol, hypochlorite, quaternary ammonium compound or other disinfections reagent in a strength specified by the manufacturer of the protective equipment at room temperature of 20°C (68°F).

Remove protector from solution and suspend in a clean, dry place for air-drying at room temperature or with heated air. Do not rinse because this will remove the residual effect of the disinfectant.

Spray type disinfectant solutions and bactericides may be utilized when such pressurized spray solutions can be demonstrated to provide comparable disinfections with the immersion procedure outlined above. Store glasses in a clean dustproof container.

Protectors showing the need for extensive cleaning should be disassembled to the extent possible without tools prior to the washing and disinfections procedure.

**We recommend each student have their own pair of safety glasses and goggles to reduce spread of eye disease.**

**Inspection of Protectors**

Instructors and students should make a visual inspection of their eye protectors prior to use. Protective devices with broken parts, heat distortion, or excessive scratches on the lens are unsuitable for use and should not be worn. Pitted and scratched lenses may reduce vision and also, along with worn-out headbands, seriously reduce protection. Replace defective parts with new ones.
Eye Protective Devices

The illustrations shown are only representative of protective devices commonly available at the time of the writing of this standard. Protective devices do not need to take the forms shown, but they must meet the requirements of the standard.

NOTES
Care shall be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards must be provided. Operations involving heat may also involve optical radiation. Protection from both hazards shall be provided. Face shields shall only be worn over primary eye protection. Filter lenses shall meet the requirements for shade designations. Persons whose vision requires the use of prescription (Rx) lenses shall wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear. Wearers of contact lenses shall also be required to wear appropriate covering eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments might represent an additional hazard to contact lens wearers. Caution should be exercised in the use of metal frame protective devices in electrical hazard areas. Welding helmets or hand shields shall be used only over primary eye protection.

For more information about ergonomics visit www.lni.wa.gov/wisha/ergo/default.htm

Elements of Ergonomics Program

A Primer Based on Workplace Evaluations of Musculoskeletal Disorders

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MATERIALS SAFETY DATA SHEETS (MSDS) AND WASTE DISPOSAL

Hazardous Communication

“Right-to-Know”—MSDS

Whenever chemicals are handled, used or stored on the school premises, the administration, instructors, and students should be familiar with the Federal Hazard Communication Standard. The purpose of this set of regulations was to “protect” employees from the potentially adverse effects of hazardous chemicals that they might come into contact with in their workplace. Initially, this regulation affected only manufacturers of potentially hazardous chemicals and the companies that used them. Since that time the law has been amended and the state has adopted laws to cover additional types of facilities and operations. It is imperative that CTE educators become familiar with these laws and how they affect them. MSDS must be reviewed with all on how to use the chemicals.

The intent of all the “Right-to-Know” regulations is basically the same “to protect employees from possible adverse effects of any potentially hazardous chemicals that they may encounter in their workplace.” This “intent” weaves its way through all aspects of the laws and regulations and is especially important when students are in contact with various chemicals.

Materials Safety Data Sheets (MSDS)

Every lab or shop is required to have a readily accessible file containing materials safety data sheets (MSDS) for all hazardous chemicals and materials used in the facility.

MSDS can be obtained from the supplier or manufacturer. There are also several websites with comprehensive lists that you can download. For a list of Internet sites just type: http://www.ilpi.com/msds/index.html

Examples:

RUST-OLEUM—PAINT THINNER

MATERIALS SAFETY DATA SHEET
NSN: 801000F003789
Manufacturer's CAGE: 08882
Part No. Indicator: B
Part Number/Trade Name: PAINT THINNER

Flammable and Combustible Liquids

- Read the manufacturer’s label information and MSDS before using a product.
- Withdraw only as much material as you will need to complete the immediate operation.
- Always wear proper eye protection.
- Dispose of waste materials in approved containers.
- Use a funnel when pouring into a smaller container.
- Follow instructions for handling and mixing catalysts with resins and finishes.
- Never pour catalyst back into the container.
- Always add catalyst to resin, not resin to catalyst. Add acid to water, not water to acid.
• Do not apply resin, paint, or other finishing material near areas used for flame cutting, welding, grinding, soldering, or other high temperature operations.
• Store materials in original containers or approved containers that are properly labeled.
• Wear rubber gloves to minimize chances of skin irritation.
• Wash hands and other exposed skin areas before leaving the classroom.
• Store volatile materials in approved fireproof cabinets or specially designed areas.
• Remove clothing that may have become accidentally soaked with epoxy, polyester resins, and other potentially dangerous substances.
• Be certain the fire extinguisher located in work area is suited for application to a fire caused by the materials being used in the work area.
• If you are unsure of materials or procedures to complete an operation, ask the instructor for help.

Some of the more hazardous flammable liquids are listed below in approximate order of hazard.

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<td>Japan dryer</td>
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<td>Kerosene</td>
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<td>Resin (polyester)</td>
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<td>Lacquer thinner</td>
<td>Stain/varnish</td>
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<tr>
<td>Adhering liquid (printing)</td>
<td>Danish oil</td>
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<tr>
<td>Paint thinner</td>
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**Chemical Safety**

Today’s CTE educators must be conscious of potential chemical hazards. New concerns are being raised daily about the potential long-term effect chemicals might have on students, instructors, and the environment. Unless handled and used with rigorous care, all chemicals have the potential to cause injury and illness.

Become familiar with every chemical before you use it. Know what it does and how it does it. Find out about the specific safety precautions, what protective equipment to wear, signs of illness associated with use, and what to do with empty containers and leftovers. Advise students of these facts. The label on the chemical container will provide most of the information you need. Your dealer is a good source of information. For safe, effective use of chemicals, the following guidelines are suggested:

• Use the least toxic chemical that will still be effective.
• Make sure that non-workers are out of the work area.
• When using a chemical that could harm you if it came in contact with your body, wear personal protective equipment—unlined liquid-proof gloves, liquid-proof hat with brim, boots, clothing, chemical goggles, face shields, and an appropriate respirator for the chemical being used.
• To protect ground water, be careful of spills when mixing and loading. If a spill occurs, clean it up and report it promptly.
• Dry chemical dust can irritate your lungs and throat. Also, handling dry chemicals can dry out and irritate your hands.
- Don’t dump them into any unapproved places where they could pollute ground water, wells, streams, or harm people and animals.
- With lower toxicity chemicals, less stringent measures will usually suffice, but they must still be adequate. Follow label recommendations, and limit exposure to any chemical you’re using.
- If possible, avoid breathing dust, vapors, or spray. Avoid splashes and spills when handling.
- Don’t eat until you’ve washed your hands thoroughly.
- If someone is splashed or doused with a toxic chemical or inhales or ingests a toxic chemical use water to flush immediately, and then call the poison control center immediately. Be ready to tell them what the chemical was and the suspected level of exposure the victim suffered.
- Store chemicals in their original labeled containers and in their proper storage location.

**ELECTRICAL PROTECTION**

Current is forced through the resistance of a circuit by voltage, which is electrical pressure or force. A lower resistance in the circuit allows more current to pass through the circuit for a given amount of voltage. If the human body is thought of as a circuit, then the amount of current that can flow between any two points of the body depends on the resistance between those two points at that time and the amount of voltage or electrical pressure applied. Normally, skin resistance is high. This high resistance tends to impede the current flowing into and out of the body. However, there are several conditions that can lower skin resistance drastically and which permit a larger amount of current to pass through the body with the same voltage applied.

The average body resistance is over 100,000 ohms. However, if the skin is wet from perspiration or other moisture, or if the pulse rate is high, the body’s resistance can be as low as a few hundred ohms. Also, if the skin is broken with a cut or an abrasion, a lesser voltage is required at that point to force the same amount of current through the body.

**Precautions to be used when working with electronic circuits:**

- Practice a precaution used by experienced technicians. Try to keep one hand in your pocket or behind you when you are making voltage and current measurements. If two hands are in contact with the circuit or if one hand is in contact with the circuit and the other hand is in contact with ground (such as a metal panel or the case of a piece of test equipment), the current path is across the chest where the heart and lungs are located. **THIS IS EXTREMELY DANGEROUS.**
- Do not work on electronic circuits when the power is on.
- Electrolytic and other large capacitors can hold a voltage charge for several hours after the power is removed. Make it a habit to check if they are fully discharged by shorting them with a screwdriver with an insulated handle or clip lead before working on a circuit.
- Do not work on electronic equipment while standing on a damp floor or when leaning on any metal object.
- Certain components, such as resistors and vacuum tubes, get quite hot. Give them time to cool off before removing them.
- Know the location of and how to use an available fire extinguisher.
- Be sure equipment is in proper working order before using it.
Electrical equipment is found in nearly every vocational subject area. Students shall be taught the dangers present in electrical equipment and wiring and learn how to protect themselves and others from injury. Points to remember:

- All electrical wiring needs to be in compliance with the National Electrical Code.
- Never use temporary wiring. All extension cords for tools and appliances must be three-wire parallel ground with grounding lug plugs. Do not overload the circuit.
- Treat all electrical equipment as if it is “live.”
- Never bypass safety interlocks (i.e., circuit breakers, fuses, etc).
- Never work on electrical equipment alone; always have someone else nearby.
- While working on electrical equipment, stand on rubber mats or wooden floors. Wear protective gloves and hat.
- Use safety light in closed or fume-laden areas. When working in a closed area, or in a place where fumes could collect, one should use only approved, sealed safety lights and explosion-proof equipment. Some explosions in the past haven’t killed anyone, but the bare wires whipping around as a result of the big boom electrocuted those present.
- Make sure that grounding is proper and complete. Most electrical industrial equipment comes with carefully designed grounding provisions. Most cords use three or four-wire cable to ensure one’s safety by providing a built-in low-resistance path to ground in case of a short circuit. Don’t guess about this. If there is any doubt about the condition or function of any electrical equipment one may have to use, get help from authorized and trained personnel instead of taking a chance.

Touching a bare wire, an exposed socket, or a faulty electrical tool or appliance may give a person an electrical shock. Shock hazards also exist inside various types of electronic equipment and around power lines. The possibility of shock is greatly increased if the person is also in contact with a ground surface or if the floor or his/her body is wet.

If attempting to rescue someone who is in contact with an electrical source, one should:

- Not underestimate the seriousness of an accident. Call 911
- Shut off the current quickly.
- Attempt to move the victim away from the conductor using some sort of insulating material if the current cannot be shut off quickly.
- Not touch the victim until electrical contact is broken. Use a wooden pole, such as a broom handle, to separate the victim and the conductor. A large cloth, such as a coat, may be used.
- Move the victim quite a distance from the conductor as a line conductor may cling to the victim.
- Apply CPR immediately if the victim is not breathing.

PORTABLE LADDER SAFETY

WOOD LADDERS

This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders in order to ensure safety under normal conditions of usage.
Ladder standards—Standards have been established by the American National Standards Institute (ANSI) that covers wood stepladders and extension ladders. Any stepladder or extension ladder with ANSI seal conforms to the standards for wood ladders.

Materials—the following requirements are applicable to all wood parts. They shall be free from sharp edges and splinters and they shall be sound and free (by accepted visual inspection) from shake, wane, compression failures, decay, or other irregularities. Low-density wood shall not be used.

**STEPLADDERS**

Stepladders longer than 20 feet shall not be supplied. Stepladders as hereinafter specified shall be of three types.

**TYPE I**—Industrial stepladder, 3 to 20 feet for heavy duty (such as those used by utilities, contractors, and industry)—duty rating of 250 pounds.

**TYPE II**—Commercial stepladder, 3 to 12 feet for medium duty (such as those used by painters, offices, and light industry)—duty rating of 225 pounds.

**TYPE III**—Household stepladder, 3 to 6 feet for light duty (such as light household use)—duty rating of 200 pounds.

The weight of the user—including clothing, tools, and materials—must not exceed the duty rating.

**GENERAL REQUIREMENTS**

A uniform step spacing shall be employed which shall be not more than 12 inches. The steps shall be parallel and level when the ladder is in a position for use.

The minimum width between side rails at the top, inside to inside, shall be not less than 11 ½ inches. From top to bottom, the side rails shall be spread at least 1 inch for each foot of length of the stepladder.

A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all its sharp points covered or removed to protect the user. For a Type III ladder, the pail shelf and spreader may be combined in one unit.

**TYPE I, II, III LADDERS**

**SINGLE LADDER**—Single ladders longer than 3 feet shall not be supplied.

**TWO-SECTION LADDER**—Two-section extension ladders longer than 60 feet shall not be supplied. All ladders of this type shall consist of two sections; one to fit within the side rails of the other, and both arranged in such a manner that the upper section can be raised and lowered.

**SECTIONAL LADDER**—Assembled combinations of sectional ladders longer than the lengths specified in this subdivision shall not be used.
TRESTLE AND EXTENSION TRESTLE LADDER—Trestle ladders extension sections, or base sections of extension trestle ladders longer than 20 feet, shall not be supplied.

PAINTER’S STEPLADDER—Painter’s stepladders longer than 12 feet shall not be supplied.

MASON’S LADDER—a mason’s ladder is a special type of single ladder intended for use in heavy construction work. Mason’s ladders longer than 40 feet shall not be supplied.

TROLLEY AND SIDE-ROLLING LADDERS—Trolley ladders and side-rolling ladders longer than 20 feet shall not be supplied.

CARE OF LADDERS

- Ladders shall be maintained in good condition at all times.
- The joint between the steps and side rails shall be tight, all hardware and fittings shall be securely attached, and the moveable parts shall operate freely without binding or undue play.
- Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.
- Frayed or badly worn rope shall be replaced.
- Safety feet and other auxiliary equipments shall be kept in good condition to ensure proper performance.
- Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as “DANGEROUS—DO NOT USE.”
- Rungs should be kept free of grease or oil.

USE OF LADDERS

- Portable rung and cleat ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one quarter of the working length of the ladder (the length along the ladder between the foot and top support).
- The ladder shall be so placed as to prevent slipping, or it shall be lashed or held in position.
- Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.
- More than one person shall not use ladders for which dimensions are specified at a time, nor with ladder jacks and scaffold planks where use by more than one person is anticipated. In such cases, specially designed ladders with larger dimensions of the parts should be procured.
- Portable ladders shall be placed so that the side rails have a secure footing. The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load.
- Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.
- Ladders shall not be placed on boxes, barrels, or other unstable bases in order to obtain additional height.
- To support the top of the ladder at a window opening, a board shall be attached across the back of the ladder, extending across the window and providing firm support against the building walls or window frames.
- When ascending or descending, the user shall face the ladder.
- Ladders with broken or missing steps, rungs, or cleats; broken side rails; or other faulty equipment shall not be used. Improvised repairs shall not be made.
- Short ladders shall not be spliced together to provide long sections.
- Ladders made by fastening cleats across a single rail shall not be used.
- Ladders shall not be used as guys, braces, or skids or for other than their intended purposes.
- The tops of the ordinary types of stepladders shall not be used as steps.
- Portable rung ladders with reinforced rails shall be used only with the metal reinforcement on the underside. Ladders of this type should be used with great care near electrical conductors, since the reinforcing itself is a good conductor.
- No ladder shall be used to gain access to a roof unless the top of the ladder shall extend at least 3 feet above the point of support at the eave, gutter, or roofline.
- Only the user shall make adjustment of extension ladders. This is to be done when standing at the base of the ladder, so that the user may see that the locks are properly engaged. Adjustment of extension ladders from the top of the ladder (or any level over the locking device) is a dangerous practice and should not be attempted. Adjustment should not be made while the user is standing on the ladder.
- The middle and top sections of sectional or window cleaner’s ladders shall not be used for the bottom section unless the user equips them with safety shoes.
- Extension ladders shall always be erected so that the upper section is resting on the bottom section.
- The user should equip all portable rung ladders with nonsolid bases when there is a hazard of slipping. Nonsolid bases are not intended as a substitute for care in the safe placing, lashing, or holding of a ladder that is being used upon oily, metal, concrete, or slippery surfaces.
- The bracing on the back legs of stepladders is designed solely for increasing stability and not for climbing.
- Hangers should be used for storing ladders horizontally in order to prevent sag and permanent set. At least three should be used for each ladder.

**PORTABLE METAL LADDERS (OSHA/NIOSH)**

Requirements are not part of this section because of the wide variety of metals and design possibilities. However, the design shall be such as to produce a ladder without structural defects or accident hazards—such as sharp edges, burrs, etc.

- The metal selected shall be of sufficient strength to meet the test requirements and shall be protected against corrosion unless it’s inherently corrosion-resistant.
- The spacing of rungs or steps shall be on 12-inch centers.
- Rungs and steps shall be corrugated, knurled, dimpled, or coated with skid-resistant material or shall be otherwise treated to minimize the possibility of slipping.

**FIRE SAFETY**

To produce fire, three things must be present at the same time.

HEAT  FUEL

OXYGEN

If any one of the three is missing, a fire cannot be started; or with the removal of any one element, the fire will be extinguished.
Standard Letter Symbols for Fire Extinguishers

Distinctive letters, shapes, and colors mark extinguishers according to the classes of fires on which they should be used.

Types of Fire Extinguishers

**Dry Chemical** extinguishers are usually rated for multipurpose use. They contain an extinguishing agent and use a compressed, nonflammable gas propellant.

**Water** extinguishers contain water and compressed gas and should be used on Class A (ordinary combustibles) fires.

**Carbon Dioxide (C0²)** extinguishers are most effective on Class B and C (liquids and electrical) fires. Since the gas disperses quickly, these extinguishers are only effective from 3 to 8 feet. The carbon dioxide is stored as a compressed liquid in the extinguisher.
**Portable Fire Extinguishers**

A fire extinguisher is a storage container for an extinguishing agent such as water or chemicals. It is designed to put out a small fire, not a big one.

An extinguisher is labeled according to whether the fire on which it is to be used occurs in wood or cloth, flammable liquids, electrical, or metal sources. Using one type extinguisher on another type fire can make the fire much worse. So learn how extinguishers are labeled and used.

Traditionally the labels A, B, C, or D have been used to indicate the type of fire on which an extinguisher is to be used.

Recently pictograms have come into use. These pictures in blue the type of fire on which an extinguisher is to be used. Shown in black with a red slash are pictures of fires on which the extinguisher is not to be used.

For example, on a class “A” type, the following symbols would appear:

![Image of symbols]

NFPA 10, Standard for Portable Fire Extinguishers, recommends that extinguishers be labeled with pictograms. However, the user may find the traditional A, B, C, D labels or both the pictograms and the A, B, C, D labels on an extinguisher.

**Fire extinguishers where you work**

It is management’s job to have extinguishers available for use and your job to know how they work.

Extinguishers come in dry chemical, foam, carbon dioxide, water or halon types. Whatever type you buy, a testing laboratory should label it.

The higher the number rating on the extinguisher, the more fire it puts out. High-rated ones are often (not always) the heavier models. Make sure you can hold and operate the one you buy for home use or be required to use at work.

Recharge it after ANY use. A partially used extinguisher might as well be empty.

Extinguishers should be installed away from potential fire hazards and near an escape route.
ABCDs

**FIRST AID**

*INSIST THAT ACCIDENTS, NO MATTER HOW SMALL, BE REPORTED.*

Always fill out a report form and submit it through the proper channels in your district.

- **WASH OFF AREA**—Wash with water any area that might have something spilled on it.
- **FLOOD ANY BURNED AREA WITH COLD WATER**—this will draw the heat away from the burn. Continue to do this until further help can be obtained. You should NOT apply any ointments.
- **COMPRESS THE WOUND**—all first aid kits should have large sterile pads. After removing any foreign material from a cut, compress it to stop the bleeding. You should NOT apply any ointment or tourniquets.
- **WASH SPILLS TO THE EYES AND SKIN FOR 15 FULL MINUTES**—Use an eye wash bottle or station and hold the eyes wide open. If eye washes are unavailable then splash water from your hands. If there is any danger from caustics then eye safety glasses should be worn.
- **DO NOT TREAT MAJOR INJURIES YOURSELF, CALL FOR ASSISTANCE OR 911**—All certificated career and technical education employees maintain a valid CPR and First Aid Card and the records of this requirement be maintained at the local level.

**POISON CONTROL CENTER:** 1-800-456-7707.
GENERAL PERSONAL SAFETY PRECAUTIONS

BODY MECHANICS

- Use proper muscle groups and distribute the workload.
- Both hands are used to pick up heavier objects.
- Lifting heavy objects alone is avoided. Help is requested.
- Pushing is preferred to pulling.
- Leg muscles are used to lift heavy objects rather than back muscles.
- Bending and unnecessary twisting of the body for any length of time is avoided.
- Work is done at the proper level.
- Two people carry long pieces of materials.
- Do not lift heavy loads above shoulder level.

PERSONAL PROTECTION

- Confine long hair so that it is not exposed to machinery and does not interfere with vision.
- Require the wearing of safety goggles, glasses, or other eye protection when there is a danger of eye injury.
- Provide respirators for use where harmful dusts or fumes exist. ** Respirator use requires appropriate certification, fit testing, and supervision to insure that there is proper fit, training, and inspection are all taking place.
- Determine the physical defects and limitations of all students so that they will not be assigned tasks detrimental to their health or physical condition.
- Prohibit the wearing of loose clothing in the laboratory and shop areas.
- Require students to remove rings and other jewelry while working in the laboratory and shop areas.
- Where noise levels are excessive over long periods of time, ear protection should be worn.
- Protective apparel, including safety shoes, aprons, shields, and gloves, are worn properly as required by the nature of the task.
- Provisions are made for cleaning and sterilizing respirators, masks, and goggles.
- Head protection is worn in all areas where there is danger of falling and/or flying objects.

FACILITY CONDITION

- Aisles, machines, benches, and other equipment are arranged to conform to good safety practices.
- Stairways, aisles, and floors are maintained, clean, dry, and unobstructed with no protruding objects.
- Walls, windows, and ceilings are clean, maintained in good repair, and free of protrusions.
- Illumination is safe, sufficient, and well placed.
- Ventilation and temperature controls are proper for conditions.
- Fire extinguishers and other necessary fire equipment are properly selected, adequately supplied, properly located, inspected, and periodically recharged as required.
- Exits are properly identified and illuminated.
- Lockers and drawers are clean, free of hazards, and doors kept closed.
• Personnel know the procedures for notification of fire and evaluation of premises.
• Laboratories and workplaces are free from excessive dust, smoke, and airborne toxic materials.
• Utility lines and shutoffs are properly identified.
• Stairways, floor openings, and overhead storage areas are properly guarded with rails and toe boards and have the proper clearances.

HOUSEKEEPING PRACTICES

• Provide for the storage and daily removal of all sawdust, metal cuttings, rags, and other waste materials.
• Provide properly marked boxes, bins, or containers for various kinds of scrap stock and rags.
• Utilize sturdy racks and bins for material storage, arranged to keep material from falling on students and to avoid injuries from protruding objects.
• Employ a standard procedure to keep floors free of oil, water, and foreign material.
• Provide for the cleaning of equipment and facilities after each use.
• Provide regular custodial service in addition to end of class cleanup.
• Prohibit the use of compressed air to clean clothing, equipment, and work areas.
• Keep walkways and work areas free of all obstructions.
• Floor surfaces must be maintained in a “nonskid” condition.
• Tools and materials are stored orderly and safely.
• File cabinets and other tall cabinets are required to be anchored.

EQUIPMENT

• All equipment should be operated in accordance with specifications as stated in the owner’s manual.
• Machines and apparatus are arranged so that operators are protected from hazards of other machines or passing individuals.
• Point of operation zones are properly identified and guarded.
• Permanent enclosure guards properly protect pulleys, gears, and belts.
• Guards are removed only for repair purposes and then replaced immediately.
• Equipment control switches for each machine are easily available to the operator.
• Machines are turned off when the instructor is out of the room and/or if the machine is unattended.
• Proper cleaning equipment is used (avoid air for cleaning purposes).
• Nonskid areas are maintained around dangerous equipment.
• A preventive maintenance program is established for all equipment.
• Machines are guarded to comply with WISHA code.
• Cutting tools are kept sharp, clean, and in safe working order.
• All hoisting devices are maintained in a safe working condition and specified load ratings are easily identified.
• Machines that are defective or being repaired are clearly marked and made inoperable by locking out the machine power switch.
• Machines and apparatus are marked with proper color code.
• Equipment cords and adapters are maintained in a safe working condition.
• Adjustment and repair of any machine is restricted to experienced persons.
• Ladders are maintained and stored properly.
• Machines designated for fixed location are securely anchored.
**RECORDKEEPING**

Always keep an adequate record of accidents and report it through proper channels in your district. An analysis of accidents is made for the purpose of corrective action.

**HAND TOOLS**

- Instruct students to select the right tools for each job.
- Establish regular tool inspection procedures to ensure tools are maintained in safe condition.
- Instruct students in the correct use of tools for each job.
- Provide proper storage facilities.
- Do not lay tools on operating machinery or equipment.
- Keep tools out of aisles and working spaces where they may become tripping hazards.
- Do not put sharp objects or tools in pockets. This could result in cuts or being stabbed.

**SCAFFOLDS**

- The footing or anchorage for scaffolding is sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects such as barrels, boxes, loose bricks, or concrete blocks cannot be used to support scaffold or planks.
- No scaffold will be erected, moved, dismantled, or altered except under the supervision of the instructor.
- Guard rails and toe boards will be installed on all open sides of platforms more than 10 feet above the ground or floor.
- Scaffolds 4–10 feet, having a minimum horizontal of less than 45 inches in either direction, will have standard guardrails installed on all open sides and ends of the platform.
- Scaffolds and their components will be capable of supporting without failure four times the maximum intended load.
- All planking of platforms will be overlapped a minimum of 12 inches or secured from movement.
- An access ladder or equivalent safe access will be provided.
- Scaffold planking will extend over their end supports not less than 6 inches or more than 12 inches.
- The use of shore or lean-to scaffolds is prohibited.
- The poles, legs, or uprights of a scaffold will be plumb and securely and rigidly braced to prevent swaying and displacement.

**COLOR CODING**

**RED**

Fire: Red shall be used as the basic color for the identification of fire protection equipment and apparatus.
Stop: Emergency stop bars, buttons, or electrical switches on hazardous machines shall be red.
Danger: Safety cans and safety signs shall be painted red.
**ORANGE**
Orange shall be used as the basic color for designating dangerous parts of machines or energized equipment. Orange shall be used to emphasize hazards when enclosure doors are open or when gear bolts or other guards around moving equipment are open or removed, exposing unguarded hazards.

**YELLOW**
Yellow shall be the basic color for designating caution and for marking physical hazards. Solid yellow, yellow and black stripes, or checkers (or yellow with suitable contrasting background) should be used interchangeably using the combination that will attract the most attention.

**GREEN**
Green shall be used to designate safety and the location of first aid equipment (other than firefighting equipment).

**BLUE**
Blue shall be the basic color for designation of caution, limited to warning against the starting, use of, or the movement of equipment under repair or being worked upon.

**PURPLE**
Purple shall designate radiation hazards.

**BLACK AND WHITE**
Black, white, or a combination of these two shall be the basic colors for designation of traffic and housekeeping markings.

**NOISE CONTROL**

The ability to hear is a precious gift. Without it, it is difficult to lead a fully productive life either on or off the job. Noise can destroy hearing, create physical and psychological stress, and thereby contribute to accidents in addition to the obvious cause by making it impossible to hear warning signals. Practical arts and vocational education laboratories and shops are not exempt from noise pollution considerations, particularly if maximization of learning and safety are the goal!

Noise is an unwanted sound. It is a form of energy or vibration that is conducted through the atmosphere. There are four variables that can affect the intensity of noise and its potential danger.

- The level of the sound, as measured in decibels (dB).
- The length of time to which one is exposed to the sound.
- The numbers and lengths of quiet (recovery) periods between periods of sound.
- Individual sensitivity to or tolerance for sound.

Fortunately, noise exposure can be controlled. No matter what noise problems occur in the laboratory and workplace, the technology exists to reduce the hazard. The responsibility to correct noise problems rests on the individuals, i.e., supervisors, teachers, etc., involved. In general, there are three basic ways to control noise.

*Source Control*

The best and most effective approach to control noise is to control it at its source since in this way no further hearing danger is posed and, therefore, other control methods are probably not needed. Techniques of noise source control include:
• Reduction of impact noise.
• Reduction of the speed of moving and rotating parts.
• Reduction of pressures and flow velocities in circulating systems.
• Reduction of flow resistance in circulation systems.
• Balancing of rotating parts.
• Reduction of friction in rotating, sliding, and moving parts.
• Isolation of vibration within equipment.
• Reduction of the size of the surface radiation areas.
• Application of vibration-damping materials to vibrating parts and surfaces.

Path Control

If source control is not possible, the next best approach is to control the noise along its path. Although such controls limit the number of persons exposed to the noise, they do not always eliminate the noise problem for all persons affected. In path control, noise is blocked or reduced before it is heard. This can be accomplished by:

• Containing or enclosing the noise.
• Absorbing the noise along its path.
• Deflecting the noise away from our ears.
• Separating the noise from the hearer.

Hearing Protection

Finally, ear protection equipment is available. This is not as desirable as either source or path control because it affords protection only to those wearing the equipment. Students must be willing to wear hearing protectors whenever they are exposed to potentially dangerous noise. Certain conditions and activities can reduce the effectiveness of the hearing protectors themselves.

Cotton should not be used as protection against abrasive sound. While a wad of cotton may minimize waves of certain frequencies, it fails to alter the intensity thus providing a false sense of security.

Sound is measured by two fundamental characteristics: frequency (related to pitch) or number of waves per second and intensity level (related to loudness). The human ear reacts to frequencies ranging from 20 cycles per second to about 20,000. Sound at a level of 85 db begins to lead to a loss of hearing, depending on (1) the intensity, (2) the frequency, (3) the duration of exposure, and (4) individual sensitivity.

EMERGENCY ACTION

Emergency Communications

It is recommended that the following be implemented to ensure proper channels of communication during an emergency: Procedures should be reviewed with the administration and employees to set methods of communication in the event an emergency occurs.
**Order of notification under the following conditions:**

If serious injury (uncontrollable situation)
- school nurse
- ambulance
- principal
- parents

If serious injury (controlled situation)
- school nurse
- principal
- parents

**Telephone**

- Each department should have communication with the building office.
- Emergency telephone numbers should be conspicuously posted and the procedure posted for dialing “outside.”
- A card file should be maintained in each school for all students. This card should include the names and telephone numbers of parents or guardians to be notified in the case of injury.

**First Aid**

All certificated career and technical education employees maintain a valid CPR and First Aide Card and the records of this requirement be maintained at the local level.

- Qualified personnel should administer first aid.
- Do not diagnose illness or prescribe or administer medication of any sort.
- Disperse crowds if accident is serious and keep the area as quiet as possible.
- Stick to basic procedures:
  - Call for aid.
  - Stop bleeding.
  - Treat for shock.
  - Mouth-to-mouth resuscitation (if breathing has stopped).
  - Cardiopulmonary resuscitation (CPR) (if required).

**Transportation**

- Parents shall be notified immediately of all cases of illness or injury. If the student is to be sent home or elsewhere, the parents should arrange for the transportation. The principal should take appropriate action for the best interest of the student.
- When the injury is serious, do not attempt to move the student except for first aid procedures until professional medical help arrives.
- If a school is uniquely located where special transportation may be required, procedures should be established at the beginning of the school year.
SECTION II    GENERAL SAFETY PRACTICES

AUTOMOBILE MECHANIC/AUTOMOBILE TECHNICIAN EDUCATION

Safety is one aspect of the automotive repair industry that cannot be overemphasized. A good mechanic is a safe mechanic. If there is a fast way or a safe way to do the job, take the safe way. Otherwise, you may not get the job done at all. Listed below are some of the potential exposures and safety precautions that you will be confronted with.

GENERAL PRECAUTIONS:

- Oil or adjust moving parts only if authorized.
- Use caution when working near the fan and belt.
- Whenever possible, work with the engine switch in the “OFF” position.
- The fan belt should be tightened only when the engine is stopped.
- Always consider the engine and exhaust system to be “HOT.”
- Do not pour gasoline from an open container into the carburetor.
- Use extreme care when welding on vehicles—provide fire protection.
- Do not work directly above another student.
- Wait for the radiator to cool before removing the cap.
- Make sure that hoods are secured in an open position when working on the engine.

WHEN “PULLING ENGINES” BE SURE THAT ROPES OR SLINGS ARE PROPERLY FASTENED. DON’T STAND OR LIE UNDER AN ENGINE OR TRANSMISSION FASTENED TO A CHAIN OR LIFTING STRAP. THE CHAIN/STRAP COULD FAIL AND YOU COULD BE CRUSHED.

PERSONAL HEALTH HAZARDS

- Wear appropriate personal protecting equipment while spray painting. THIS INCLUDES SPRAY PAINT CANS.
- Do not clean hands in solvent or gasoline. These materials are explosive and also can cause a skin rash.
- Avoid back strain when it is necessary to lift parts from the engine. Crouch down and let your legs/thighs do the work.
- Never place hands in front of a high-pressure grease gun.
- Keep open wounds properly dressed and covered.
- Eliminate loose clothing and confine long hair. (This includes chains and long earrings.)
- Never spray compressed air into the skin or eyes. A FATAL INJURY COULD RESULT.
- Wear safety glasses when under a vehicle. This will protect your eyes from falling debris—dirt, and, glass, metal, etc.
- Wash hands and clothing frequently—this prevents skin problems and prevents tools from slipping out of your hands.
JACKING AND HOISTING

- Do not jack up the vehicle if anyone is under it.
- Jack stands must be used when working under vehicles. When using a hoist, it must have air/hydraulic backup controls and/or locks.
- Avoid excessive shaking of the vehicle when on jack stands.
- Have the instructor inspect the jack stand supports before students work under any vehicle.
- Long jack handles are a serious tripping hazard and they should be barricaded or raised out of position.
- Do not use bumper jacks.
- Do not run an engine when the car is on the hoist or on jack stands.
- Caution should be observed when lowering a vehicle.

DRIVING AND LOCATING THE VEHICLE FOR WORK

- Do not wear eye protection with restricted vision when driving a vehicle in the shop.
- Only students with valid driver licenses and with the instructor’s permission should drive vehicles.
- Work should not be performed on vehicles parked in heavily traveled areas or on public thoroughfares.
- Towing or pushing should be done only with instructor approval.
- Have a fellow student guide you when parking a vehicle in a congested area.
- Someone should be in the driver’s seat of a vehicle when the engine is being started.

GREASES, OILS, FUELS, AND SOLVENTS

- Clean up all spills immediately and ventilate the area.
- Use only approved solvents for cleaning parts. Do not use gasoline. Wear gloves when cleaning parts with solvents.
- Be sure that there is proper ventilation before an engine is started.
- Keep oil-soaked rags in approved rag waste containers.
- Check fuel connections for leaks before starting an engine.
- Keep flammable liquids in closed, approved containers.
- Clean up all oil/fuel/solvent spots and/or spills before a “test” drive.
- Use drip pan for all vehicles stored overnight.

AIR PRESSURE

- Use an air gauge when inflating tires. Do not over inflate tires.
- When inflating truck tires that have a snap ring, the tire should be confined within an approved cage.
- Never aim an air hose at another student or at yourself.

WRENCHES AND TOOLS

- Keep all tools clean and free of oil and grease.
- Keep tools picked up from the floor.
• Make certain that wrenches fit properly
• Hammers with loose handles should not be used.
• Use tools only for the purpose for which they are designed—never use a file as a pry bar.
• Creepers should be stood on end or stored in a rack when not in use.
• Do not use chisels or punches with “mushroom” heads.
• The palm of your hand is not a tool. Install wheel covers with a rubber mallet.

**CARBON MONOXIDE**

Carbon monoxide is a poisonous gas caused by incomplete burning of gasoline or other fuels. It is present in gaseous form when the engine is running. Even a small amount of carbon monoxide in your body can be fatal. That is why it is imperative that you never run an engine in a poorly ventilated area.

**COMPRESSED GAS**

The most commonly used gases for cutting and welding are oxygen and acetylene. However, hydrogen, nitrogen, argon, helium, Freon, ammonia, propane (liquefied petroleum gas), carbon dioxide, or sulphur dioxide may be used.

To use them safely you need to know their characteristics and be sure you are using the right bottle. There is no standard color code for compressed gas bottles! Read the labels.

Treat compressed gas cylinders with the greatest respect. There is an immense amount of power in each cylinder. Careless handling resulting in valve or cylinder damage can produce instant death for you or your friends. Use a cart or hand truck for moving cylinders.

**FLAMMABLE GASES**

Acetylene, hydrogen, propane, are highly flammable. They are normally handled in compressed gas cylinders or tanks. Acetylene is dissolved in acetone; propane is liquefied by pressure, so it is especially important that these cylinders be kept upright when in use.

They will all form violently explosive mixtures with air or oxygen, so valves, regulators, hoses and other equipment must be tight and in good repair. Shut off valves and regulators when they are not in use!

Store spare flammable gas cylinders in a well-ventilated location, separated by a fire resistant barrier—preferably outside.

All gas cylinders must be secured and stored erect at all times. When storing or moving, cylinder caps must be in place. Students should not move cylinders unless secured to carts.

**OXYGEN**

For shop use, this gas is in a class by itself. It will combine with many common materials and under the right conditions will cause these materials to burn violently or to explode. Oxygen under high pressure can cause oils to explode. NEVER USE OIL ON ANY OXYGEN VALVE OR REGULATOR EQUIPMENT!
**NONFLAMMABLE GASES**

These include nitrogen, argon, helium, Freon, sulphur dioxide, and to some extent ammonia, which is flammable only in high concentrations. Some are odorless, and others (sulphur dioxide, ammonia) have extremely strong odors. None will support life, so adequate ventilation of the use is essential. Read up on the specific characteristics and detailed safety precautions for the gas you will use and discuss them with your instructor before proceeding.

**TEST DRIVING VEHICLES**

Test-driving a vehicle requires a person to drive a defective vehicle for diagnostic purposes or a repaired automobile to determine if all repairs have been made adequately. Test-driving an automobile is inherently dangerous. There is the possibility of mechanical failure resulting in a wreck. If test-driving on a public roadway, the risk is increased due to traffic concerns.

Young drivers are twice as likely to experience an automobile crash due to their lack of driving experience. According to the Insurance Institute for Highway Safety, the automobile crash death rate for 16-year-olds nearly doubled from 1975 to 1996. The institute cites high-risk circumstances such as night driving and driving with other teens in the car as factors in these statistics. The best loss control method to reduce this exposure is to allow only a district employee (e.g., auto shop teachers) to test drive vehicles. Limit the number of student passengers to reduce the exposure.

However, if it is your district’s choice to allow students to test drive vehicles, the following suggestions are made to limit this exposure:

- Require student to be 18 years old and/or have at least one year of driving experience.
- Require student to have successfully completed a driver’s education course.
- Ensure the student has a valid motor vehicle license.
- Obtain a driving abstract to ensure student has received no moving violations/accidents.
- Require students to obtain express permission from the teacher prior to test drives.
- Obtain from the student a signed parent permission slip that informs of the inherent risks.
- Test drive vehicles on district property in a safe place away from traffic whenever possible.
- Test drive vehicles only during the full daylight hours.
- Do not test drive vehicles during inclement weather.
- Do not allow other student passengers in the car.
- Due to the potential of catastrophic accidents prohibit students from test-driving vehicles that have had brake repairs.
- Do not allow students to build, repair, practice, or prepare any car intended for racing, speed or demolition contests, or any stunt activity.

**DUSTS, FUMES, AND COMBUSTIBLE METALS**

Dust or fumes (fine metal particles from burning) found in the industrial arts laboratory can be irritating to some people. Some can be highly flammable or explosive and possibly cause serious or permanent illness. It is important to control classroom exposure by:

- Using the ventilation equipment to remove dust from your work area.
- Sweeping or vacuuming and properly disposing of dust produced.
- Wear an appropriate respirator when working on dust producing operations.
- Consulting your instructor before cutting, welding, or grinding on galvanized metals.
Asbestos dust is a particular hazard that requires extra precaution when cutting or drilling or machining. Appropriate respirators and protective clothing must be worn when working with this material. Asbestos Hazard Emergency Response Act (AHERA) requires schools to develop a “management plan” and make this plan available to all concerned persons, including faculty, staff, parents, or other interested parties.

Certain metals such as magnesium are flammable and unstable and should not be used in the industrial arts laboratory. Good ventilation is essential when working with lead or zinc, whether burning, welding, soldering, melting, or machining.

**FLAMMABLE AND COMBUSTIBLE LIQUIDS**

Flammable and combustible liquids are essential in many industrial arts classes (refer to fire code requirements). They must be stored and used in a manner that will provide a high degree of safety. Always read the label on the container before using any of these materials.

**FLAMMABLE AND COMBUSTIBLE LIQUIDS ARE POTENTIALLY DANGEROUS BECAUSE:**

Many produce vapors that are heavier than air and can accumulate along floors or other low points, lying in wait for a stray spark. Many are readily oxidized or release heat in curing so that rags or waste coated with them will catch fire spontaneously. Vapors from some have harmful effects and can cause damage to nervous and/or waste elimination systems of the body. All are poisonous if taken internally. Most will remove protective oils from the skin, and repeated exposure can cause dermatitis (skin rash). Nearly all will burn violently. Such fires are difficult to extinguish without proper extinguishing agents. When burning, most flammable liquids will produce dense black smoke that may drive you from the room before the fire can be put out.

**STORE AND HANDLE FLAMMABLE AND COMBUSTIBLE LIQUIDS SAFELY:**

- Be sure the exhaust fan or vents are operating in the flammable liquids storeroom.
- Draw out only as much as you need for your class period or particular operation.
- Dump waste or excess materials only in covered metal containers as directed by the instructor.
- Use a funnel when pouring into a small container.
- Clean up spills and drips immediately, disposing of the rags and waste material as instructed.
- Read and follow instructions for handling and mixing catalysts with resins or finishes.
- Never pour catalysts back into the bottle.
- Always add catalyst to resin, not resin to catalyst.
- Never apply resin, paint or other finishing material near areas used for cutting, welding, grinding, or other hot work.
- Be sure that the working area is well ventilated.
- Store thinners and solvents only in original purchase containers or approved cans.
- Use rubber gloves to minimize chances of skin irritation when working with epoxy and polyester resins.
- Wash hands and other exposed skin areas before leaving the shop.

Some of the more hazardous flammable liquids that you may encounter in your shop activities are (listed in approximate order of hazard):

<table>
<thead>
<tr>
<th>Starting fluid</th>
<th>Aerosol cans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>Catalysts M.E.K. Peroxide</td>
</tr>
</tbody>
</table>
GENERAL SAFETY PRACTICES FOR CULINARY ARTS EDUCATION

Safety in the commercial foods industry is as large a concern as in any other field. Many people fail to realize that in the food preparation areas equipment and personnel can pose potentially dangerous situations. Some of these hazards include burns from hot stoves, ovens, pans, and/or liquids; cuts from sharp knives, meat and/or vegetable cutting equipment; falls on slippery floors; fumes from cleaning materials; and electric shock from unsafe operating conditions of electrical appliances. It is important that students and staff be aware of the specific kinds of hazards presented by equipment used where food is prepared commercially. These include machines that are used to bake, cook, cut, divide, mix, slice, dice, etc. Therefore, it is important that students and instructors become familiar with the many potentially hazardous conditions and operations when using food preparation and cooking equipment.

- Use flat-bottomed and well balanced cooking utensils, avoiding those with copper or cadmium-plated interiors.
- Avoid using inexpensive tin-plated utensils which have sharp corners and raw edges exposed.
- Do NOT use ceramic ware if the glaze is cracked.
- Turn handles of cooking utensils inward on top of range and work areas, and match pot with burner size.
- Check handles of utensils to be sure that they are securely attached.
- Handle hot pans with dry potholders or mitts.
- Clean microwave ovens regularly and check periodically with a special instrument to ensure that there is no microwave radiation leakage.
- Locate microwave ovens with due regard to the possibility of fire and personal injury.
- Place microwave ovens on noncombustible foundations, accessible from all sides and adequately spaced to permit the proper functioning of exhaust systems.
- Dry food thoroughly before deep fat frying and fill pan only one-third full of fat, carefully controlling the temperature.
- Keep knives sharp and stored carefully, preferably in slotted racks.
- Insert beaters of electric mixer before plugging mixer into the power source.
- Utensils are used in the bowl of an electric mixer only when the mixer is not operating.
- Unplug toaster before using a utensil to remove a piece of toast.
- Guard grinders, choppers, and disposals, and use a mechanical device to feed the food.
- Clean exhaust hoods and ducts regularly, and guard fan blades that are 7 feet or less from the floor.
- Store foods properly to control contamination, using tightly covered containers in racks or bins off the floor.
- Store grease containers away from range, and clean oven and broiler pans to prevent accumulation of grease.
- Locate gas range away from window and locate towel racks away from range.
- Avoid eating or sampling in the kitchen while preparing foods and cleaning.
• Assure that pest control is adequately exercised and applied by licensed applicators
• Blades on food grinders, choppers, and slicers must be adequately guarded.
• Do NOT place hot cooking containers in an area where other people may come in contact with them.
• The wooden pusher shall be used to force meat or food into the worm feed of the food grinder. Under NO circumstances shall operators use their fingers.
• Persons in the kitchen area shall wear a cap or other suitable hair covering. Hair shall be tucked under head covering to prevent it from being caught in rotating machinery.
• Do NOT use an ingredient from an unmarked container.
• Do NOT place hot equipment where others may come in contact with it.
• Clean sharp cutting utensils individually. Do NOT place in sink.
• Bowl-locking devices shall be of a positive type that requires the attention of the operator for unlocking (vertical mixer).
• Horizontal dough mixers shall be equipped with a full enclosure over the bowl that is always closed while the agitator is in motion.
• Slicing machines shall be provided with a device to push food through the slicer knives.

No one assigned to food handling or preparation shall be permitted to work if he/she:

• Has an infectious, contagious, or communicable disease.
• Has a fever.
• Has a skin eruption.
• Has a cough lasting more than three weeks
• Have other suspicious symptoms.

GENERAL SAFETY PRACTICES FOR DRAFTING EDUCATION

It is the student’s responsibility to keep their work areas clean. It is also their responsibility to keep equipment clean and secure in its proper storage place.

It is their responsibility to report any safety hazard accident or fire danger to their instructor immediately.

It is their responsibility to conduct themselves in a safe manner and not to abuse equipment. Everyone must “ACT SAFELY” in all their actions while in the drafting classroom.

GENERAL SAFETY PRACTICES FOR CONSTRUCTION TRADES EDUCATION

The construction trades encompass many professions, each of which carries its own particular set of safety hazards in addition to many common to other fields. The following will cover many of those hazards that may be encountered by students as they work in these fields and give safety tips that can help prevent injuries and/or death.

These potential hazards include electric shock from unsafe machinery or conditions while working around electric wiring; falls from ladders, rooftops, or cluttered floors; cuts from saws or other sharp tools; working with hazardous materials such as asbestos; and working with materials that emit dangerous fumes such as paint and/or solvents.
All construction trades face many safety hazards on the job, some of the obvious ones are:

- Being struck by falling objects.
- Strains from lifting and moving heavy equipment.
- Falls from ladders and platforms.
- Eye injuries.

**BRICKLAYING**

Bricklayers face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards you may face are:

- Hydrochloric acid in masonry cleaners
- Lime dust in cement
- Asbestos added to cements.
- Silica dust in cement
- Epoxy resins in wall coatings

**CONTROLLING HAZARDS**

Once you’ve found hazards, there are three basic ways they can be controlled:

The most effective way is to eliminate the hazard through engineering controls. For example, asbestos-free cement should be substituted for asbestos-containing cement. Another way is to modify work practices. For example, wetting down surfaces when cutting concrete blocks, will lower exposure to dust. And, finally, you can use personal protective gear when you are exposed to a hazard. For example, chemical goggles and gloves will protect you when working with acids.

While it is always best to eliminate the hazard, personal protective gear is widely used on construction sites. This gear must be used and maintained properly—if not, it won’t protect you.

**CARPENTRY**

Carpenters face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards you may face are:

- Wood dust
- Wood preservatives in treated woods
- Hand-arm vibration from power tools
- Lead and heavy metals in paints
- Cold
- Hearing loss from excessive noise levels

**ELECTRICAL WORKERS**

Electrical workers face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards you may face are:

- Epoxy resins from cable coatings
- PCBs in older transformers
- Solvents, such as ethylene chloride
- Isocyanides from wire covering
- Fumes from soldering
CONTROLLING HAZARDS

Once you’ve found hazards, there are three basic ways they can be controlled: The most effective way is to eliminate the hazard through engineering controls. For example, substitute a cadmium-free solder for solder containing cadmium. Avoid using very toxic solvents such as benzene or toluene. Another way is through work practices, like washing your hands before eating or smoking or leaving work to remove metal fume contamination. And finally, you can use personal protective gear when you are exposed to a hazard. For example, you should wear the proper gloves when working around equipment leaking PCBs or the proper respirator when soldering in a confined area.

PAINTERS

Painters face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards you may face are:

- Solvents
- Epoxy resins in paint
- Metals in paint pigments, such as lead or chromate
- Confined work spaces
- Isocyanine paints

PLUMBERS

Plumbers and boilermakers face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards you may face are:

- Metal dust from cutting pipes
- Asbestos from lagging around pipes
- Fumes from welding and soldering
- Confined work spaces
- Eye injuries

CONTROLLING HAZARDS

Once you’ve found hazards, there are three basic ways they can be controlled: The most effective way is to eliminate the hazard through engineering controls. For example, substitute a cadmium-free solder for solder containing cadmium. Be sure that confined workspaces are well ventilated. Another way is through work practices, like washing your hands before eating or smoking or leaving work to remove metal pigment contamination. And finally, you can use personal protective gear when you are exposed to toxic fumes. Follow directions for application, ventilation, and handling procedures (see containers and MSDS).

Once you’ve found hazards, there are three basic ways they can be controlled: The most effective way is to eliminate the hazard through engineering controls. For example, substitute a cadmium-free solder for solder containing cadmium. Another way is to limit the amount of time you are exposed to the hazard. Your supervisor may limit the time you spend each day doing work in hot, confined spaces. And finally, you can use personal protective gear when you are exposed to a hazard. For example, you can use the appropriate respirator to protect you from metal dust when you are cutting pipe.
**ROOFERS**

Roofers face many chemicals and other health hazards on the job. These health hazards are often hidden, so you might not know you’re being exposed or affected. Common health hazards that may be faced are:

- Solvents used in new roofing systems and clean up.
- Radiation from sunlight (increased sensitivity caused by skin contact with many roofing materials).
- Coal, tar, pitch in roofing materials.
- Asbestos during removal of old roofing tiles
- Hot asphalt

**CONTROLLING HAZARDS**

The most effective way is to eliminate the hazard through engineering controls. For example, less toxic solvents such as acetone or ethanol should be used rather than very toxic solvents such as benzene or gasoline. Exhaust fans can be used to provide good ventilation in confined spaces, if properly used. Another way is to modify your work practices to help avoid the hazard. For example, you should try to work upwind if possible during heat welding. Finally, you can use personal protective gear when you are exposed to a hazard. For example, you should use the appropriate respirator to protect you from the gases and fumes released during application of materials. Use protective devices to protect knees and joints. Utilize safety restraint lines in accordance with OSHA, and industry standards to protect injuries sustained from falling.

**GENERAL SAFETY PRACTICES FOR GRAPHIC ARTS EDUCATION**

In the graphic arts lab you will be using many hand tools, chemicals, electrical devices and machines, all of which represent potential safety hazards.

The following equipment safety sheets and tests represent some of these areas of concern. However, most accidents in the graphics lab occur when students are using simple hand tools or handling paper, plates, chemicals, and other materials that they use every day.

Some important areas of GENERAL SAFETY CONCERN are:

<table>
<thead>
<tr>
<th>Hand tools</th>
<th>X-acto knives and razor blades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felt pens (toxic)</td>
<td>Hand paper cutters</td>
</tr>
<tr>
<td>Compasses</td>
<td>Scissors</td>
</tr>
<tr>
<td>T-squares and triangles</td>
<td>scribing tools</td>
</tr>
<tr>
<td>Furniture</td>
<td>Stools</td>
</tr>
<tr>
<td>Glass light tables</td>
<td>Carts/hand truck/dollies</td>
</tr>
<tr>
<td>Toxic chemicals</td>
<td>Flammable materials and chemicals</td>
</tr>
<tr>
<td>Skin irritants</td>
<td>Wax (hot)</td>
</tr>
<tr>
<td>Paper (sharp)</td>
<td>Metal plates (sharp)</td>
</tr>
<tr>
<td>Oily rags and other fire hazards</td>
<td>Electrical hazards</td>
</tr>
<tr>
<td>Lifting hazards</td>
<td>Storage hazards</td>
</tr>
<tr>
<td>Roller, gears, cylinders</td>
<td></td>
</tr>
</tbody>
</table>
GENERAL SAFETY PRACTICES FOR METAL TRADE EDUCATION

Specific knowledge of machinery and tools is a large part of safety in the metal trades. General safety in the facility is primary, but specific safety concerning individual machines or tools is paramount to an overall safe environment.

WELDING, CUTTING, AND BRAZING

The use of welding, cutting, and brazing equipment is common throughout many occupational trades. The improper use of this equipment can be extremely dangerous for those performing the work or those in the general vicinity of the activity. Therefore, it is imperative that proper procedures be followed before doing these specialized tasks. Special efforts must be made to evaluate the procedures used while operating the equipment. Consideration should be given to the storage and handling of the specific gases and to the availability and use of personal protective equipment.

GENERAL SAFETY PRACTICES FOR AGRICULTURAL EDUCATION

People employed in agricultural fields often work with considerable potential hazard. It is the function of this listing to recognize some of these hazards as they relate to agricultural education and to assist in correcting them.

- In areas where acids and hazardous chemicals are used (milk-testing equipment and battery acids), an eye flush and shower must be available.
- No riders are allowed on tractors, crawlers, skidders, or other machinery.
- Tractors, crawlers, and skidders are equipped with roll bars, power take-off shields, fire extinguishers, and slow moving vehicle signs.
- Safe tractor operations are taught to all operators.
- Chain saws are equipped with anti-kickback chains.
- Special protective apparel and equipment are provided for students logging with chain saws.
- A safe distance of 1½-tree heights is maintained from anyone engaged in tree felling.
- During outdoor laboratories, all personnel are moved to a place of safety when electrical storms, high winds, or unusual and threatening weather conditions occur.
- Pesticides are used and stored in accord with manufacturers’ specifications (see state pesticide requirements).
- Appropriate safety instruction and certification are provided. It is the districts responsibility as a condition of local employment.

GENERAL SAFETY PRACTICES FOR BUSINESS AND OFFICE OCCUPATIONS

Although accidental injuries in business and office occupations are usually not as severe as in other areas, a few additional safety practices merit mention:

- Casters on swivel chairs are securely fixed to the bases of the chairs.
- Adjustment features on chairs are maintained so that they will work properly.
- Drawers on desks and file cabinets have safety stops.
- Guards are placed on paper cutters.
• File drawers, office furniture, and other equipment do NOT extend out into aisles.
• Card index files, dictionaries, and heavy objects are kept off the top of file cabinets and other furniture.
• Only one filing drawer at a time is opened.
• Punctures and cuts from paper are given immediate attention.
• Office machines that creep during operation are secured.
• Office machines are NOT placed near the edges of tables or desks.
• Power is turned OFF on electrical equipment during electrical storms.
• Grasping the plug, not by pulling the cord, disconnects electrical cords.
• Electrical cords of office machines are arranged to avoid tripping hazards.
• Reprographic processes are not confined to a separate small room unless the room is vented to the outside.
• Pointed items like tacks and razor blades are stored with points concealed.
• File personnel wear rubber finger guards to avoid cuts and injury.
• If cords must cross the floor, they are covered with rubber channels.
• Electrical outlets placed on floors are located where they will NOT be accidentally kicked or used as foot rests.
• Telephone and electrical outlets do NOT protrude into passages that people use.
• Maintenance personnel move desks and files.
• Loose clothing and jewelry should NOT be worn if working around moving machinery such as printing machines, paper shredders, etc.
• Use appropriate methods or devices to control screen glare when computers or word processors are used.

**GENERAL SAFETY PRACTICES FOR MARKETING EDUCATION**

A safe environment is an essential part of a quality marketing education program. The following are further considerations when inspecting safety conditions in the marketing store/laboratory and classroom. Store, classroom, and storage areas are free of:

• Sharp edges (also check for burrs on desks, file cabinets, shelves, and counters).
• Pulled-out drawers
• Obstructing materials (e.g., extension cords and school supplies)
• Protruding merchandise or stock
• Display overhangs.
• Litter on floor, tables, counters, desks, and shelves.
• Defective glass counters that may be chipped or cracked or have uneven edges (durable synthetic surfaces are free from this trouble).
• Fire-hazard wastebaskets (sufficient noncombustible containers are used).
• Heavy fixtures or merchandise which could fall and cause injury are secured or placed at floor level.
• Fixture glass is tempered; this prevents easy breaking of display case or countertops upon sudden impact with hard objects.
• Proper ventilation and/or exhaust are provided in area around sign-making machine, duplicating equipment, and other required areas.
• Carefully check spring-loaded typing desk before opening to avoid the typewriter table snapping out.
• Avoid standing on a castered stools and other unstable furniture. Check brake on rolling ladder.
• Avoid carrying excessive loads or stacks that may impair vision and/or strain back.
• Pencils, pens, and other sharp items are NOT stored in a glass container with points outward.
• Avoid working close to knives or scissors with the points or sharp edges toward the worker—no knives or scissors are left on a work surface with the points toward the user; also, always hand a pointed instrument to another person with the point away from the recipient.
• All paper cutters have a guard.
• Drawers on desks and file cabinets have safety stops—avoid stepping near open drawers.
• NO spindle (spike) file is allowed.

GENERAL SAFETY PRACTICES FOR HEALTH OCCUPATIONS EDUCATION

Safety is an important part of any occupation, but a health care worker has a special obligation to be concerned about the safety of the patient. Since Health Occupations training takes place in both a classroom laboratory setting and a clinical setting, specific safety practices for each area should be considered.

Classroom Laboratory

• Horseplay or practical jokes cause accidents and, therefore, have no place in the laboratory.
• Use proper body mechanics at all times.
• Maintain a broad base of support by keeping the feet 6–8 inches apart.
• Use the stronger and larger muscles of your body. These are located in the shoulders, upper arms, thighs, and hips.
• Bend from the hips and knees to get close to an object.
• Use the weight of the body to help push or pull an object. Whenever possible, push or pull rather than lift.
• Carry heavy objects close to the body.
• Avoid twisting the body as you work. Turn feet and entire body and face the direction in which you are working.
• Avoid unnecessary bending and reaching and bending for long period of time.
• Get help from a coworker to move heavy objects or patients whenever necessary.
• While working with a partner in patient simulations, observe all safety precautions taught in caring for a patient.
• Exercise care in handling equipment and solutions.
• Keep electric cords to electric beds, sterilizers, and other equipment in good repair and have ground connectors.
• Equip wheels on beds, stretchers, and wheelchairs with locking devices.
• Place crank on adjustable bed under the frame so that it is out of the way.
• Do not operate or use any equipment until instructed on how to use it.
• Check labels three times before contents are used and discard unlabeled bottles.
• Some solutions can be injurious or poisonous; therefore, avoid contact with eyes and skin. Use only as directed.
• Attend to the immediate removal of spilled liquids, broken glass, and other hazards.
• Observe fire safety procedures.
• Know the evacuation route for responding to a fire alarm.
• Know location of and how to operate fire extinguishers.
• Know location of and how to activate fire alarm.
• All exits should be clearly marked with exit signs.
• Know the procedure for responding to a tornado alarm.
• Keep the laboratory clean and neat with all equipment and supplies in their proper locations at all times.
• Report any injury or accident, no matter how minor, to the instructor immediately

**Clinical Facility**

Always observe the rules for proper body mechanics as outlined in the previous section on classroom laboratory safety. Proper medical aseptic techniques should be followed.

• Observe personal hygiene measures.
• Wash hands before and after giving patient care, after urinating or having a bowel movement, and before handling or preparing food.
• Hold linens and equipment away from uniform.
• Avoid shaking linens and other equipment; use a damp cloth to remove any dust.
• Clean from the cleanest area to the dirtiest area.
• Clean away from the body and uniform.
• Pour contaminated liquids directly into sinks or toilets.
• Avoid sitting on the patient’s bed. You will pick up microorganisms and transfer them to the next surface that you sit on.
• Do not take equipment from one patient’s room to use for another patient, even if the equipment is unused.
• Properly clean, disinfect, and/or sterilize material and equipment used by one person before being reused.
• Maintain method of isolation recommended for a patient.
• Exercise care in handling equipment and solutions as outlined in the section on classroom laboratory safety.
• Observe fire safety procedures and obey all NO SMOKING signs.
• Extinguish matches, cigarettes, and any other flammable items completely.
• Dispose of combustible materials in appropriate containers.
• Remove spark conduction equipment or materials before beginning procedures using oxygen and other explosive gases.
• Know how to activate institutional fire alarm systems.
• Know location of and how to operate fire extinguishers.
• Remain calm and follow institution’s routine for fire in patient area.
• Always use stairs to evacuate; do NOT use elevators.
• Report any injury or accident, no matter how minor, to the immediate supervisor immediately.

**GENERAL SAFETY PRACTICES FOR FAMILY AND CONSUMER SCIENCES EDUCATION**

In the field of family and consumer sciences education (FACSE) there are approved methods of working and safe procedures for using space and equipment. Following is a more specific listing of safety practices unique to this area.
• Follow the operator’s manual for each appliance for safe operating practices, maintenance procedures, and further safety practices.
• Keep abreast of current information on the use and safety of appliances and equipment.
• Inspect appliances and equipment regularly to be certain that they are in safe, proper operating condition.
• Have an expert check for electrical safety in appliances that have been bumped, dropped, or exposed to other mishaps.
• Have sturdy stepladder or safe step stool handy for reaching high places.
• Plug cord into electrical appliance first, then into wall outlet.
• Always disconnect cord from wall outlet before removing from appliance.
• Grasp plug rather than cord when removing from outlet or appliance.
• Avoid using small appliances and cords in an area where they can accidentally fall into a sink while connected.
• Always handle electrical equipment/appliances with dry hands.

Clothing and Textiles

• Place pins and needles in pincushions or pin cases.
• Store scissors and other sharp tools in holders or secure place.
• Arrange the electric cord of the sewing machine on the floor so that it will not cause anyone to stumble.
• Close sewing machine carefully to avoid damaging electric cord.
• Avoid putting excessive weight or pressure on sewing machine leaf.
• Use a well-balanced, rigid ironing board.
• Use a nonflammable or treated ironing board cover.
• Each sewing machine shall be equipped with a guard permanently attached to the machine so that the operator’s fingers cannot pass under the needle.

Housing and Home Furnishings

• Craft knives must be sorted in a secure place.
• Follow manufacturers’ directions for using hot glue guns and other small equipment.

GENERAL SAFETY PRACTICES FOR INDUSTRIAL TECHNOLOGY EDUCATION

Transportation

• Close car doors, hood, and trunk lid, and make sure no one is inside before raising vehicles on a lift.
• Know the load limits of lifts and jacks and do NOT overload them.

• Vehicles are checked for proper positioning just before they leave the floor.
• Do NOT lock the hoist controls of lift and jacks in the open or shut position.
• On lifts not fitted with safety catches or provided with accommodations for the insertion of a safety bar, jack stands should be immediately placed under the front and rear of the vehicle.
• In pulling operation, NEVER stand directly behind a jack. Stand to one side. Ensure that the area is cleared of all other personnel before starting the pull.
• When a student is required to work under a jacked-up vehicle, no other person shall work on that vehicle.
• Jacks are checked periodically to see that they are in good condition.
• Vehicles on jacks are cribbed, blocked, or secured at once.
• Support stands are used after the vehicle has been raised with a hydraulic jack.
• NO internal combustion engine should be started and allowed to run in the shop area until the exhaust ventilation (tail pipe exhaust system) has been connected and operating.
• Double-check to see that all controls are in proper starting position before attempting to start engine or motor.
• All power-driven belts, chains, marine propellers, gears, and cutting blades should be guarded to prevent accidental contact during repairs that require operation of the equipment.
• Do NOT leave running engine unattended.
• NO riders are allowed on vehicles, crawlers, skidders, or other machinery.
• Safe vehicle operations are taught to all operators.
• Test engines should be securely mounted to the bench or test stand.
• NEVER open a pressurized radiator or air-conditioning system while the engine is hot.
• Proper procedures should be adhered to when fueling all engines.
• Extreme care shall be taken with flames, heat, or sparks in operations or procedures that involve repairing, replacing, or coming in close contact with fuel systems and tanks.
• Gas and liquid coolants used in automotive air conditioners must be handled with care, especially those stored under pressure.
• Battery charging areas are ventilated and designated as NO SMOKING areas.
• Where batteries are serviced, methods must be provided for:
  • Flushing and neutralizing spilled electrolyte.
  • Fire protection.
  • Adequate ventilation to prevent hydrogen gas buildup (hydrogen gas given off during battery charging is explosive).
  • Quick drenching of workers if acid is splashed or spilled.
• Open flames, spark producing apparatus, and electric arc must be excluded from the battery service area.
• Tools and other metallic objects shall be kept away from the tops of uncovered batteries.
• Prohibit the use of compressed air to clean clothing, equipment, and work area.
• Air tank drain valve on compressor shall be opened frequently to prevent excessive accumulation of liquid.
• Relief valves on compressor shall be maintained in good operating condition and tested at regular intervals.
• Pressure control gauges on compressors shall be protected and maintained in good operating condition.
• When working on small engines, disconnect spark plug wire to prevent accidental start.
• NEVER place any part of the body under the blade enclosure or in grass discharge chute while lawn mower is running.
• Safety racks (cage) or equivalent protection should be provided and used when inflating, mounting or dismounting tires with split rims or lock rings.
• All paint should be in storage cabinet when NOT in use.
• Low-flash paint thinners are used for equipment cleaning only under ventilated situation.
• Portable lamps are removed during spray operations.
• NO SMOKING signs are posted in spray area, paint room, paint booth, and paint storage area.
The spray is at least 20 feet from flame, sparks, electric motors, or other ignition sources.
- Electric lamps in spray area are enclosed and guarded.
- The spray area is kept clean of combustible residue.
- Spray booth floors and baffles are noncombustible.
- Spray booths have explosion-proof lights or are lighted through sealed, clear panels.
- Mechanical ventilation is utilized during spraying and drying operations.
- Spray booths have independent exhaust systems.
- Exhaust rates meet minimum requirements.
- Air exhausted from spray operation is removed from the ventilation system.
- Ducts have access doors to allow cleaning.
- Intake air is free of contaminants.
- Make-up air heater is located outside the spray booth.
- Over-spray filters have pressure gauges to indicate need for filter replacement.
- The spray area used for drying with portable heaters or heat lamps is kept clean of over-spray deposits.
- The infrared apparatus is kept out of the spray area during spraying operations.
- The spray area is completely ventilated before using drying apparatus.

**Communications**

- NEVER place fingers or hands in machinery while in operation.
- Handle paper carefully to prevent cuts.
- Stack materials properly.
- Handle paper cutter knives (on or off the machine) very carefully.
- Only one person must operate a machine at a time.
- Watch for accidental double cycling on the cutter blade on electric cutters.
- Make sure camera lights are disconnected before adjustment or maintenance.
- Watch out for hot arcs and lights.
- Do NOT move in darkroom until eyes adjust. Walk with arms extended.
- Avoid handling electrical equipment with wet hands.
- Do NOT talk to others while operating equipment.
- Do NOT operate equipment at excessive speeds.
- Do NOT overload pallets or tables.
- NEVER work in the pressroom or darkroom alone. A second person must be present to assist in case of an accident.
- Use and store pencils, pens, tacks, and other sharp objects properly.
- Do NOT lean back on stools or chairs balancing weight on the rear legs.

**Electricity/Electronics**

- Turn power OFF and/or unplug before working on any circuit.
- Use an isolation transformer when working with any AC line-operated item.
- Discharge electrolytic capacitors.
- Use only one hand inside of equipment or panels, even if power is removed.
- Avoid touching grounded points with other parts of the body.
- Be extra cautious around water, as it is an excellent conductor of electricity.
• Use caution in handling or working near cathode ray tubes as they explode dangerously if broken.
• Frames of electric motors, regardless of voltage, must be grounded.
• Non-current-carrying metal parts of fixed equipment that may become energized must be grounded under any of the following circumstances:
  • In wet or damp locations.
  • If in electrical contact with metal.
  • When in a hazardous location.
  • Before repairs on electrically powered equipment are begun, the main switch should be locked in the OFF position.
• Electrical installations, modifications, and alterations shall conform to federal, state, and local municipality standards, codes, and specifications.

Materials and Processes

• All materials stored in tiers shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling, or collapsing.
• Always check scaffolding ladders and temporary walkways before using.
• NEVER carry tools with sharp points or edges in your pockets.
• NEVER try to stop a machine with hands or other parts of the body after turning it off.
• Used lumber shall have all nails withdrawn.
• Manual adjusting and gauging (callipering) of work shall NOT be permitted while machine is running.
• Remove chuck keys and other equipment before starting machine.
• Do NOT throw refuse in machine coolant. This contaminates the coolant and can spread disease.
• Use brush, vacuum, or special tools for removing chips.
• Care shall be taken not to come in contact with projections on work or stock, faceplates, chucks, etc., while machine is operating.
• Do NOT use wiping rag on revolving parts.
• Using the machine power to start the faceplate or chuck onto the spindle shall NOT be permitted.
• Splashguards, shields, and other means should be employed to minimize contact with cutting oils that may cause skin irritation.
• A “stock tube” should be employed when long sections of stock extend beyond the machine. It is important that the bar stock fit completely inside the stock tube so that rotating ends are not exposed.
• The work rests on offhand grinders are adjusted within a maximum of 1/8 inch from the wheel.
• The tongue guards on offhand grinders are adjusted within a maximum of 1/4 inch from the wheel.
• Safety set screws are provided on all lathe dogs and revolving accessories.
• No saw, cutter head, or tool collar is placed or mounted on a machine or bar unless it is of proper size.
• Where a standard guard cannot be used, a feather board or jig is used in place, as in grooving, jointing, etc.
• To eliminate the hazard of impalement, people shall NOT be permitted to work above vertically protruding reinforcing steel unless it has been protected.
• Bull float and vibrator handles shall be constructed of nonconductive materials or shall be insulated to protect operator when he/she might come in contact with energized electrical conductors.
• Formwork and shoring shall be designed, erected, supported, braced, and maintained so that they will safely support all vertical and lateral loads that may be upon them during placement of concrete.
• Powered and rotating type concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the operator removes his/her hands from the handles.
• Knife blades or blades of jointers shall be installed and adjusted so that they do not protrude more than 1/8 inch beyond the cylindrical body of the head.
• NEVER place the tool rest below the center of the piece being turned on the lathe.
• NEVER let the cutting edge of a lathe tool get under the wood being turned.
• Don’t attempt too heavy a cut with the machine. Take several light cuts.
• NEVER attempt to plane or joint very short stock. (See manufacturer’s specifications.)
• NEVER attempt to make an adjustment while the machine is running.
• Always turn the power OFF immediately after using the machine.
• Saw blade should project through the table just far enough to cut the stock.
• When pushing material over table saw, the operator should stand to the side.
• NEVER attempt to clear saw table of chips or dust by hand while the machine is running. Use a stick to push it off.
• When using a band saw, stand in front of it, and NEVER step around to the side, in line with the direction of the travel of the band saw wheel. This is to prevent injury should the blade break.
• Always use as heavy a blade as possible for the work to be done.
• Make sure band saw blade guides are set properly; if not properly set, the blade will strain, kink, and break.
• The practice of inserting wedges between the saw disc and the collar to form what is commonly known, as a “wobble saw” shall NOT be permitted.
• Push sticks or push blocks shall be provided at each machine requiring their use and the operator, when required by the work being done, must use them.
• No device or attachment facilitating mixture of air or oxygen with flammable gases should be used prior to consumption except at the burner or in a standard torch.
• All welding equipment and apparatus for gas and arc welding, cutting, and brazing meet American Welding Society Standards.
• Under NO condition shall acetylene by generated, piped, or utilized at a pressure in excess of 15 p.s.i. gauge pressure.
• All compressed gas cylinders are legibly marked as to gas content with either the chemical or trade name. Such marking shall by means of stenciling, stamping, or labeling not readily removable.
• All gas cylinders are kept away from radiator and other sources of heat.
• Inside of building, cylinders are stored in a well-protected, well-ventilated, dry location at least 20 feet from highly combustible materials such as oil, excelsior, or other substances likely to cause or accelerate fire.
• Cylinders are stored in specifically assigned places away from elevators, stairs, or gangways.
Cylinders are stored or located where they will not be knocked over or tampered with by unauthorized persons. A chain or other suitable device should secure them.

Cylinders are NOT kept in unventilated enclosures.

Empty cylinders have their valves closed and protective caps on.

Cylinder valve protective caps are in place, hand-tight except when cylinder is in use.

Acetylene cylinders are stored valve end up.

Oxygen cylinders in storage are separated from fuel-gas cylinders or combustible materials a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one half hour.

Cylinders, cylinder valves, couplings, regulators, hoses, and apparatus are kept free from oily or greasy substances.

Oxygen cylinders or apparatus are NOT handled with oily hands or gloves.

A jet of oxygen is NOT permitted to strike an oily surface or greasy clothes, and it is not permitted to enter a fuel oil or other storage tank.

Cylinders are NOT dropped or struck or permitted to strike each other violently.

Unless cylinders are secured on a special truck, regulators are removed and valve protection caps are in place before cylinders are moved.

Cylinders are NOT placed where they might become part of an electric circuit.

Cylinders are NOT dropped or used as rollers or supports.

Before connecting regulator or cylinder valve, the valve is opened slightly for an instant and then closed.

The cylinder valve is always opened slowly.

An acetylene cylinder valve is NOT opened more than one and one-half turns of a spindle and preferably no more than three-fourths of a turn.

The acetylene-opening wrench is left in position on the cylinder valve while in use so that it can be shut off quickly if needed.

For a manifold system, one acetylene wrench is available for immediate use at each station.

When work is finished, cylinder valves are closed, and torch and regulator valves are opened, and then closed, to bleed remaining pressurized gas from regulator and lines.

Acetylene cylinders in a manifold system are installed with flash arresters.

Each oxyacetylene cylinder lead is equipped with a backflow check valve.

Piping for manifolds for acetylene is steel or wrought iron.

The generally recognized colors are red for acetylene and other fuel-gas hoses, green for oxygen hoses, and black for inert gas and air hoses.

Hoses showing leaks, burns, worn places, or other defects rendering them unfit for service are repaired or replaced.

Gauges or oxygen regulators are marked “USE NO OIL.”

Tilting and rolling on their bottom edges move cylinders.

Cylinders containing oxygen, acetylene, or other fuel gases are NOT taken into confined spaces.

Torches are lit by friction lighters or other approved devices and NOT by matches.

When welding under wet or other conditions causing perspiration, steps are taken to reduce shock hazard.

On all types of arc welding machines, control apparatus are enclosed except for the operating wheels, levers, or handles.

Terminals for welding leads are protected from accidental electrical contact by personnel or by metal objects.
• Chains, wire ropes, cranes, hoists, and elevators are NOT used to carry welding current.
• All ground connections are checked to determine that they are mechanically strong and electrically adequate for required current.
• Cables with splices or defects should NEVER be used.
• Machines that have become wet are thoroughly dried and tested before being used.
• Protective shields, ventilations, or fire curtains are installed to protect against sparks, harmful rays, and flames.
• Tests shall be conducted in accordance with manufacturers’ instructions and accepted industry practice.

**COMPUTER USE**

• Treat this computer like you’d treat your own—with respect.
• Always ask permission before using this computer.
• Use this computer only for school-related activities: homework, research, etc.
• Respect other people’s files on this computer, do not change, copy, delete, read, or otherwise access files that are not yours.
• Do not install or remove any software on this computer.
• Remember that others need to use this computer, too. Do not monopolize it.
• All software on this computer is copyrighted, do not copy, distribute, or alter it in any way.

**ONLINE RULES**

• Never give out personal information anywhere on the Internet.
• Be concerned about getting personal e-mail messages from anyone online asking you for personal information, attempting to arrange private meetings, etc.
• Do not bypass any security measures installed on this computer.
• Talk with your teacher immediately if you observe/are involved with any violations of the first three rules listed above.
• Never use the Internet to harm other people in any way.
• Always ask for permission to use pictures or text from someone’s website in your work.
• Treat other online users as you would like to be treated—with respect.
• Protect your password(s).
• “Lurk” before you leap; read what others have written before you post your comments.
• While at school, use the Internet only for school-related activities, homework, research, etc.

**SECTION III     GENERAL MACHINE SAFETY PRACTICES**

• Always wear eye protection. Wear safety glasses, goggles or a face shield.
• Get the instructor’s permission before you use the equipment.
• Use the equipment only when the instructor is in the laboratory.
• Report all accidents, near accidents, or injuries to the instructor immediately.
• Don’t use tools or equipment that is in any way defective. Tell the instructor if a tool is dull or broken or isn’t working properly.
• Don’t use any equipment until you have been shown how to use it correctly and safely. Don’t use it unless you understand the instructions.
• Keep clothes tucked in and sleeves neatly rolled up. Loose clothing can get caught in a machine and cause an injury.
• If your hair is long, tie it back or wear a cap over it. Long hair can be caught in a moving machine.
• Remove rings, bracelets, watches, and necklaces before you do any work in the laboratory.
• Watches and jewelry should not be worn in the laboratory.
• Wear protective shoes. Wear hard shoes or boots with rubber soles and rubber heels. Don’t wear sandals in the laboratory.
• Wear approved ear protection around loud, noisy equipment.
• Wear a dust mask or an air filter when working around a lot of wood dust. Wood dust can be harmful if inhaled.
• Use finishing materials, thinners, or other oily or flammable liquids only in well-ventilated areas.
• Clean up spills. Don’t leave anything on the floor that someone could slip on.
• Keep used rags in an approved, covered metal container. Damp, oily rags can ignite through spontaneous combustion. The heat produced by oxidation is enough to start a fire.
• Know where the fire extinguishers are located and know how to use them before there is an emergency.
• Keep cabinet doors and drawers closed.
• Aisles have to be kept clear and free of litter, scraps, and materials. Don’t leave anything on the floor that could be tripped over or slipped on.
• Vises should be kept closed when they’re not in use.
• Keep workbenches clear and organized. Don’t pile up tools and don’t lay tools down so they hang over the edge of the bench.
• Always use a brush or a rag to clear away sawdust and scraps. Never use your hands to wipe off a surface.
• Use the right tool for the job. Use the tool only for what it’s designed to do. Use the right size tool.
• Carry pointed or sharp tools with the point or edge held down toward the floor. This will help avoid injuries if you bump into something or if someone bumps into you.
• When you hold a tool, hold it by the handle. When you hand someone a tool, hold it so they can take it by the handle.
• When you’re finished with a tool, return it to its proper storage area. Return it to the tool room, tool rack, or cabinet where it belongs.
• If you’re handling large or heavy materials, get someone to help you. Also, ask someone to help or “tail-off” for you when you cut a large piece of material on a machine.
• Lift with your legs, not with your back. Lifting improperly or carelessly can cause severe back injuries.
• Be sure your hands are dry and that you’re standing on a dry floor when you use electrical devices.
• Check the condition of the power cord. Don’t use the equipment if the insulation on the cord is damaged, cut, or frayed. Tell the instructor.
• When you disconnect a power cord, pull the plug; don’t yank on the cord. Hold the plug and pull it out of the outlet.
• Use all the recommended guards and safety devices on the power equipment. Never remove a guard without the instructor’s permission.
• Disconnect the power equipment any time you need to make major changes or adjustments.
• Unplug the tool or machine or disconnect it at the circuit breaker panel. If you disconnect the circuit breaker, put up a sign: “Don’t connect.”
• Turn off the machine any time you make minor changes or adjustments. Never adjust equipment while it’s running. Wait for it to come to a complete stop before you make the adjustment.
• Do not at any time leave a machine. Turn it off and stay with it until it comes to a complete stop.
• When you approach a machine to use it, make sure the person who used it before you turned it off. Make sure it’s completely stopped.
• Respect the safety zones. Stay away from anyone operating the power equipment. Don’t talk to them or distract them in any way. Don’t let anyone distract you when you’re using the equipment.
• Concentrate on what you’re doing; give it your full attention. If you don’t feel well or if there’s some reason you can’t concentrate, tell your instructor.
• Work at a safe speed. Don’t rush or hurry through a project. Working too fast is dangerous and it will result in poor craftsmanship.
• Confine long hair before operating rotating equipment.
• Always wear safety glasses; use suitable helmets and goggles for welding.
• Remove ties when working around machine tools or rotating equipment.
• Remove rings and other jewelry when working in the shop.
• Conduct yourself in a manner conducive to safe shop practices.
• Use soap and water frequently as a method of preventing skin disease.

General safety rules

• Keep all hand tools sharp, clean, and in safe working order.
• Report any defective tools, machines, or other equipment to the instructor.
• Make sure all guards and barriers are in place and adjusted properly before starting a machine tool.
• Retain all guards and safety devices except with the specific authorization of the instructor.
• Operate a hazardous machine only after receiving instruction on how to operate the machine safely.
• Report all accidents to the instructor regardless of nature or severity.
• Turn off the power and make certain the machine has stopped running before leaving.
• Disconnect the power from machine tools before performing the maintenance task of oiling or cleaning.
• Use solvent only after determining its properties, what kind of work it has to do, and how to use it.
• Use correct properly fitting wrenches for nuts, bolts, and objects to be turned or held.
• Keep the shop or laboratory floor clean of scraps and litter.
• Clean up any spilled liquids immediately.
• Oily rags or oil waste should be stored in metal containers with self-closing lids.
• Clean the chips from a machine with a brush—not with a rag or the bare hands.
• Do not use compressed air to clean your person or clothing.
• Methods used to maintain a clean and orderly shop
- Arrange machinery and equipment to permit safe, efficient work practices and ease in cleaning.
- Stack materials and supplies safely or store in proper place.
- Store tools and accessories safely in cabinets, on racks, or in other suitable devices.
- Clear working areas and work benches of debris and other hazards.
- Clean and free floors from obstructions and slippery substances.
- Free aisles, traffic areas, and exits of materials and other debris.
- Dispose of combustible materials properly or store in approved containers.
- Store oily rags in self-closing or spring-lid metal containers.
- Know the proper procedures to follow in keeping the work area clean and orderly.
- Keep sufficient brooms, brushes, and other housekeeping equipment readily available.
- Report any defective tools, machines, or other equipment to the instructor.
- Retain all guards and safety devices except with the specific authorization of the instructor.
- Operate a hazardous machine only after receiving instruction on how to operate the machine safely.
- Report all accidents to the instructor regardless of nature or severity.
- Turn off the power and make certain the machine has stopped running before leaving.
- Make sure all guards and barriers are in place and adjusted properly before starting a machine tool.
- Disconnect the power from machine tools before performing the maintenance task of oiling or cleaning.
- Use a solvent only after determining its properties, what kind of work it has to do, and how to use it.
- Use correct properly fitting wrenches for nuts, bolts, and objects to be turned or held.
- Keep the shop or laboratory floor clear of scraps and litter.
- Clean up any spilled liquids immediately.
- Oily rags or oily waste should be stored in metal containers.
- Clean the chips from a machine with a brush—not with a rag or the bare hands.
- Do not use compressed air to clean your person or clothing.
- Arrange machinery and equipment to permit safe, efficient work practices and ease in cleaning.
- Stack materials and supplies safely or store in proper place.
- Store tools and accessories safely or store in proper place.
- Clear working area and work benches of debris and other hazards.
- Clean and free floors from obstructions and slippery substances.
- Free aisles, traffic areas, and exits of materials and other debris.
- Dispose of combustible materials properly or store in approved containers.
- Store oily rags in self-closing or spring-lid metal containers.
- Know the proper procedures to follow in keeping the area clean and orderly.
- Keep sufficient brooms, brushes, and other housekeeping equipment readily available.

**Power Equipment Safety Practices**

- Always wear eye protection.
- You must have the instructor’s permission before you use the equipment.
- Don’t use any of the power tools unless you’ve been shown how to use them correctly and safely. Don’t use a tool until you understand how to use it properly.
- Power equipment may be used only when the instructor is in the shop. No power equipment may be used unless the instructor is present.
• If you don’t feel well or if you can’t concentrate, tell the instructor. Don’t use any of the tools unless you can give your full attention to what you are doing.
• Your hands must be dry when you work around electricity, and you must be standing on a dry floor.
• When you approach a machine, be sure the person who used it before you has turned it off and it’s completely stopped.
• Check the cutting tool in the machine. The cutting tool must be sharp and in good condition.
• The cutting tool must be installed correctly and properly adjusted for the work.
• Check to see that all the safety guards are in place and working properly. Use all the safety guards whenever possible.
• Never remove a guard unless you have the instructor’s permission.
• If the machine doesn’t sound right or if it doesn’t work properly don’t use it. Turn it off and tell the instructor.
• Use the machine only for what it was designed to do. For example: don’t overload the machine or use it on something too small to be safe.
• If you have to make any adjustments or changes, get permission.
• Before making any major changes or adjustments, disconnect the power. Pull the plug or disconnect the power at the circuit breaker.
• Minor adjustments should always be made with the machine turned off and completely stopped.
• Work in a well-lighted area. Stand so you can see clearly.
• Keep yourself balanced. Don’t overreach or put your weight on a machine.
• Check the condition of the material. The wood must be clean and free of defects. It must be clear of hardware, paint, or finishes.
• Always wait for the machine to come up to full speed before starting the cut.
• Use an even, steady pressure to make the cut. Don’t force it or over load the machine.
• If the material is large or heavy, get help. Ask someone to “tail-off” for you. The tail-off helper should support the material while you control how it is moved into the cut.
• Get permission to use special set-ups, jigs, or attachments. Ask the instructor to double-check special set-ups before you use them.
• Don’t let anyone distract you while you’re operating the machine. Keep your full attention on what you are doing.
• Use a piece of scrap wood, a push stick or a brush to remove scraps around the cutting tool.
• Never use your hands to clear away scraps or dust.
• Stay out of the danger zones when someone is using the equipment. Make sure that others stay clear when you’re operating the equipment.
• When you are finished using equipment, turn it off and stay with it until it has come to a complete stop.
• Remove any special attachments or special cutting tools you may have used. Replace the guards if you’ve removed them and readjust settings to their normal position.
• Use a brush to clean off the equipment, and then sweep the area around the machine.

Hand Tool Safety Practices

• Wear eye protection. Always wear safety glasses, goggles, or a face shield when you work in the laboratory.
• Always use the right type of tool for the job. Use the tool designed for the work you want to do.
• Use the right size tool. Don’t try to do heavy work with a small, light tool; don’t try to do fine work with large, heavy-duty tools. Use the tool that suits the work.
• Before you use a tool, check it to be sure it’s clean and in good condition.
• Never use your hands or fingers to test whether or not a tool is sharp. If the tool is as sharp as it should be, you’ll cut yourself.
• Be sure the tool handle is fitted tightly and securely.
• Don’t use a dull, broken, or defective tool. Report defective or damaged equipment to the instructor.
• Always carry tools by the handle.
• When you carry a tool, hold it so the point or sharp edge is aimed down toward the floor.
• Avoid holding the work with one hand while you use the tool with the other hand. Fasten the work down so you’ll have both hands to use the tools.
• Plan the work so you can keep your balance. Always keep your weight on both feet, and don’t over-reach.
• Don’t lay tools down near the edge of the bench. Don’t lay tools down where they could roll off, where someone could bump into them or where someone could trip over them.
• Never aim a cutting tool toward your hands, arms, or body. Aim the tool away from you and away from others, whether you are working with it or just holding it.
• Always keep your hands and arms out of the path of a cutting tool. Keep hands and arms behind the cutting edge.
• When you are finished with a tool, return it to its assigned storage area. Don’t leave tools lying around.
• Use the tools only if you understand how to use them correctly and safely. If you’re not sure, check with the instructor.

Portable Power Tool Safety Practices

• Portable power tools produce a lot of wood chips and dust. You can prevent eye injuries by wearing eye protection. Wear safety glasses, safety goggles, or a face shield.
• You must have the instructor’s permission before you use any of the power tools.
• Use power tools only when the instructor is present in the shop.
• Don’t wear loose clothing. Keep shirts tucked in and shirtsleeves rolled up neatly.
• Remove rings, watches, bracelets, and necklaces.
• Long hair must be tied back out of the way or tucked under a cap.
• The tool has to be sharp and in good condition. Check the blade, knives, or bit to make sure that they are sharp and in good condition.
• Don’t over load or force a portable power tool. Use it only for what it was designed to do.
• Electricity should never be used around water or moisture. It can cause a severe electric shock. Be sure your hands are dry and you’re standing on a dry floor when you handle electric power tools.
• Electrical power tools must be grounded or double insulated to prevent a possible electric shock. Don’t use equipment that isn’t properly insulated or grounded.
• Check the power cord to make sure the insulation is in good condition. Don’t use the tool if the insulation is broken, cut, or damaged in any way.
• Keep the tool disconnected when it is not in use. Plug it in when you are ready to use the tool, and pull the plug as soon as you are finished.
• Check the switch before you plug in the tool. Always check the switch first to make sure it’s in the “off” position before you plug it in.
• Keep the power cord well out of the way when the tool is operating. Keep the cord out of the path of the tool.
• Always disconnect the tool before you make any changes or adjustments. Don’t make any changes or adjustments while the tool is plugged in.
• When you disconnect a power tool, pull the plug. Don’t yank on the cord.
• Fasten the work down. Avoid holding the work with one hand and operating the tool with the other hand.
• Hold the tool firmly. It may twist when you turn it on. Hold the tool so you always have control of it.
• Wait until the tool comes up to full speed before you start the cut.
• Don’t overreach. Keep yourself balanced.
• Wait until the tool has come to a complete stop before you set it down.
• Using a power tool will require all your attention. Don’t let anyone distract you. Keep your attention on what you are doing so you can work safely at all times.

SECTION III  MACHINE-SPECIFIC SAFETY RULES

TRANSPORTATION TRADES

Air Chisel
Drill Press
Grinder
Parts Washer
Portable Grinder
Service Jack
Storage Batteries
Tire Changer

Air Sanding Tools
Gas Forge
Impact Wrench
Portable Drill
Sand Blaster
Soldering Station
TIG and MIG Welder

Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received

SAFETY SUGGESTIONS FOR OPERATING AIR CHISELS

• Always wear gloves when operating an air chisel
• Operate only with instructor’s permission and after proper instructions have been received
• Always wear a protective face shield in addition to proper eye protection.
• Never point the air chisel toward a person or object who/that could be injured/damaged.
• Make sure to have a safety collar screwed on tightly to the chisel to prevent the chisel bit from accidentally shooting off of the chisel gun.
• Keep the chisel bits sharp.
• Place metal scraps in the garbage can.
• Keep fingers away from the chisel while it’s in use.

SAFETY SUGGESTIONS FOR OPERATING AIR SANDING TOOLS

• Always wear proper eye protection.
• Operate only with instructor’s permission and after proper instructions have been received
• You must wear a particle mask when sanding automotive plastics and paints.
- Sanding tools must be operated in a well-ventilated area.
- Air sanding tools should be hooked up to a vacuum system if at all possible to eliminate as much of the dust particles as possible.
- Coveralls should be worn to protect clothing.
- Never operate tools over the recommended air pressure.
- Never leave tools laying on car when not in use.
- Keep tools clean and in good repair.

SAFETY SUGGESTIONS FOR OPERATING A DRILL PRESS

- Always wear proper eye protection.
- Operate only with instructor’s permission and after proper instructions have been received.
- Always use a piece of scrap wood and set the table or stop to keep from drilling into the tabletop.
- Use a clamp or vise grips to secure/fasten your wood to the table.
- Make sure that your scrap wood, good wood, and any clamp you are using are the ONLY objects on the table. Other objects can get caught in the machine and cause injuries.
- Use a “V-block” clamp for C02 cars, round or irregular shaped stock.
- Select the right size and type of bit, wood bits for wood; metal bits for metal.
- Use a center punch for a guide whenever possible. Always use a center punch when drilling into metal or hard woods.
- Do not panic if the bit gets stuck in the wood. Turn the machine off. When it has completely stopped, remove the bit from your wood.
- Select the correct drilling speed. For metal or hard woods and large drill bits you should use a slower speed.
- Always remove the chips from the table after the machine is turned off and is no longer moving.
- Use a table brush, never your hands.
- As with any machine, if it is not working properly you should always turn it off, unplug it, and tell a teacher.

SAFETY SUGGESTIONS FOR OPERATING GAS FORGE

- As with any machine you must wear proper eye protection, and have your teacher’s permission to operate it.
- Make sure that the area is clear of any type of flammable material and make sure the area is well-ventilated.
- Keep top OPEN while lighting.
- Follow all sequential instructions for igniting gas and air; review them if you have questions about operating procedures.
- Use tongs or pliers to handle HOT metal.
- To be SAFE, treat all metal that may be around the furnace as being HOT.
- Wear leather gloves, like for welding, and long-sleeved shirts when handling HOT material.
- ALL unattended/unused HOT metal should be placed in a specific designated area.
- Make sure that you stand so that your face is protected when quenching metal.
- Shut off the “GAS” first and “AIR” last when you are finished using the forge.
- MAKE SURE that all of the valves are tightly turned OFF when the forge is not being used.
- It doesn’t matter if they are WARM or HOT; quench the tongs before putting them away.
SAFETY SUGGESTIONS FOR OPERATING GRINDER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- With this machine you must wear proper eye protection, a face shield, pass ALL tests with 100 percent, and have your teacher’s permission to operate it.
- Set the tool rest and spark deflector so that they are 1/16 inch to 1/8 inch away from the wheel.
- Hold work firmly and securely with both hands. Remember that small pieces require special set-ups.
- Never stand directly in front of the grinding wheel. Stand to the side when you start this machine.
- Grind using only the face of the wheel, never the sides.
- Press material against the wheel with just enough pressure that you cause a steady, even removal of metal. This will happen with practice; do not become discouraged on your first try.
- Again, move stock slowly and evenly across the face of the wheel, not the sides.
- Never leave the machine until the grinding wheels have come to a complete stop, even if someone will be using it right after you do.
- Grinder must be secured to prevent tipping.

SAFETY SUGGESTIONS FOR OPERATING AN IMPACT WRENCH

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Be sure the trigger is in the ‘OFF’ position before connecting the air supply.
- Use only black impact sockets designed for use with power equipment.
- Secure all work with clamps or tightly in a vise.
- Set torque control for correct tightness before starting the job.
- Be sure both hands are free to properly operate the impact tool.
- Maintain balance and firm footing at all times.
- Always use the tool in short bursts of power.
- Disconnect the airline at the tool when not in actual use.

SAFETY SUGGESTIONS FOR OPERATING A PARTS WASHER

- Use in well-ventilated area.
- Wear approved goggles or face shield.
- Use cleaning solvents with relatively high flash points (temperature at which vapors will ignite when brought into contact with an open flame).
- Do not spill or splash solvent on clothing.
- When brushing parts in solvent, use nylon or brass bristle brush to avoid sparks.
- A large tank of solvent must have a lid that is held open by a fusible link (holding device that will melt and drop the lid in the event of a fire).
- Wash hands and arms thoroughly when cleaning job is complete. Apply hand-cream or lanolin after washing.
- Avoid prolonged skin exposure to all types of solvents. USE GLOVES. If any rash or redness on skin appears—stop using solvent on skin immediately—use gloves.
SAFETY SUGGESTIONS FOR OPERATING A PORTABLE DRILL

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Select the correct drill bit just like you would for the drill press.
- Secure a piece of scrap wood and the good wood to the table so that it will not move around while drilling.
- Make sure that the switch is OFF, the chuck key is removed, and that your work area is clean and dry BEFORE you plug the drill in and turn it ON!
- Drill with straight, even, and steady pressure.
- When drilling deep holes, withdraw the drill bit several times to clear the area. This helps to provide a SAFE and even drilling process.
- As with any machine DO NOT PANIC if something “goes wrong.” Turn it OFF, unplug it, and tell a teacher.

SAFETY SUGGESTIONS FOR OPERATING A PORTABLE GRINDER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Be sure switch is in the “OFF” position before connecting the power source.
- Make all adjustments to pad and disc before turning on the power.
- Do not allow the edge of the disc to touch the edge of the stock.
- Stand clear of the spark line or spark area.
- Sand with a stroking motion; do not pause in one spot.
- When finished, disconnect the sander from power source and place the sander on its back.

SAFETY SUGGESTIONS FOR OPERATING A SAND BLASTER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Always wear Z87 safety glasses.
- Keep the access door closed when blasting.
- Be sure that the exhaust system is working and the bag is attached.
- Point the nozzle at your project only.
- Never blast a wet object.
- Remove all loose paper before blasting.
- Remove all loose materials that could clog the intake line.
- Open the door and place your project inside the cabinet.
- Close the door.
- Turn on the light and exhaust fan.
- Hold the blasting nozzle approximately 1-inch away from the project.
- Keep moving the blasting nozzle around the project. Do not hold in one place for longer than 5 seconds.
- Stop when you have blasted your project design to the desired depth.
- Remove the project from the cabinet and check the design.
- Close the door to the cabinet and turn off the light and exhaust fan.
SAFETY SUGGESTIONS FOR OPERATING A SERVICE JACK

- When using the jack, be sure it is securely placed and lift saddle properly aligned to prevent slipping.
- Once saddles are located, apply some pressure, then stop and examine these before lifting the car.
- Never raise a car while someone is under it.
- Always use car stands or supports before going under a raised car.
- Inspect the jack for oil leaks or other malfunctions before using.
- Never work under a vehicle supported only by a service jack.
- If possible, use the service jack as a “backup” to your vehicle’s jack stands. Bring the saddle just to the cross member (lifting point) and lock.

SAFETY SUGGESTIONS FOR OPERATING A SOLDERING STATION/PENCIL

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Operate only with instructor’s permission and after you have received instruction.
- Remove jewelry, eliminate loose clothing, and confine long hair.
- Make sure all guards are in place and operating correctly.
- Always wear eye protection.
- Avoid serious burns by treating all soldering equipment as though it was hot.
- Always place equipment back in holder after use. Never lay it on the bench.
- Handle all soldering equipment with caution.
- Solder over the bench top to prevent hot solder from dropping on the operator’s legs.
- Storage Batteries
  - The storage battery that you are most likely to come in contact with is the automotive storage battery. Because of its compact size and the fact that it is so common, sometimes we tend to become careless in our use of the battery.

SAFETY SUGGESTIONS FOR BATTERY STORAGE AND USE

- Batteries should be stored or charged only in well-ventilated areas. Do not breathe fumes of battery acid. Battery caps should be removed during charging.
- All sources of ignition should be remote from the battery storage area (i.e., no smoking, no lighted matches, no sparking from tools). Do not touch or “fiddle” with battery charging clamps while the charger is activated or has just finished charging.
- Do not work on batteries while on discharge or charge.
- Proper protective clothing should be worn when handling batteries (i.e., rubber gloves, face shield, apron).
- Metal jewelry such as rings, bracelets, or necklaces should not be worn around batteries.
- Deluge showers and eye baths should be provided adjacent to the battery charging area.
- Acid spills can be neutralized with a weak ammonia solution or a bicarbonate of soda solution or dilated by large quantities of water applied immediately.
- Battery chargers should be connected or disconnected only when charger is off and caps are in place.
- Disconnect battery ground (—) cables before performing any major component removal from vehicles.
Some of the more serious potential hazards from batteries are:

- Explosion due to improper connections.
- Acid spills by incorrectly handling.
- Back strain from improper lifting.

SAFETY SUGGESTIONS FOR OPERATING A TIG AND MIG WELDER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Additional protective welding clothing, including a helmet, long-sleeved jacket, and gloves, must be worn to prevent burns from ultraviolet and infrared rays emitted while arc welding.
- The helmet used for TIG and MIG welding should be equipped with a minimum number 12-density shade.
- Be certain that the welder equipped with a high-frequency stabilizing unit is installed, maintained, and used according to the recommendations of both the manufacturer and the Federal Communications Commission.
- Never touch the tungsten electrode or MIG wire while the welder is turned on. It is electrically “hot” and can cause a serious shock.
- The exhaust system must be turned on prior to welding.

SAFETY SUGGESTIONS FOR OPERATING A TIRE CHANGER

- Wear approved eye protection.
- Use correct lifting techniques.
- Deflate the tire by pushing the valve core.
- Use the proper tools in all aspects of changing tires.
- Truck tires using a split-rim assembly require the use of a safety cage.
- Be sure that the wheel assembly is securely locked on the mounting machine.
- Keep fingers away from the tire bead and wheel rim.
- On tubed tires, be sure that the stem and core are inserted properly.
- Release the tire wheel assembly from the mounting machine before the air pressure is built up.
- Eliminate clutter of parts, old tires, etc., from the tire changer area. Have plenty of room to work!

MANUFACTURING/WELDING/METALS TRADES

Arc Welder        Buffer
Crucible Furnace   Grinder
Drill Press        Horizontal Milling Machine
Metal Lathe        Oxyacetylene Welder
Portable Belt Sander Portable Drill
Portable Grinder    Sheet Metal Machines
Soldering Station   Spinning Lathe
Tig and Mig Welder  Spot Welder
Manual and Power Shears
SAFETY SUGGESTIONS FOR OPERATING AN ARC WELDER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- A welding helmet with a clean observation window must be worn.
- Keep sleeves and pants cuffs rolled down.
- Goggles must be worn for all chipping operations.
- Keep all flammable material away from working areas.
- Always wear leather gloves, apron, and shoes when welding.
- The floor area should be dry and kept clear of all obstructions.
- Closed containers should not be welded without the instructor’s permission.
- Report any overheating of the welding unit to the instructor at once.
- Screens to protect others must be in place before welding is started.
- The exhaust system must be turned on prior to welding.

SAFETY SUGGESTIONS FOR AN OPERATING BUFFER

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- The LEFT side is for BUFFING; the RIGHT side is for CLEANING!
- The buffer is to be used on plastics. Wood or metal will contaminate the wheel and cause it to scratch and ruin your project.
- If you need more buffing compound, tell your teacher.
- Buffing compound is basically a very fine sanding compound. It causes the plastic to heat up and melt, giving you a smooth finish. This means it can and will burn you if you touch it while it is on.
- Make sure that all clothing, hair, and jewelry is secured or removed. They will get caught in this machine.
- Work with a partner in case something does go wrong.
- Hold your plastic with both hands, and buff toward the lower middle. Make sure you are holding the plastic vertically or “UP/DOWN.” Never hold it horizontally “SIDeways,” because this will ruin the buffing wheels material.
- Never buff at the top or very bottom of the wheel. Those are the spots where material easily gets caught and thrown, causing injuries.
- Respect all machines, even the buffer as “nice” as it looks, can cause a serious injury!
- Remember, have patience and wait quietly behind the yellow line for your turn.
- As with any machine, if something goes wrong, turn it off, unplug it, and tell your teacher.

SAFETY SUGGESTIONS FOR OPERATING A CRUCIBLE FURNACE

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- As with any machine, you must wear proper eye protection, and have your teacher’s permission to operate it.
- You must wear all necessary protective clothing; i.e., safety glasses, coats, leather gloves, face shield, shoes, and leg protectors.
- Keep all flammable material away from the work area.
• Preheat cold metal before placing it in the crucible. Do not just throw or toss the metal into crucible since that can cause a dangerous splash; use tongs to carefully place it inside.
• Place the mold on the designated area BEFORE you begin to pour the metal.
• Move cautiously and carry molten metal close to the mold to help reduce possible dangers.
• Be very careful and make sure that you do not step on any molten metal.
• Any unused and unattended metal should be placed in an area designated for this purpose. Don’t pour molten metal over bare concrete. Moisture in concrete or molding sand will explode when exposed to moderate amounts of molten metal.
• To shut down, make sure that you turn the “GAS” off first.

SAFETY SUGGESTIONS FOR OPERATING A GRINDER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received. With this machine you must have a face shield
• Set the tool rest and spark deflector so that they are 1/16 inch to 1/8 inch away from the wheel.
• Hold work firmly and securely with both hands. Remember that small pieces require special set-ups.
• Never stand directly in front of the grinding wheel. Stand to the side when you start this machine.
• Grind using only the face of the wheel, never use the sides.
• Press material against the wheel with just enough pressure that you cause a steady, even removal of metal. This will happen with practice; do not become discouraged on your first try.
• Again, move stock slowly and evenly across the face of the wheel, not the sides.
• Never leave the machine until the grinding wheels have come to a complete stop, even if someone will be using it right after you do.
• Grinder must be secured to prevent tipping.

SAFETY SUGGESTIONS FOR OPERATING A HORIZONTAL MILLING MACHINE

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Turn the power OFF before you make any measurements or adjustments.
• Be sure cutter/tooling is tightly secured to machine spindle or arbor.
• Be sure the holding device is mounted solidly to the table and the work is held firmly.
• Never reach over or near the rotating center.
• Cutters should not be handled with bare hands, make sure that you are wearing protective gloves.
• Always use a small brush like a table broom to remove chips and never clear chips away while the machine is in operation. Don’t remove chips with hand as they are sharp and will cut.
• Do not leave the machine while it is working. Remain with the machine for the duration of the cut.
• Keep the floor around the machine clear of chips, and wipe up spilled cutting fluid immediately.
• Make sure that you store all oily rags used to wipe down the machine in an approved metal container that can be closed tightly.
SAFETY SUGGESTIONS FOR OPERATING A METAL LATHE

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• When operating this machine you must wear a face shield
• Never leave chuck key or wrench in the lathe chuck since they can be thrown easily, causing an accident.
• Be sure that all parts of the carriage will clear any rotating part during the full length of the turning that you will be doing.
• Place hands on the controls or at your sides, except when filing or polishing.
• Make sure the work is secure and the lathe is set at the correct speed and feed rate before you start.
• Handle chucks and face plates very carefully.
• Bring lathe to a complete stop before reversing.
• Remove tool holder and post before you begin to file or polish.
• Remove chips with a table broom brush, never by hand.
• Do not stop a lathe chuck with anything. Allow it to slowly coast to a stop. Remember to keep hands and any other body parts away from all moving parts.
• No loose clothing!

SAFETY SUGGESTIONS FOR OPERATING AN OXYACETYLENE WELDER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Be sure cylinders are fastened with a chain as a protection against falling or rolling.
• Always close the cylinder valve and replace protective cover before moving the cylinder.
• Keep welding equipment free of oil and grease.
• Protective goggles and spark-resistant clothing must be worn when welding.
• Make sure that hoses are properly connected and all connections are tight.
• Keep all flammable material away from working area.
• Do not weld or cut on a closed container without instructor’s approval.
• The acetylene must never exceed 15-psi outlet pressure.
• Only use a friction torch lighter to ignite the torch.
• Close the acetylene valve first if the torch backfires.
• Close cylinder valves when completing a welding job. Release or drain hoses.
• The exhaust system must be turned on prior to igniting the torch.

SAFETY SUGGESTIONS FOR OPERATING A PORTABLE BELT SANDER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Check to see if the belt is worn or torn, tracking properly, and is the correct grit size for the job.
• Before connecting to a power source, make sure the switch is “OFF.”
• Start sander above the work, let rear of belt touch first then level the tool.
• Keep the sanders moving back and forth in the direction of the grain. Do not pause in one spot.
• Lift the sander off the stock when stopping.
• Always allow the sander to come to a complete stop before placing the sander on the table.
• Keep electrical cord and dust bag away from working area.
• When changing belts make sure the new belt runs as the arrow indicates.

SAFETY SUGGESTIONS FOR OPERATING SHEET METAL MACHINES

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Keep hands and fingers clear of clamps, jaws, and rotating parts.
• Never bend, roll, crimp, or bead metal that exceeds the capacity of the machine.
• Make all rolls and bends smoothly and steadily.
• Work with only one piece of metal at a time.
• Remove burrs from the metal before attempting to work it in the machine.
• Obtain help when working with large pieces of stock.
• Never force levers or handles.

SAFETY SUGGESTIONS FOR OPERATING A SPINNING LATHE

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Beware of sharp-pointed metal edges when cutting metal discs to size and when getting them ready for spinning.
• Make sure that the tool rest base, tool rest, and fulcrum pin are securely tightened in place before attempting to spin.
• Never stand in line with the disc during a centering operation.
• Make certain the spinning tools are fitted solidly to the handle.
• Do not touch a spinning disc by hand.
• Use the correct tool for the operation and slowly force material to match the forming chuck.
• Remove tool rest and pin when using steel wool or polishing.
• Seek instructor’s help, if in doubt about a specific operation.

SAFETY SUGGESTIONS FOR OPERATING TIG AND MIG WELDERS

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Additional protective welding clothing, including a helmet, long-sleeved jacket, and gloves must be worn to prevent burns from ultraviolet and infrared rays emitted while arc welding.
• The helmet used for TIG and MIG welding should be equipped with a minimum number 12-density shade.
• Be certain that the welder equipped with a high-frequency stabilizing unit is installed, maintained, and used according to the recommendations of both the manufacturer and the Federal Communications Commission.
• Never touch the tungsten electrode or MIG wire while the welder is turned on. It is electrically “hot” and can cause a serious shock.
• The exhaust system must be turned on prior to welding.
SAFETY SUGGESTIONS FOR OPERATING A SPOT WELDER

- Always wear a protective face shield in addition to proper eye protection.
- Do not weld with wet hands or in a damp area.
- Do not touch the tips, tongs, or welded material after welding as they become very hot.
- Never leave the spot welder unattended with the electrical cord plugged in.
- The metal being spot-welded must be clean and dry.
- When spot welding galvanized material, remove the galvanize from the area being welded.

SAFETY SUGGESTIONS FOR OPERATING MANUAL AND POWER SHEARS

- Never go beyond the capacity of the shear.
- Always be certain that the metal is under the hold-down bar or lugs before cutting.
- Keep fingers clear of the hold-down bar or lugs.
- Always keep fingers clear of the blade and never override the safety barriers that guard the blade.
- Before operating the treadle, be sure that the feet of the operator and of any observers are clear.
- Use gloves when handling sheet metal.
- Whenever two people are needed to operate the shear, one shall be the operator, the other the helper.
- If unable to view both sides of the shear, give a “clear” signal before bringing the blade down.

CONSTRUCTION/WOODS TRADES

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SAFETY SUGGESTIONS FOR OPERATING A BAND SAW

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Adjust the blade guard to where it is ¼ inch above the highest part of the wood.
- Use a push stick whenever possible and always when cutting small objects.
- ONLY one person can use the machine at a time. Everyone should form a line and wait patiently and quietly behind the yellow line.
- Never force your wood into the blade. Let the machine do the work.
- If it is not working properly, turn it off and tell your teacher immediately.
- Cut sharp curves on the scroll saw.
- Avoid backing out of a cut. If there is no way to avoid it, then you need to turn the machine off, wait until the blade has completely stopped, and then carefully back out.
- Your fingers should be on either side of the blade, but never in front of the blade.
• Blades do occasionally break. If the blade breaks while you are operating it simply turn it off and send your partner to get the teacher. Never leave the machine or try to open the casing and fix it yourself.
• Make sure that the dust collector is on and that the vent is open.
• Round stock must be cut using the V-block to secure it. Also, never reach around the blade to remove your work.
• Always use scrap wood to push or move scrap wood away from the blade.
• Never leave the machine until it has come to a complete stop, and then clean the table off by using a table broom, never your hands.

SAFETY SUGGESTIONS FOR OPERATING A BELT FINISHING SANDER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Make sure there is adequate, strong tension on the belt and that it is not torn.
• Make all adjustments, except final belt tracking, with the power off.
• When changing belts, make sure the new belt runs as arrows indicate.
• Adjust table to within 1/16 inch of the abrasive belt.
• Sand on the down stroke of the belt sander.
• Machine-sand only objects large enough to hold safely to the belt.
• Move stock evenly and steadily over the abrasive surface of the sander.
• Keep hands clear of the abrasive belt while operating and keep material flat on the table.

SAFETY SUGGESTIONS FOR OPERATING A PORTABLE CIRCULAR SAW

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• All stock must be well supported and securely clamped down.
• Adjust the depth of cut to the thickness of the stock (material) plus 1/8 inch.
• Make sure the power cord is clear of the blade and that your work area is clean before you start cutting.
• Check the base and angle adjustments to be sure they are tight.
• Always place the base of the saw on the stock you will be cutting. Make sure that the blade is not actually touching the stock before you turn it on.
• Advance the saw blade slowly and evenly making sure that it cuts straight through the work.
• Never put the saw down until the blade has come to a complete stop!
• Always unplug the machine to change the blades or to make any kind of adjustments.

SAFETY SUGGESTIONS FOR OPERATING A DISC SANDER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Check the abrasive disc for tears or loose areas. If it has any, report them immediately.
• The table should be 1/16 inch away from the disc.
• Always sand on the down-stroke side of the disc. Sanding on the up side will cause your wood to get caught and thrown, potentially causing serious damage to yourself, lab partners, or school property.
• The disc sander is just as dangerous as any saw. Keep all parts of your body away from the disc as it rotates—especially your fingers. It can cut or tear part of your finger off.
• Sand objects that you can SAFELY hold to the table.
• Remember always to hold your wood flat against the table. If you need wood sanded at an angle adjust the table accordingly.
• Move your wood at an even and steady pace/pressure across the surface of the rotating disc.
• Use just enough pressure to do the job. Too much pressure can ruin the disc, machine, and cause injury to someone.
• Always make sure that the dust collector is turned ON and that the vent is OPEN.
• Never leave the machine until it has come to a complete stop! You can help it stop by sanding down a piece of scrap wood. Never jam a piece of scrap wood into the machine.
• As with every machine, if it is not working properly turn it off and tell the teacher.
• Remember to have patience and wait quietly for your turn behind the yellow line.

SAFETY SUGGESTIONS FOR OPERATING A JIG/BAYONET SAW

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Select the correct blade for the stock (material) and clamp the blade down tightly in the chuck.
• Always disconnect the saw to change blades or make adjustments of any kind.
• Use vise or clamps to securely hold the stock (material) that you will be cutting. A C-clamp, wood clamp, or quick grips are the easiest ones to use.
• Keep a constant and even cutting pressure. Do not force the blade into the work. Just like with any saw, if it’s not cutting, there is a reason!
• Do not attempt to cut curves that are so tight that the blade can be twisted and then broken.
• Never sit this saw or any power tool down on the workbench until it has completely stopped. If you are not going to use it again immediately, you should also unplug it so that it does not get accidentally turned on before you need it again.

SAFETY SUGGESTIONS FOR OPERATING A JOINTER

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Always keep the knives of the jointer sharp. Dull knives tend to cause kickbacks and will result in poor planning. Report dull knives to the teacher immediately.
• The fence should be tight. Never adjust the fence while the jointer is running.
• Adjust the depth of cut before you turn the jointer on. The maximum safe plane thickness is 1/16 inch.
• Be sure that the guard is in place and operating with ease. If the regular guard is removed, a special guard must be provided.
• Always allow the machine to come to full speed before using it.
• Check all stock for knots, splits, metal particles, and other imperfections. Remove them before you plane the stock.
• Do not use the jointer on plywood or PARTICLEBOARD.
• Stand to the side of the jointer, never directly behind it. You want to be out of the way in case of a kick back.
• Cut with the grain. Also, never joint the end of a board!
• Always use a push stick or push block when the wood is below the height of the fence or when surfacing the wood.
• Do not try to make too heavy of a cut. The maximum safe plane thickness is 1/16 inch.
• Use COMMON SENSE when stock is too thin or thick to joint safely.
• Never apply pressure to the board with your hand directly over the cutter head area.

SAFETY SUGGESTIONS FOR OPERATING A MOTORIZED MITER BOX

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Disconnect power before making angle adjustments or changing blades.
• Always hold the work firmly against the fence and table.
• Allow the motor to reach full speed before starting a cut.
• Keep fingers outside of blade guards.
• Remove scrap stock from table when making multiple cuts. Use scrap to do this and not your fingers.
• Use the brake to stop the blade.
• Operate only with instructor’s permission and after you have received instruction.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• Always use proper eye protection.
• Be sure power is disconnected before making angle adjustments or changing blades.
• Always hold the work firmly against the fence and table.
• Install a new table if adequate support has been cut away.
• Allow the motor to reach full speed before staring to cut.
• Use the brake to stop the blade before removing scrap or chips from the work area.
• Be sure guard parts are functioning properly.

SAFETY SUGGESTIONS FOR OPERATING A PLANER–SURFACER

• Operate only with instructor’s permission and after you have received instruction.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• Always use proper eye protection.
• A “backer board” should be used when planning thin stock.
• Do not force material through planer.
• Do not remove chip accumulation while machine is running.
• Do not stand directly behind the machine or in the line of kick back.
• Do not look into the throat of the Surfacer when it is running.
• Be sure to select the proper speed and depth of cut.

SAFETY SUGGESTIONS FOR OPERATING A PORTABLE ROUTER NOTES

• You should never carry any portable tool by its power cord.
• Always check your wood for any defect that could cause the stock to tear out and then throw that wood, potentially causing injury.
• Always use a fence to guide your wood and cut with the grain.
• Only when your work area is prepared should you plug it in and begin cuffing.
• Always use a face shield to protect your face.
• Always check to make sure that you are using the correct bit. Check the chart.

SAFETY SUGGESTIONS FOR OPERATING A RADIAL ARM SAW

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Make all adjustments with the power off and the cutter head behind the fence.
• Make sure that the cutter is off, place the wood against the fence, and slowly “walk” the blade forward to check your cut mark.
• Before you make any cut, wait until the exhaust system is turned on and the cutter head is turning at full speed.
• If cutting long pieces of wood, get your partner to help support the length to your left.
• Never attempt to cut wood that is wider than 1’-0” Get teacher assistance for stock that is wider.
• Place the wood against the fence; use your left hand to hold it flush and flat against the table. Stand to the left of the blade and use your right hand to guide the blade across the wood.
• Always make sure that the blade guard and kick-back fingers are properly adjusted before you attempt to rip the wood.
• Feed the blade into the wood only as fast as it can smoothly cut without binding or “sticking.”
• Always pull the blade through the wood and return it back behind the fence before making your next cut.
• Always make sure that the machine is turned off and that the blade has stopped before you leave the machine.
• As with any machine, if you think that it is not working properly, turn it off, unplug it, and get the teacher(s) to inspect it.
• Always use common sense when operating this and any machine. Remove your jewelry, tuck your shirt in, wear Z87 safety glasses, work with a partner, and always keep your fingers and body away from the path of the blade.
• Never, ever, place any part of your body directly in front of or behind the blade.

SAFETY SUGGESTIONS FOR OPERATING A SCROLL SAW

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Make all adjustments with the power OFF.
• Make sure that you are lightly holding the wood flat against the table to keep the wood from bouncing around and possibly being thrown out.
• Check to make sure that the teeth of the blade is pointing down and that the guide assembly is flush with the wood.
• Use both hands to guide the wood through the cut. However, hands should remain to the side of the blade, never in direct line with the blade.
• The scroll saw can hurt you as badly as the band saw. The smaller blade will not save your hand or fingers.
• Never use your hand to clear the table. Always use a table broom or the chip blower.
• Scroll saw blades break very easily, so take your time to make the right cuts. Remember, never force the wood and use the correct speed.
• “Hard” woods and tight curves should be cut using the slower speed.
• If the blade breaks, turn the machine off, unplug it, and tell the teacher immediately. Never try to fix it yourself.
• You have to wait patiently and quietly for your turn on this machine, behind the yellow line, just like with any machine.
• If for any reason you are not sure of the way to cut out an object, get your teacher’s assistance. You may have to wait a little while, but you will be helped as soon as possible. Remember, have patience!
• The machine must be turned off and at a complete standstill before you can leave it.

SAFETY SUGGESTIONS FOR OPERATING A TABLE SAW

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• Make sure you are dressed correctly for the job. Remove ties, scarves, jewelry, gloves, and keep long hair tied back.
• Always wear safety goggles when operating a table saw.
• Keep guards in place at all times while using a table saw.
• Stand to the side of the saw during operation. Do not stand in line with the blade.
• Do not raise the blade more than ¼” inch above the wood’s surface.
• When you are cutting long stock, a helper should support the weight of the wood while the operator does the pushing.
• Have your instructor inspect all special set-ups and dado heads.
• Adjustments on the machine should be made with power off and the blade stopped.
• Use a push stick when ripping narrow pieces of stock.
• Turn on the exhaust system before beginning work.

SAFETY SUGGESTIONS FOR OPERATING A WOOD LATHE

• Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
• When operating this machine you must wear a face shield.
• Carefully examine all wood for checks, knots, or other defects before putting it on the lathe.
• Work must be balanced and securely held between centers or mounted on a faceplate.
• Rotate spindle by hand to check to make sure that you have enough clearance before starting the turning.
• Tool rest must be set 1/8” away from the work piece and adjusted to the proper height for the tool being used.
• Be sure the lathe is running at the proper speed for the operation.
• You should use caution and common sense to prevent turning tools from catching in the stock.
• Select and use the correct tool for the cut you plan to make.
• Even when wearing a face shield, you should also make sure that the safety shield is properly in place.
• Remove tool rest and base before sanding or polishing.
• Use a table broom brush to clean off lathe when finished.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• The tool rest must be close to the work when cutting tools are being used.
• The cutting tools must be kept sharp.
• Do not feel for smoothness of work while machine is running.
• Work must be centered, balanced, and secured.
• The tool rest must be removed while sanding.
• Examine set up and turn work by hand before turning on power.
• Shut off power while cleaning machine.

SAFETY SUGGESTIONS FOR OPERATING A PLANER

• Operate only with instructor’s permission and after you have received instruction.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• Always use proper eye protection.
• Be sure switch is in off position before adjusting depth of cut, table tilt, or checking cutters.
• The guard must be clean and slide freely before beginning the operation. Do not clamp in the up position.
• Always use push stick or a push block when planning small material.
• Continue moving the work piece past the cutter head until it is resting against the rear fence.
• Do not brush chips or dust away from the point of operation until the machine has come to a full stop.

SAFETY SUGGESTIONS FOR OPERATING A PORTABLE ELECTRIC PLANER

• Operate only with instructor’s permission and after you have received instruction.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• Always use proper eye protection.
• Before connecting to the power source, make sure the switch is in the off position.
• Make all adjustments with the plane disconnected from the power source.
• Place front shoe on the work piece, start motor, and then move plane over work, keeping pressure and speed constant.
• Keep fence and the rear shoe tightly against the work piece until the cutter has cleared the work.
• Keep hands on handle and motor housing away from the cutter head.
• Be sure of clearance for the motor.

SAFETY SUGGESTIONS FOR OPERATING A WOOD SHAPER

• Operate only with instructor’s permission and after you have received instruction.
• Remove jewelry, eliminate loose clothing, and confine long hair.
• Make sure all guards are in place and operating correctly.
• Always use proper eye protection.
• All adjustments for cutter height and fence position should be made with the power off.
• Guards and hold-downs should be checked for proper operation.
• Choose the correct cutter and collars for the operation.
• Expose only the amount of cutter necessary to do the job. Use additional fixtures if necessary.
• Always use a starting pin for freehand shaping.
• Use the smallest table insert possible.
• Use three-wing one-piece cutters whenever possible.
• Brush away dust and chips only when the machine has stopped.

**GRAPHIC ARTS/COMMUNICATION TRADES**

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**SAFETY SUGGESTIONS FOR OPERATING A HOT GLUE GUN**

You may use a hot glue gun on some activities or projects. A HOT glue gun provides melted glue that dries quickly and provides a very strong bond. Because the HOT glue can cause burns, you must follow these SAFETY rules when using the gun.

• Never touch the melted glue or the nozzle of the glue gun.
• Do not put anything except glue sticks into the glue gun.
• Use the correct size glue sticks in the glue gun. Do not try to trim a glue stick that is too big.
• Wait until the glue has melted completely before using it on your project. Test the glue by squirting a small amount on a piece of scrap material. It should be runny and soft.
• Be careful when holding glued pieces together. Melted glue can soak through thin or porous material and cause burns.

**SAFETY SUGGESTIONS FOR OPERATING PHOTOGRAPHY EQUIPMENT**

• Obtain the teacher’s permission before leaving class on a photography assignment.
• Secure permission of models and owners of private property before taking photographs.
• When taking a picture from a car, pull to the edge of the road, stop the car, and put on the brake before beginning to photograph.
• Never place oneself or one’s model in danger when taking a photograph.
• Treat the camera with care. Do not drop it or place it where it may get banged against solid objects.
• Do not leave cameras and film in closed cars. The summer sun may superheat them.
• Before mounting a camera on a tripod, be sure the tripod legs are secure.
• Never ask a model to look directly into the sun or other bright light.
• Do not set up foolhardy or dangerous pictures. The photographer is in charge of a photography session and should keep things under control.
• Be sure to take the necessary training in diving techniques before attempting any underwater photography.
**FLASH UNITS**

- Electrical contacts in the camera and the flash unit are to be kept clean. Use a rough cloth or a pencil eraser to clean them before using each new roll of film.
- Be sure the photoflash batteries are fresh. Alkaline batteries are recommended for their long life and short recovery time. However, units that have unplated brass or copper electrical contacts should use zinc carbon batteries.
- Use a lamp ejector to eject the spent bulbs. Do not pull the bulbs out by hand. They may break in the hand or foul the fittings.
- Handle the flashbulbs carefully. Slight cracks may cause the bulb to shatter when fired.
- Insert the first bulb in a series with the cord or the flash unit disconnected from the camera. If the flashbulb is inserted into a live socket, it may go off in the hand, causing cuts and/or burns if the glass shatters.
- Always have the flash unit aimed away from oneself and others when connecting it. Several conditions may cause the unit to fire into the eyes as it is connected.
- Always use a flashguard over the flash unit. Occasionally, flashbulbs shatter. A flashguard will protect both the photographer and subjects.
- Never allow the flash unit to go off in an explosive atmosphere. Also, do not use flash equipment where there are volatile fumes, such as gasoline, etc.
- Do not handle the flashbulbs immediately after firing. They are extremely hot and can burn. Use the ejector to eject the spent bulbs into a waste container (when they are cool).
- Never drop freshly fired bulbs into a recommended voltage. Do not fire the flashbulbs with household current unless they are designed for such use.
- Fire the flashbulbs only at the recommended voltage. Do not fire the flashbulbs with household current unless they are designed for such use.
- Do not carry loose bulbs in a pocket or bag. Friction may break or ignite them.

**MOVIE PROJECTORS**

- Be careful when using projector light bulbs. They become very hot and can cause burns.
- Be careful not to catch the fingers in the moving gears of the projector.
- Disconnect the power cord before opening the case to change a burned out light bulb.
- When changing a bulb, one should be very careful not to crack the bulb and thus cut oneself.
- Do not put your fingers near moving take-up reels of film, as severe cuts may result.
- Do not let the projector light shine directly into the eyes of the audience.
- When using a projector, do not lower the room light so much that the audience could not see to leave in an emergency.
- Be careful the audience does not trip over extension cords running to the projector.
- Be sure the projector is set on a solid surface where it will not fall.
- When the projector session is finished, disconnect power cords and extension cords as soon as possible in order to prevent tripping. Then roll them up neatly and put them away.

**STROBE LIGHTS**

- Know how to operate strobe equipment before using it.
- Be extremely careful not to touch any hot parts.
- Do not operate strobe lights with a frayed or damaged cord. If an extension cord is necessary, be sure it has suitable amperage rating.
Always unplug strobe equipment from the electrical outlet when it’s not in use.

Let the equipment cool completely before storing it away.

**STUDIO LIGHTING EQUIPMENT**

- Do not handle any power cords or switches with damp hands or while standing on a damp floor.
- Be sure that all electrical cords and connectors are in good condition before connecting them to the source of power. Tell the teacher immediately if frayed cords are found.
- Exercise extreme caution with light hazards. The total of all photo lamps connected to a single household circuit should not exceed 1500 watts. Consult an Electrician or electrical supply store before setting up a home studio.
- When raising or lowering the lighting units, use extreme caution in securing the locking devices in order to avoid serious injury.
- When working with the boom lighting units, use extreme caution to prevent injury from the heavy counter balance units and the possibility of a unit falling on another person.
- Use caution when handling or moving spotlights. The housings become extremely hot after a few minutes of operation. Also, the bulb life is greatly decreased when the spotlights are moved while they’re still hot.
- Do not place any floodlight reflector or spotlight head directly on the floor of the studio.
- Take care not to place flammable screen materials too close to or in direct contact with hot lighting equipment.
- Do not touch any hot lamp with the bare hands or splash any liquid on a hot lamp.
- After using lighting units, lower all the heads to the lowest possible position, coil the electrical cords, and secure them to the light stand.
- Be sure all props are firmly secured so they will not fall on models.
- Tape down any temporary power cords running across the floor so no one will trip over them.
- Place all studio lighting in such a way that the models do not look directly into the bright lights.
- To protect the model, never adjust the boom light with the model in place. Always be sure the wing nuts and locks are tightened securely.
- To adjust boom lights, two students are necessary; one to hold the balance the light, and one to tighten the wing nuts securely.
- To prevent tripping, return all extension cords and electrical equipment to the proper storage place after each use.

**SAFETY SUGGESTIONS FOR OPERATING PHOTO FINISHING EQUIPMENT**

- Operate only with the teacher’s permission and after instructions have been received.
- Use the paper cutter with great care as it can cause serious cuts and pinches.
- When operating the paper cutter, keep the fingers behind the safety guard and never remove the guard.
- To prevent cut fingers, use the safelight when cutting orthochromatic film in the darkroom. For cutting panchromatic film in total darkness, the cutting edge should be coated with fluorescent or luminescent paint.
- Place a ruler, not the fingers, next to the blade to hold the paper flat.
- When using a paper cutter, cut only one sheet of paper or film at a time. Do not use the paper cutter to cut anything except paper or film.
- When finished, always close the cutting blade and fasten it with the safety lock.
**CUTTING TOOLS**

- Use all cutting tools (scissors, X-acto knives, matte knife, etc.) very carefully.
- Keep all cutting tools sharp since dull blades can be dangerous.
- Carry and store all cutting tools in a safe manner.
- To prevent serious cuts, never try to catch a dropped cutting tool.

**PRINT DRYER**

- Operate only with the teacher’s permission and after instructions have been received.
- Be careful to avoid burns when using the print dryer. Its surfaces are hot.
- Be sure the electrical cord to this machine is not worn and is properly grounded.
- Do not use this machine with wet hands or while standing on a wet floor.

**DRY MOUNT PRESS**

- Operate only with the teacher’s permission and after instructions have been received.
- When using the dry mount press or tacking iron, students should be careful not to burn themselves.
- Never test the heat of the press or tacking iron by touching.
- Do not let your hands come into contact with the platen of the dry mount press. Also, do not close the press on your hands.
- Dry mount with the heat setting prescribed by the teacher.
- Do not lay the hot tracking iron down on papers or the counter top. Return it to its proper holder after each use.
- When closing the platen of the dry mount press, be sure that the print and the mount are the only items under the platen.
- Turn off and unplug the press or tacking iron when the job is finished.

**SPRAY ADHESIVES AND FILM CLEANERS**

- Get instructions on how to use these materials properly and safely before proceeding.
- Use spray adhesives and film cleaners in a well-ventilated place. They are flammable.
- Avoid breathing the fumes. There is evidence that these fumes can seriously damage one’s health.
- Do not use these materials in areas where others will have to breathe the fumes.
- Treat these substances just like any other flammable material would be treated.

**CULINARY ARTS**

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SAFETY SUGGESTIONS FOR OPERATING BLENDER

- Make sure all legs are in place.
- Do not fill blender container more than 2/3 full.
- Make sure blender container is attached to motor securely.
- Clamp lid on tightly
- Start machine on low speed.
- Do not put any hand tools in container while machine is on.
- Make sure motor has stopped before removing container.

SAFETY SUGGESTIONS FOR OPERATING BROILER

- Assemble tools necessary to use the broiler (e.g., tongs, wire brush).
- Before turning on gas broiler, check to ensure that pilot lights are lit.
- Have dry towels available.
- Broiler bars must be wire brushed frequently while being used.
- Broiler must be cleaned regularly to avoid fat build up.
- Tray at bottom of broiler should be lined with aluminum foil and changed frequently (daily)
- Ventilating hoods above broiler should be cleaned daily to avoid grease buildup.

SAFETY SUGGESTIONS FOR OPERATING BUFFALO CHOPPER

- Make sure the switch is in the off position while assembling the cutter.
- Keep hands from under cover or in the bowl when it is operating.
- Do not lift the lid until knives have stopped revolving.
- Note that the leader knife is beveled on one side only. This knife is to be on the shaft first nearest the motor.
- Always turn off machine before switching speeds.
- Periodic lubrication of the bowl drive gear is needed. A yearly check should be done
- Make sure hand knob for knives is tightened before starting machine.
- Use care not to overload the machine and to add food in such a way that the cuts are fairly uniform in size.
- When using the attachments on the food cutter, it is a good practice to remove the knife unit.
- When operating the dicer, slicer or any attachment, make sure the correct knife-cutting frame and pusher plate are assembled according to instructions.

SAFETY SUGGESTIONS FOR OPERATING CONVECTION OVEN

- Preheat oven at least 15 minutes before use.
- Circulating fan must be in operation at all times. Failure to practice this rule will cause the motor to overheat.
- As with all ovens, always have dry towels or oven mitts available to remove food products.
- When loading a convection oven, open the door and load quickly to avoid heat loss.
• If using the timer located on the oven, remember that it does not control the oven temperature.
• With a convection oven, always keep in mind that the required cooking time is shorter than that of a regular oven. Keep a chart on proper cooking temperatures for your particular oven.
• Convection ovens must be kept clean. To operate efficiently, check your owner’s manual on the proper procedure to clean the interior of the oven.
• Oven doors must close tightly for proper oven function.
• Use oven lighting only to check food product. Do not run continuously.

SAFETY SUGGESTIONS FOR OPERATING A CONVENTIONAL OVEN

• For gas oven—make sure pilot is lit.
• When examining contents, pull pans out with shelf rack they are on.
• Remember inside of door will be hot.
• Do not use oven door as a shelf.
• Do not use excessive amount of water when cleaning inside of ovens.
• Always use hot pads or a dry towel when removing contents from oven.

SAFETY SUGGESTIONS FOR OPERATING A DEEP FAT FRYER

• Fill the fryer with fat to a level at least 2 inches above the heating elements and turn on heat. It is important to have the fat extend above heat elements when heat is on.
• Do not heat higher or longer than necessary. At no time should the fat be heated over 400 degrees.
• Keep the fryer free of sediment and salt.
• Fryers should be placed where there is sufficient ventilation to prevent fire.
• Do not overload fryer with food to prevent splattering.
• Check the outlet to be sure that it is closed. Melted fats on floor are highly hazardous to all kitchen workers.
• Submerge basket into hot fat cautiously in the event that moisture of food causes hot fat to bubble up.
• Wash fryer with detergent and hot water, rinse with vinegar solution, then again with water.
• Dry fryer and elements before using again
• When fryer is on standby, the thermostat should be lowered to 200 degrees.

SAFETY SUGGESTIONS FOR OPERATING A FOOD PROCESSOR

• To protect against risk of electric shock, do not put base or motor in water or other liquid.
• Unplug cord from outlet when not in use, before putting on or taking off parts, and before cleaning.
• Do not operate with a damaged cord or plug.
• Always use attachments that are made for your processor.
• Never feed food into chute by hand when slicing or shredding; always use a food pusher.
• Because blades and discs are sharp, handle carefully.
• Blades or disc should come to a full stop before removing cover.
• Never attempt to defeat the locking system of the processor. It is there for a safety reason.
• Never use more products than the bowl will accommodate.
• Do not use near hot surfaces. The cord may melt and cause injury to operator.
SAFETY SUGGESTIONS FOR OPERATING A GAS CHEESE MELTER

- Make sure pilot is lit before turning machine on.
- Check heating element for proper ignition while turning on.
- Keep top and sides free of any excess grease.
- All outer surfaces will be hot during operation.
- Clean inside of melter frequently to prevent grease fires.
- Use hot pads or towels when removing items from the melter.
- Do not let top of food touch heating element.
- Do not do “broiling” in the cheese melter.

SAFETY SUGGESTIONS FOR OPERATING GAS RANGE

- Wear an apron to keep clothes tight to your body, and keep sleeves rolled or tight.
- Dry towels, oven mitts, and/or hot pads are a necessity.
- Be careful not to allow towels, etc., to be ignited.
- Check pilot light before turning on stove or oven.
- Be sure gas knobs are turned off before relighting pilot light.
- Be sure burners are off when not in use.
- Pan handles should be kept inward.
- Remove covers away from you to prevent steam burns.
- Keep soda or salt on hand in case of grease fires.
- Be sure floors are kept clean and grease free.
- Never use water for a grease fire.

SAFETY SUGGESTIONS FOR OPERATING A GRIDDLE

- Always assume that the griddle is hot.
- Pan handles and tools should always lie inward.
- Make sure exhaust fans are on during cooking and cleaning time.
- Salt and soda should always be on hand in case of fire.
- Keep check on your temperature setting.
- Be sure all catch pans are clean
- Floors should be kept clean and grease free.
- Clothing should not be loose, making it possible to drag in hot grease.
- Wiring should be checked and kept in good condition.
- When putting ice or water on griddle for cleaning, watch out for steam burns.
- Be careful in case the grill brick rolls.
- Be careful not to splash oil.

SAFETY SUGGESTIONS FOR OPERATING A LARGE FOOD MIXER

- Check the mixer bowl for cleanness.
- When placing the mixer bowl on the mixer support arm, make sure all three securing points are correctly inserted. There are three points. Two points are at the side and one is located on the back of the mixer bowl.
- Insert the proper mixing attachment onto the mixer shaft. Caution: Use care when whipping food products that are hard. The whip tines can be bent or broken.
Check the mixer speed before turning the machine on. Never change speeds while the mixer is operating. Raise the mixer bowl before starting the mixer. Operate the mixer at a safe and proper speed.

Never place your hand or cooking utensil into the mixer bowl while the mixer is operating. Wait until the machine is completely stopped.

Lower the mixer bowl to remove mixer attachment.

Do not attempt to lift a heavy mixer bowl. Ask for assistance or use the proper mixer bowl dolly.

SAFETY SUGGESTIONS FOR OPERATING A MEAT GRINDER

It is good practice to keep all the grinder parts in one drawer or shelf. This keeps parts from being misplaced.

When assembling the grinder, insert the grinder body into the hole at the top of any food mixer. You may have to remove the access plate to expose the hole. Tighten the thumbscrew securely.

Insert the worm gear into the grinder body. Make sure the fiber washer is on the end with the large square shaft end. Rotate the worm until it slides all the way into the drive hole.

Place the cutter blade with the edges facing out.

Select the desired grinding plate and push up against the cutting blade. Rotate the plate until the notch fits into the small peg at the bottom of the grinder body.

Thread the hand nut onto the threads of the grinder body; snug the hand nut to the grinder plate, and give a ¼ (quarter) turn to properly secure the parts together.

Place feed tray on top of feed tube on grinder body.

Set mixer speed to desired setting (usually #3).

Place product to be ground into feed tray. Turn on machine. Caution: Always use stomper to push product down feed tube.

Cut pieces to be ground small enough to easily fit down feed tube.

Place a cart or stand below grinder plate and place bowl close to grinder end.

Food wrap should be draped over the end of the grinder. This will keep product from falling straight down into the bowl.

SAFETY SUGGESTIONS FOR OPERATING POWER A MEAT SAW

Make sure saw is on level surface.

Check saw for proper set-up before turning on.

Turn saw on briefly and listen for proper set-up before adding meat.

Use all safety guards in operating.

Use truck to push meat through saw, not “free hand.”

Keep mind on task while working on machine.

Shut saw off and disconnect power before cleaning.

Turn saw off if blade “binds” while cutting. Do not wiggle or force product through blade.

Do not open blade covers while power is connected.

Be careful not to get water in motor during cleaning.
SAFETY SUGGESTIONS FOR OPERATING A SLICER

- Make sure slicer is put together properly and tightly.
- Adjust blade for desired thickness.
- Position food to be sliced.
- Secure food with end weight.
- Slice using end weight and handle only for motion.
- Do not force food.
- People coming up behind slicer operator should use caution not to be distracting.
- Think “caution”—be careful of quick movements.
- Turn slicer off for loading and unloading of food.
- Always be sure blade has stopped before going any further.
- Close blade all the way when not in use.
- Be sure all wiring is in good condition.
- Keep floor area clean.

CLEANING A SLICER

- Turn off—never attempt to clean until blade has completely stopped.
- Close blade all the way.
- Pull plug from socket.
- Wash blade from side.
- Be careful not to hit blade when removing food tray.

SHARPENING A SLICER BLADE

- The blade should always be kept sharp.
- Do not use hand sharpener. Use the one on the machine, which is designed for it.
- Be careful to clean blade from the side after sharpening.
- The chef or supervisor should be consulted for supervision when sharpening machine.

SAFETY SUGGESTIONS FOR OPERATING STEAMERS

- Hand protection—hot gloves should be worn at all times.
- Make sure pan supports are securely in position or door may not close sufficiently to produce proper steaming of product.
- Close door and engage latch and lock the door handle in upright position before starting cooking cycle.
- Do not force door at end of cooking cycle; wait until pressure reaches zero.
- During stand-by periods, allow power to remain on with door ajar.
- Wash and brush inside of cooker daily and do not allow food particles to fall into drain.
- It is recommended at least once a week that the safety valve be operated manually while the steamer is pressurized. Use a long-handled kitchen tool to protect hands from steam blow down.
- Automatic thermostat holds the cooking temperature in chamber at approximately 360°F. Should the circuits malfunction, a safety thermostat opens at a temperature between 450 to 470°F.
• Door gaskets should be kept clean and free of food to prevent steam escaping, which may cause burns.

**STEAM KETTLE**

• Always assume that the steam kettle is not.
• Lift lid away from you to avoid steam burns.
• Use proper equipment—long tongs, spoons, ladles, or paddles.
• Do not leave utensils in tank.
• When emptying, watch out for splashing.
• Always be sure floor area around kettle is clean and dry.
• Hot pads, oven mitts, and dry towels are essential.
• When bleeding the lines (which should be done daily), wear heavy rubber gloves.
• Be sure all wiring is wrapped and not frayed.

**STEAM TABLE**

• Always assume that it is hot.
• Add water before turning on.
• Be careful to use the correct amount of water.
• Do not leave utensils in pans.
• Lift lids away from yourself and others on both sides of table.
• Be sure that people around you are aware that you are removing pans.
• Hot pads, oven mitts, and dry towels are a must.
• Be sure all wiring is in good condition.
• The underneath side of the steam table does get hot, so avoid touching the area.
• To empty steam table, always turn off and allow water to cool. Scoop all water out until the remainder can be removed with a cloth.

**SAFETY SUGGESTIONS FOR OPERATING TILTING BRAZIER**

• Follow the owner’s manual for your model in terms of starting the unit. (i.e., gas, electric)
• Never allow the unit to overheat when empty as this can cause warpage of the pan bottom. Do not heat an empty pan for more than 5 minutes at a setting higher than 300° F.
• If possible, use wooden utensils in the brazier to avoid “dinging” the pan bottom.
• Use the hand crank or electric switch to raise or cover the pan. Do so slowly to avoid spilling contents.
• If the pan contains items in sauce or melted fat, they can slide forward suddenly during tilting and splash out the hot liquid.
• Any item prepared will be easier to handle if the pan is first preheated.
• Close the lid to braise or stew. Leave the vent open to vent out excess steam.
• The unit will not heat any faster if the thermostat is turned to its highest setting.
• When pouring liquid items out the pouring spout, try to place the bucket or pan as close to the spout as possible to avoid splashing.
• To clean the unit, clean while still warm, but not hot. Use a mild detergent and rinse well.
• When cleaning the electrical type of brazier, use caution, as the control box is not waterproof.
SAFETY SUGGESTIONS FOR OPERATING TOASTER

- Make sure cord is in good condition.
- Make sure table area is dry.
- At no time should metal be stuck in toaster.
- Unplug toaster before trying to remove stuck toast.
- Use wood or plastic utensils to remove stuck toast.
- Inside filaments are very fragile. Care should be taken not to break them when removing stuck pieces of toast.
- Little or no water should be used when cleaning outside of machine.
- Never lift toaster by placing fingers in toaster slot.

SAFETY SUGGESTIONS FOR OPERATING VERTICAL POWER SHREDDER ATTACHMENT FOR MIXER

- Make sure back case is securely attached to motor.
- After assembling, briefly turn on machine, on low speed, to check for proper set-up.
- Be sure to keep hands and fingers out of feed plate area during operation.
- Keep apron strings, hair, and sleeves away from moving parts.
- Always feed food into slicer or shredder with plunger.
- Never open front door assembly while operating machine.
- Never reach up into the shredder outlet while operating machine.
- Never attempt to adjust parts while machine is on.
- Set machine up in area that will allow room for catch pan to sit on secure surface.
- Never force food into machine, let the machine set the pace.
- Always replace motor hubcap after removing attachment.

TECHNOLOGY EDUCATION

SAFETY SUGGESTIONS FOR OPERATING ROBOTICS

- Proper eye protection must be worn—operate only with instructor’s permission and after proper instructions have been received.
- Operate only with instructor’s permission and after you have received instruction.
- Remove jewelry, eliminate loose clothing, and confine long hair.
- Make sure all guards are in place and operating correctly.
- Always use proper eye protection.
- When in the teach mode, use slow movements to jog the arm from point to point.
- Be sure the emergency stop button is functioning properly by testing it early in the teach cycle.
- Care should be taken that the operator’s fingers and other body parts are kept out of the work envelope.
- The operator must understand the program of robot actions and motions prior to the use of the robot.
BEWARE!
HOT Metal Area
Do Not Remove GUARD
DANGER!

FUEL GAS

Open Flames

Not Allowed
CAUTION!

Do Not Operate Unless Safety Guards Are in Place
SAFETY FIRST
Carelessness Is Dangerous
Ear Protection Required to Operate this Machine
EYE PROTECTION Required to Operate this Machine
**Resources**

The following list of groups, organizations, state agencies, and others is provided to assist instructors, program directors and others in their efforts to obtain information that will assist them in providing a safe environment for students of all ages. This list of resource groups should not be considered a comprehensive list of all of the possible resources that can be of assistance or who have information of the possible resources that can be of assistance or who have information about any of the elements of safety. Rather it should be viewed as a starting point and should be supplemented as new resources become available.

**Safety and Health Websites—U.S. Government Websites:**

- Centers for Disease Control and Prevention [www.cdc.gov](http://www.cdc.gov)
- Environmental Protection Agency [www.epa.gov](http://www.epa.gov)
- Food and Drug Administration [www.fda.gov](http://www.fda.gov)
- Mine Safety and Health Administration [www.msha.gov](http://www.msha.gov)
- National Cancer Institute [www.nci.nih.gov](http://www.nci.nih.gov)
- NIOSH [www.cdc.gov/niosh/homepage.html](http://www.cdc.gov/niosh/homepage.html)
- National Weather Service [www.wrh.noaa.gov](http://www.wrh.noaa.gov)
- OSHA [www.osha.gov](http://www.osha.gov)
- US Dept. of Transportation [www.dot.gov](http://www.dot.gov)
- US Fire Administration [www.usfa.fema.gov](http://www.usfa.fema.gov)

**Washington State**

- Wash. State Dept of Labor & Industries [www.wa.gov/lni](http://www.wa.gov/lni)

**Organizations**

- Advocates for Highway and Auto Safety [www.saferoads.org](http://www.saferoads.org)
- American Conf. of Gov. Industrial Hygienists [www.acgih.org](http://www.acgih.org)
- American Industrial Hygiene Association [www.aiha.org](http://www.aiha.org)
- American Lung Association [www.lungusa.org](http://www.lungusa.org)
- American National Standards Institute [www.ansi.org](http://www.ansi.org)
- American Red Cross [www.redcross.org](http://www.redcross.org)
- ASSE [www.asse.org](http://www.asse.org)
- Center for Safety in the Arts [www.artswire.org](http://www.artswire.org)
- Human Factors and Ergonomics Society [www.hfes.org](http://www.hfes.org)
- Illuminating Engineering Society of N. America [www.iesna.org](http://www.iesna.org)
- Industrial Safety Equipment Association [www.safetycentral.org](http://www.safetycentral.org)
- Insurance Institutes for Highway Safety [www.hwysafety.org](http://www.hwysafety.org)
- National Air Duct Cleaners Association [www.nadca.com](http://www.nadca.com)
- National School Board Association [www.keepschoolssafe.org](http://www.keepschoolssafe.org)
- Mayo Clinic (offers weekly newsletter) [www.mayohealth.org](http://www.mayohealth.org)
Safety and Health Websites (continued)

National Fire Protection Agency  www.nfpa.org
National Safety Council  www.nsc.org

General Information Sources

Associated Industries of the Inland NW  www.aiin.com
The Federal Register  http://fr.cos.com/
Fremont Compensation Insurance Group  www.fremont.com
Lighting Design Lag  www.northwestlighting.com
Material Safety Data Sheets  www.msds.pdc.cornell.edu/msdssrch.asp
Lighting  www.lightingresource.com
Professional Development Associates  www.pdanet.com
Safety Online  www.safetyonline.net
“Safety Currents”  www.safetyonline.net/currents/home.htm
“Safety on the Internet”  www.govinst.com
Traffic Safety Village  www.drivers.com
World Safety (monthly newsletter)  www.worldsafety.com

Safety Vendors

Oxarc  www.oxarc.com
Cole-Parmer Instruments Co.  www.coleparmer.com
Grainger  www.grainger.com
Lab Safety  www.labsafety.com
SKC, Inc.  www.skcinc.com
Masune 1st Aid & Safety  www.masune.com
Moore Medical Corp.  www.mooremedical.com
Hach  www.hach.com
JJ Keller  www.jjkeller.com
Quest Technologies  www.quest-technologies.com
Coastal Safety and Environmental  www.coastal.com
Mitchell Instruments  www.mitchellinstrument.com
The Safety Zone  www.safety-zone.com
Selected Bibliographies

Noise and Vibration Control the Science Instructor's Safer Source
Edited by Leo L. Beranek Chemical Catalog/Reference Manual
Library of Congress # 78-148977 by Flinn Scientific, Inc
ISBN 07-004841-X P.O. Box 2A, 917 W. Wilson Street
Published by McGraw Hill, Inc Batavia, IL 60510
(312) 879-6900

Artist Beware Hazards in the Chemical Laboratory
By Michael McCann, PhD Edited by L. Bretherick
1515 Broadway New York, NY 10036
Published by the Royal Society of Chemistry
18982 Letchworth, Herts, SG6 1Hn, ENGLAND Blackhorse Road

Injury in America Prudent Practices for Disposal of
National Academy Press Chemicals from Laboratories
2101 Constitution Avenue, NW National Academy Press
Washington, D.C. 20418 2101 Constitution Avenue, NW
Library of Congress # 85-60999 Washington, D.C. 20418

Washington Education Directory Health Hazards in Arts and Crafts
Barbara Krohn and Associates Society for Occupational & Environmental Health
835 Securities Building Seattle, WA 98101 1341 G Street, NW, Suite 308
(206) 622-3538
Edited by Michael McCann, Ph.D., & Gail Barazani

Noise and Noise Control Industrial Ventilation—17th Edition
Malcolm J. Crocker/Frederick M. Kessler Committee on Industrial Ventilation
CRC Press, Inc. P.O. Box 16153
2000 Corporate Blvd., NW Lansing, MI 48901
Boca Raton, FL 33431
Lithographed by Edwards Brothers, Inc
2500 South State Street Ann Arbor, MI 48104
Library of Congress # 75-2352 ISBN#0-8493-5093-0
(Vol. 1) 0-81819-064-3 0-8493-5094-8 (Vol. 2)

Health Hazards Manual for Artists
By Michael McCann
Nick Lyons Books
32 West 21st Street
New York, NY 10010
ISBN 0-941130-06-1
Industrial Noise Control—Fundamental and Applications
By Lewis Bell
Published by: Marcel Dekker, Inc
270 Madison Avenue
New York, NY 10016

Washington State Department of Health
PO Box 47825
Olympia, WA 98504
Available at: www.doh.wa.gov/ehp/ts/iaq/pdf

Safety Guide for Career and Technology Education
Office of Superintendent of Public Instruction
PO Box 47200
Olympia, WA 98504-7200

Special credit given to:
Utah State Office of Education
Texas USDE
Washington Industrial Safety and Health Administration (LABOR AND INDUSTRIES)
Dr. Terry Bergeson
Washington State Superintendent of Public Instruction
Mary Alice Heuschel
Washington State Deputy Superintendent Learning and Teaching
Mickey Lahmann
Washington State Assistant Superintendent Curriculum and Instruction
Rob Fieldman
Washington State Director Career and Technical Education
Moe Broom
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