YOUNGSTOWN STATE UNIVERSITY
Office of Environmental Health & Safety

Youngstown State University

Makerspaces

(WIP, WTC, ETC, Art, Ceramics, Theatre, Scene Shop)

General Safety Orientation Training Manual

Youngstown State University recognizes its responsibility to protect the health and assure the safety of the students, employees, instructors and visitors. The following entry-level orientation information contains general safety information for the students who participate in chemistry, biology, engineering, arts, clubs, laboratories and makerspaces. A makerspace is a place that provides hands-on, creative ways for students to design, experiment, and invent as they engage with a variety of tools and technology. Makerspaces are multidisciplinary in both approach and in the products created which fuels engagement and innovation. YSU students are communicating, collaborating and creating in a variety of flexible learning environments. For hands-on activities and experimentation, makerspaces are must-have spaces. Tech-heavy makerspaces may include 3D printers, laser cutters, CNC machines, power tools, green screens or robotics equipment, whereas low-tech makerspaces may use hand tools and art supplies.

This manual provides safety and health guidance for research, teaching tasks, and club activities. Each student, faculty, staff or volunteer working in these areas is expected to read this manual thoroughly and act in accord with the guidelines. This manual should also be kept available for future reference. Completing this orientation manual grants these students minimal access to tools, chemicals and equipment. Students will not need to repeat the orientation after completing it once. This general safety training does not authorize students/persons to use lab equipment or operate each machine they will be required to use. Only people who have been thoroughly trained by their Department Instructor/Professor or Competent Person, or those who are undergoing supervised on-the-job training are permitted to use lab equipment or operate machinery.

Section I. (Must be read in entirety)

EMERGENCY SITUATIONS

The following general information is important when reporting emergencies on campus. Remember---**STAY CALM, DON'T PANIC, HELP IS ON THE WAY. NEVER PUT YOURSELF AT RISK!**

ALL Emergencies – Environmental-Safety-Security-Medical -- YSU Police Department

The YSU Police are available 24 hours a day 7 days a week all holidays.

Emergency Phone Number- 330-941-3527
From campus phone dial 3527 or 911.
Cell phone MUST dial 330-941-3527

*If you dial 911 from a cell phone it will be routed to Youngstown City Police and could delay response times.

COMMUNICATIONS

Penguin Alert text messages and/or e-mails will be sent with updates of the situation.

Emergency Response and Accident and Injury Reporting

In the event employees or students require emergency assistance (criminal activity, fire/smoke, medical emergencies or hazardous materials incidents) contact the Campus Police Dispatch by CALLING 9- 1-1 from a campus phone. Cell phone users should call 330-941-3527 and provide name, location (building/room) and a brief description of the emergency. Emergency response guidelines can be found at Campus Emergency Management Plan

Reporting Accidents/Incidents/Injuries

Report all near misses and injuries, no matter how small, to your professor/instructor/competent person as soon as possible. Safety and Health incidents must be investigated. The person(s) involved must provide a written Incident Report Form to EHS in case of minor spills, fires, or hazardous material release regardless of whether an injury occurred. This form is available online from at Incident and Injury Report

EHS may ask for assistance to investigate and prepare an investigation report. Investigations are made and reports written not only to satisfy certain laws but also to learn the cause of the problem and what changes in procedures, equipment, or training should be made to avoid other incidents/injuries.

EHS will respond to chemical spills as reported. However, if the spilled material is not volatile and there is no immediate fire or toxic hazard, cleanup may be done by properly trained STEM faculty and staff. In situations involving a fire of unknown materials, research chemicals, or toxics, EHS will advise on evacuation or other protective precautions for persons or property in the immediate area.

Puncture or Cut

If someone has a puncture wound or cut, wear personal protective equipment (gloves) to minimize exposure to human blood. Apply a pressure pad or clean cloth firmly to the wound. Raise the wounded area above the level of the heart to slow the bleeding. For severe bleeding or spurting call 911. Until medical personnel arrive, have the victim lie down and try to control any external bleeding. In a severe injury, keep the victim warm and do not move them.

Inhalation of hazard/toxic

A person exposed to smoke or fumes must be moved to fresh air. Any person overcome by smoke or fumes must be given medical treatment, call 911. NOTE: The air may be unsafe to enter. Do not enter without first confirming it is safe; this requires air sampling. Contact EHS to perform entry sampling.

Skin contact with a chemical

If a chemical contacts a person's skin, remove the chemical from the skin as soon as possible. For chemicals that can cause burns, the stronger the chemical and the longer the contact, the worse the burn. For all chemicals except hydrofluoric (HF) acid, flush the skin under a safety shower for at least 15 minutes; call 911.

For limited skin exposure on a small area, a drench hose or sink may be adequate for flushing and 911 may not

need called. Do not treat the burn. Do not puncture any blisters that may develop. Follow up medical treatment is recommended (doctor office or emergency room).

Eye contact with a chemical

Wash the eye(s) with water for at least 15 minutes, 911 may not need called. Follow up medical treatment is recommended (doctor office or emergency room).

Burn from a fire

If your clothing catches fire, immediately get under a safety shower or other water source. If a safety shower is not immediately available, stop, drop, and roll to extinguish the fire. Assess the condition of the skin's burn area. If skin is not broken, run water over the burn area to remove heat. Do not put ice on the burn. If skin is broken, apply a dry, sterile dressing over the wound and call 911. Until medical personnel arrive, keep the victim warm and do not move them.

Cryogenic Liquid Contact

Contact with cryogenic liquids may cause crystals to form in tissues under the spill area, either superficially or more deeply in the fluids and underlying soft tissues. The first aid procedure for contact with cryogenic liquids is identical to that for frostbite. Re-warm the affected area as quickly as possible by immersing it in warm, not hot, water (between 102° and 105° F). Do not rub the affected tissues. Do not apply heat lamps or hot water and do not break blisters. Cover the affected area with a sterile covering and seek assistance as you would for burns and call 911. Until medical personnel arrive, keep the victim warm and do not move them.

Shock

Shock is likely to develop in any serious illness or injury. Shock is a condition in which the circulatory system fails to deliver blood to all parts of the body. When the body's organs do not receive adequate blood supply, they fail to function properly. If a person appears to be in shock call 911. Until medical personnel arrive, have the victim lie down and elevate the victim's legs about 12 inches unless you suspect broken bones or possible head, neck, or back injuries. Help the victim maintain a normal body temperature and avoid moving them.

Working alone or outside normal business hours

High risk work with chemical or physical hazards (high voltage, mechanical hazards) or any other work that might prove immediately dangerous must NOT be conducted alone. All high risk laboratory and makerspaces work must be conducted with a partner or co-worker and MUST always have a Competent Person in site of the activity. High risk work on YSU campus outside of normal business hours (M-F 7:30am to 5pm) must be pre-approved in writing by the department chair and must include emergency contact information. Experiments or other tasks or machinery that continues to operate while someone is not present (unattended) must be pre-approved in writing by the department chair and must include emergency contact information. The Unattended Operations Taking Place Form must be completed and posted at room entrance or next to equipment running. Users must post all applicable information, including emergency shut-down instructions. This information is used to inform other building occupants, Physical Plant personnel, Safety staff and other Emergency Responders in the event of an unexpected reaction, overheating, odor or emergency.

Visitors

Do not allow visitors, including children and pets, in work areas where high risk activities are in progress.

Students from primary and secondary schools (minors) occasionally may enter these areas as part of educational programs under carefully controlled and supervised conditions. Colleagues, prospective students, and others may be invited into laboratory and makerspaces work areas but must be escorted the entire time and wearing proper PPE where required.

It is essential that all laboratory and makerspaces workers understand the types of hazards, recognize the routes of exposure, and are familiar with the major hazard classes of chemicals. In many cases, the specific hazards associated with new compounds and mixtures will not be known, so it is recommended that new chemical compounds be treated as if they were potentially harmful and to use appropriate eye, inhalation and skin protection equipment.

LOCK DOWN PROCEDURES

- Security Threat Outside building
- Building is locked from the outside to prevent entrance
- Occupants stay inside building
- If you're outside remove yourself from campus as quickly as possible, avoid using vehicles
- If in a room where the door doesn't lock, then barricade it closed (bathrooms)
- Staff - remain in office and LOCK door
- Faculty - assist getting students to a room that locks, classroom doors automatically lock when closed
- Keep listening and check cell phone for Penguin Alert message updates

BUILDING EVACUATION

- Threat Inside building
- Occupants expected to leave building immediately
- Activating a fire alarm is a quick way to initiate building evacuation even if it's not a fire
- Stop classes, work, or business operations
- Make your work area safe for the responders- close chemical containers, shut down equipment
- Take only essential personal items such as car keys and handbags
- Close all doors behind you if you are the last one out of the room
- Walk to the nearest exit – do not use elevators
- Go to the building pre-designated assembly area for accountability and further instructions https://ysu.edu/campus-map
- Keep listening and check cell phone for Penguin Alert message updates
- Do not leave the assembly area unless instructed to do so by your department chair or onsite safety officer or accountability police officer

SHELTER IN PLACE PROCEDURES

- Threat Outside building

- If outside proceed to the nearest building
- Take refuge in a designated area of safety within a building
- Basement or lower levels, interior rooms without windows
- Stop classes, work, or business operations
- Make your work area safe for the responders - close chemical containers, shut down equipment
- Close all windows, exterior doors and any other openings to the outside
- Take only essential personal items such as car keys and handbags
- Close all doors behind you if you are the last one out of the room
- Walk to a basement or lowest level of a building - do not use elevators
- Go to the building pre-designated shelter area for accountability and further instructions
- Keep listening and check cell phone for Penguin Alert message updates- Do not leave until the All Clear is given.

PREPLANNING FOR INDIVIDUALS WITH DISABILITIES

- At the first 2 classes announce that individuals that may need help in an emergency should privately talk to the instructor
- Ask for at least 3 student volunteers to assist any disabled individuals
- If the classroom is in an area that makes removal of the individual extremely difficult, the instructor should ask for a room change to a ground floor location
- Room changes must be made with assistance from the Registrar's Office
- If a room change is not possible and the individual cannot use the stairs, then the instructor should help move the person to the nearest designated refuge area
- Notify the accountability officer at the building's assembly location for an evacuation or call YSU Police dispatch for a shelter in place

REPORTING A CRIME

If a crime or disruptive behavior occurs on campus (assault, robbery, theft, etc.), contact YSU Police immediately. Dial ext. 3527 for the Dispatcher, or if immediate police response is essential, dial 911 from any campus phone, (330)941-3527 from a cellular phone, or use any emergency phone on campus.

Furnish pertinent information:

Location
Nature of incident
Description/Identity of those involved
Whereabouts of perpetrators
Whereabouts of victims
Description of what transpired
Any related information

When reporting an incident of crime on campus, all information will be treated with appropriate confidentiality. Please identify yourself to YSU Police. Your identity will be afforded all due confidentiality. We encourage members of our campus community to report any criminal activity promptly. Safety and security on campus is a cooperative effort. Upon receipt of notification of a crime occurring on campus, YSU Police Officers will respond immediately and investigate.

ACTIVE SHOOTER

If you find yourself involved in the very rare event of an active shooter situation, try to remain calm and use these guidelines to help plan a strategy for survival.

Active Shooter is OUTSIDE the Building

1. Go to a room that can be locked, close and lock all the windows and doors, and turn off all the lights; if possible, get everyone down on the floor and ensure that no one is visible from outside the room.
2. Call 911 and inform the dispatcher of your location; remain in place until the police or a campus administrator known to you gives the "all clear." Unfamiliar voices may be the shooter attempting to lure victims from their safe space; do not respond to any voice commands until you can verify that they are being issued by an official. Likewise, do not leave the room if the fire alarm is activated unless you can see smoke and flames and judge the fire to be a greater risk than the shooter.

Active Shooter is INSIDE the same Building

- If your room can be locked, close and lock all the windows and doors, and turn off all the lights; if possible, get everyone down on the floor and ensure that no one is visible from outside the room.
- If your room can't be locked, determine if there is a nearby location that can be reached safely and secured, or if you can safely exit the building.

Active Shooter ENTERS your Office or Classroom

Try to remain calm. Dial 911, if possible, and alert police to the shooter's location; if you can't speak, leave the line open so the dispatcher can listen to what's taking place. Attempting to overpower the shooter with force should be considered a last resort.

Moving From Current Location

No matter what the circumstances, if you decide to flee during an active shooting situation, make sure you have an escape route and plan in mind. Do not attempt to carry anything while fleeing and leave coats and jackets behind so the police can easily see you aren't armed; move quickly, keep your hands visible, and follow the instructions of any police officers you may encounter. Do not attempt to remove injured people; instead, leave wounded victims where they are and notify authorities of their location as soon as possible. Do not try to drive off campus until advised it is safe to do so by police or campus administrators.

BOMB THREAT

Instructions: Be calm. Be courteous. Listen. Do not interrupt the caller. Notify supervisor immediately.

When is the bomb going to explode?	Did you place the bomb?
Where is the bomb right now?	Why?
What does the bomb look like?	What is the address?
What kind of bomb is it?	What is your name?
What will cause the bomb to explode?	EXACT WORDING OF BOMB THREAT

CHEMICAL SPILL

- Sound the fire alarm to evacuate the building if strong fumes are present.
- Contact YSU Police at (330)941-3527 or by dialing 911 from a campus phone.
- Give YSU Police a complete description of the incident. Describe the type of accident: fire, explosion, chemical spill, leaking drum. If the incident is a chemical spill, and you know the name of the chemical, inform YSU Police.
- Identify the building where the incident occurred and the room number or location of the incident.
- If the incident involves a chemical spill give the approximate amount of the spill.
- Give your name and the telephone number from which you are calling.
- Note any injuries: Are you or anyone else in the building injured? Tell YSU Police of the injuries.
- Don't hang up until told to do so by the dispatcher.
- At a safe distance, await the arrival of YSU Police. Provide any additional information that they may require.

FIRE

Preplan:

- Know that an INTERMITTENT alarm signals a fire.
- Know the location of the fire alarm pull stations.
- Know the closest exit out of the building and at least 2 other means of exiting the building.
- Leave the building immediately when the fire alarm is sounded.
- Have a pre-designated meeting place for all those in your office.
- Know who is not present for the day so that they can be accounted for at the designated meeting place.

If you should spot a fire:

- Sound the fire alarm to get everyone out of the building.
- Dial 911 from a campus phone to contact YSU Police. If dialing from a cellular phone, contact YSU Police by calling 330-941-3527.
- Give your name, the name of the building and the location of the fire within the building.
- Only take essential personal possessions when leaving the building. Take items such as car keys and handbags in case the building is shut down and you are not able to re-enter the building.
- Close all doors behind you if you are the last one out of the room
- WALK!!!! to the nearest exit. DO NOT USE ELEVATORS!!! Note: Individuals with disabilities may need assistance.
- Go to your department's pre-designated emergency assembly point. Campus Map
- Cooperate with emergency personnel and YSU Police. Follow all instructions when given.
- Do not re-enter the building until you are told to do so by YSU Police or other emergency personnel.

If the fire is small and your safety is not compromised and you know how to use a fire extinguisher, you can attempt to put out the fire with 1 or 2 fire extinguishers.

Remember the word **PASS:**

- P - Pull the pin
- A - Aim low at the base of the fire
- S - Squeeze the handle
- S - Sweep from side to side at the base of the fire

TORNADO

- Know that a ***CONTINUOUS*** alarm signals a tornado.
- Identify the appropriate place in your building to seek shelter should a tornado occur.
- Stay indoors, be alert to falling objects.
- Immediately walk to the designated tornado shelter area. The location of the shelter in each building on campus has been selected based on tornado safety criteria.
- **Note:** Individuals with disabilities may need assistance. **DO NOT USE ELEVATORS.**

If you are in a building you are unfamiliar with or if you cannot find a map or sign for Designated Tornado Shelter Area, go to an interior wall with no windows at ground level:

- Go to the lowest level of the building, find an interior area with no windows (e.g., interior hall, closet, or bathroom). Seek refuge under a table or desk kneeling face down with your hands covering your head to reduce injury. If available, cover yourself with a coat or other such material.
- Avoid areas that have a large roof span that may collapse: auditoriums, gymnasiums, etc.
- Stay away from windows and glass, and unsecured objects such as filing cabinets or bookcases.

If you are outside:

- Lie flat on the ground in a depression and cover the back of your head and neck with your hands.
- Do not seek cover in an automobile or under a tree.

If driving a vehicle:

1. Get out and seek shelter in a building or low area; never try to outrun a tornado.
2. Remain in the safe area until you receive an "all clear" message from YSU Police or their designees.

If the building does not have signage designating a Tornado Shelter/Safe Area proceed to the lowest floor and into interior areas that do not have outside windows.

EARTHQUAKES

Keep in mind that most earthquakes are of a short duration and that injury usually occurs from falling objects. With that in mind, the following procedures can assist you in the case of an earthquake.

If inside a building:

- Remain calm.
- Stay inside the building.
- Find cover under a sturdy object such as a desk or in a door frame.
- Watch for falling objects.
- Stay away from windows and any other objects, which may fall on you.

If you are outside:

- Go to an open, area free of trees, power lines and away from buildings.
- Cover your head and watch for falling objects.

After the earthquake is over:

- Expect aftershocks so remain protected.
- Remain calm.
- Follow the instruction of YSU Police and evacuate the building if told to do so.
- When evacuating, watch for falling objects and walk carefully as the floor or steps may be damaged.
- **DO NOT USE ELEVATORS!!!!**
- **Note:** Individuals with disabilities may need assistance.
- Do not move seriously injured persons unless there is danger from fire or building collapse.
- Do not re-enter the building.
- Do not light cigarettes, matches, lighters or use cellular phones as this may cause an explosion if natural gas is present in the immediate area.

MOTOR VEHICLE ACCIDENT

If you are involved in an accident, do the following:

- Stop at once! Check for personal injuries and request an ambulance if needed. Do not leave the scene. Ask for assistance of a bystander.
- Protect the scene. Set emergency flashers to prevent further injury or damage.
- Secure assistance of a Police Officer when possible. Record the name and badge number of the officer.
- If accident occurs on or near campus, contact YSU Police Department at (330) 941-3527 and they will contact additional University departments. Additional information can be found at Risk Management Programs- Vehicle Use
- Record names and addresses of all witnesses and occupants of involved vehicles. Record the vehicle license number.
- Do not argue! Make no statement except to proper authorities. Sign only official police reports. Do not plead guilty or admit fault.
- If you are driving a **university-owned vehicle** fill out the "ON THE SPOT" ACCIDENT REPORT which is found in the glove box of every University-owned vehicle.
- If you are driving a **rental vehicle**, these reports can be obtained from the Department of Environmental and Occupational Health and Safety (EHS) located in room 2046 Cushwa Hall or at ext. 3700.
- As soon as possible report the accident to EHS at ext. 3700.

HOUSEKEEPING

Poor housekeeping practices can cause a variety of hazards, which can lead to injuries, fires, and unhealthful working conditions.

Keeping things clean and organized helps provide a safer working space. Keep drawers and cabinet doors closed and electrical cords off the floor to avoid tripping hazards. Keep aisles clear of obstacles such as boxes, chemical containers, and other storage items that might be put there even temporarily. Avoid slipping hazards by cleaning up spilled liquids promptly and keeping the floor free of dirt and rocks or other small items. Never block or even partially block the path to an exit or to safety equipment, such as a fire extinguisher or safety shower.

Make sure that supplies and equipment on shelves provide sufficient clearance so that fire sprinkler heads operate

correctly. There shall not be any storage within 18 inches of a sprinkler head.

Put ordinary trash in a trash can/container separate from chemical wastes. Broken glass and other sharp items must be disposed of in rigid, puncture-resistant containers to protect people collecting the waste materials. Chemical wastes and unwanted chemicals must be disposed of promptly and not left to clutter a workspace. Follow all procedures for Hazardous Waste Disposal found at Chemical Waste.

PERSONAL HYGIENE

Personal hygiene is extremely important in a workspace. Contamination of food, beverages, or smoking materials is a potential route of exposure to toxic chemicals through ingestion. Therefore, do not prepare, store, or consume food or drink, smoke, or apply lip balm in the work area.

Hand washing is a primary safeguard against inadvertent exposure to toxic materials. Always wash your hands before leaving the workspace even if you were wearing gloves. Wash your hands after removing soiled protective clothing, and before eating, drinking, smoking, or using a rest room.

Wash your hands periodically during the day at intervals dictated by the nature of your work. Wash with soap and running water.

Confine long hair and loose clothing when in the work area to keep them from catching fire, dipping into chemicals, or becoming entangled in moving machinery. Avoid wearing finger rings, fingernail extensions and wrist watches which may become contaminated, or be caught in the moving parts of equipment.

Remove contaminated coats and gloves before you leave the workspace. Keep a clean spare coat to wear outside the workspace. Do not wear gloves outside the workspace.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment Personal protective equipment serves as a person's last line of defense against exposures and is required by everyone entering a laboratory and makerspaces work space containing hazards. The primary goal of PPE is to mitigate, at a minimum, the hazard associated with exposure to hazardous substances. The SDS for a chemical or material should always be consulted to determine the appropriate required PPE.

The PPE policy outlines the basic PPE requirements, which include but are not limited to:

1. Safety eye protection with ANZI Z87.1 markings is mandatory in laboratory and makerspaces work spaces where there are hazards of flying objects or splashing chemicals. Safety glasses with clear side shields are adequate protection for general use. Goggles must be worn when there is danger of splashing chemicals or flying particles, such as when chemicals are poured, or glassware is used under elevated or reduced pressure. Safety goggles differ from safety glasses in that they form a seal with the face, which completely isolates the eyes from the hazard. A face shield with goggles offers maximum protection (for example, with vacuum systems that may implode). Normal glasses do not provide sufficient protection; people whose vision requires corrective lenses, and who are required to wear eye protection, must wear goggles over their eyeglasses, or prescription safety glasses. If contact lenses are worn, they should not be handled in the laboratory and makerspaces work spaces and must be worn with required eye protection.
2. When working with or around power air tools, portable hand tools, or equipment that generates loud noise (in excess of 85 decibels), hearing protection is required (contact EHS at ext. 3700 if it is suspected hearing protection may be indicated) but not required.
3. Protective gloves, laboratory coats and shields are to be worn whenever it can reasonable be anticipated there could be exposure to materials that may cause cuts or abrasions or whenever there may be exposure to hazardous chemicals.
4. Hard hats must be worn whenever there is a danger of falling objects or working under overhead cranes.
5. Close-toed shoes must be worn at all times. Do not wear sandals, cloth sport shoes, perforated shoes, or open-toed shoes. Safety shoes/toe guards must be worn at all times by those individuals who have been

identified as being part of the YSU Safety Footwear Program.

6. Full length pants must be worn at all times.
7. Flame resistant laboratory coats are required for high hazard materials, pyrophorics, and flammables. Consider wearing flame-resistant moisture wicking or all cotton undergarments/shirt/pants
8. Many gloves are made for specific uses. For adequate protection, select the correct glove for the hazard in question. Leather and Kevlar gloves provide good protection for picking up broken glass, handling objects with sharp edges. However, because they absorb liquid, these gloves do not provide protection from chemicals, nor are they adequate for handling extremely hot or cold surfaces. Select glove materials resistant to the chemical being used and change gloves periodically to minimize penetration. The chemical resistance of common glove materials varies according to the glove manufacturer, as manufacturers may vary the thicknesses and formulations of material. Nitrile gloves are typically not required except when handling corrosive, flammable or toxic chemicals.
9. Respirators must be worn whenever working with chemicals or generating particles that may constitute an inhalation hazard. Respirators must be issued in accordance with the YSU Respirator Protection Program. Typically, respiratory protection is not needed in a work space where there is adequate ventilation. Under most circumstances, safe work practices, small-scale usage, and engineering controls adequately protect workers from airborne hazards. Under certain circumstances respiratory protection may be needed. These can include:
   - An accidental spill of a hazardous chemical outside a fume hood
   - An unusual operation that cannot be conducted under local ventilation
   - Weighing hazardous powders
   - When exposure monitoring indicates that exposures exist that cannot be controlled by engineering or administrative controls
   - As required by a specific protocol or as defined by applicable regulations (i.e. welding on stainless steel)

   Because there are numerous types of respirators available, and each has specific limitations and applications, respirator selection and use require pre-approval by EHS. For voluntary use, the employee must read and sign the Verification of Review Voluntary Respirator Use Requirements. For voluntary use of a respirator, fill out a Voluntary Use of Respirators form; review it with your professor/competent person and have them return the completed form to EHS. EHS will then contact the employee to evaluate the potential exposure. Tasks with potential airborne hazards that cannot be eliminated by engineering or administrative controls will not be authorized by EHS until affected employees can be incorporated into the Respirator Protection Program.
10. Personal protective equipment (PPE) should be kept clean and stored in an area where it will not become contaminated. PPE should be inspected prior to use to ensure it is in good condition. It should fit properly and be worn properly. If it becomes contaminated or damaged, it should be cleaned or repaired when possible, or discarded and replaced. cases where spills or splashes of hazardous chemicals on clothing or PPE occur, the clothing/PPE should immediately be removed and placed in a closed container that prevents release of the chemical. Heavily contaminated clothing/PPE resulting from an accidental spill should be disposed of as hazardous waste. Non-heavily contaminated PPE should be cleaned. Laboratory and makerspaces personnel should never take contaminated items home for cleaning or laundering.

KNOW THE LOCATION OF THESE ENGINEERING SAFETY CONTROLS AND ASSURE YOU RECEIVE TRAINING ON THEIR USE:

- Eyewash/Safety Shower
- Drench-hose
- Class-ABC Fire Extinguisher or Class D
- First-Aid Kit- For use by persons trained in first-aid

- Acid, Base and Flammable Material Spill Kit

CHEMICAL STORAGE & TRANSPORTATION

- Always segregate and store chemicals in appropriate cabinets
- Always transport chemicals in secondary containment
- Do not throw away empty chemical bottles
- Follow all YSU and DOT requirements when transporting chemicals

GENERAL GUIDELINES WHEN WORKING WITH FLAMMABLES

- Chemicals defined as "Flammable" have a flash point of <100°F (<37.8°C)
- Vapor from flammable chemicals can be ignited and lead to fire or explosion
- Some flammable chemicals are also considered toxic or health hazards
- Combustible chemicals (flash point >100°F / 37.8°C) are also considered fire hazards

GENERAL SAFETY RULES

1. In case of an emergency, turn off the machine and follow your professor/instructor/competent person's instructions.
2. Stay within designated walkways. All walkways, aisles and means of egress must be kept clear and free of obstructions.
3. All spills must be cleaned up immediately and the area properly posted as long as a slip hazard is present. Don't use cleaners that could make the floor slippery. Clear walkways, stairs, and lobbies of anything that might be a tripping hazard, such as cords, wires, empty boxes, and clutter. Make sure that floor mats lay flat rather than wrinkled or bunched. Use handrails when you walk up and down steps.
4. If work area lighting goes out, stop work and notify the Department Instructor/Professor or Competent Person.
5. Before entering the shop, secure loose clothing, remove loose jewelry, remove dangling cords (like those from headphones and hoodies), roll up long sleeves, and tie back long hair.
6. When you notice a damaged tool in the shop, report it to your Department Instructor/Professor or Competent Person immediately.
7. When using a sharp tool such as scissors, always point the sharp edge away from your body, hands and eyes. Wear cut-resistant gloves when required.
8. Do not remove safety guards from machines.
9. No Horseplay. Do not make unnecessary movements and noises in the lab because they could distract other students and cause accidents.
10. Tools, machines, chemicals and other hazardous items may only be used when the Department Instructor/Professor or Competent Person is present, you have received permission from that person, and you have received instruction and training in the specific safety precautions.
11. Equipment may only be used for its intended purpose and may only be used for school projects approved by the Department Instructor/Professor or Competent Person.
12. In case of an emergency, turn off the equipment and follow your Department Instructor/Professor or Competent Person's instructions.
13. Always assure you lift objects and materials properly. You may need two or more people to safely handle or move large, long or heavy materials.
14. Leave backpacks out of the work area by placing them in your regular classroom, preferably under a desk or table so they are not in the way where other people might trip over them.

15. No individual may use compressed air to clean debris from body or clothing. It is strictly prohibited to direct compressed air towards an individual.
16. No individual may operate an industrial truck, scissor lift, crane or similar equipment without having been properly trained and certified in its safe use.
17. Never walk under a crane without a hardhat and never pass under a load overhead.
18. No individual may use a ladder without having been properly trained how to inspect and use ladders.

Section II. (ONLY READ SECTIONS PERTAINING TO YOUR MAKERSPACE/EQUIPMENT)

The following safety information covers specific equipment and instrumentation guidelines, controls, rules, requirements, and procedures for the Makerspaces- WIP, WTC, ETC, Art, Ceramics, Theatre, Scene Shop Areas. Only read information that pertains specifically to you and your work area.

COMPRESSED GAS CYLINDER SAFETY GUIDELINES

Transportation

- Valve protection caps must be in place when compressed gas cylinders are transported.
- Secure compressed gas cylinders in an upright position on an approved carrier while being transported.
- Cylinders should never be stored horizontally in a vehicle.

Handling

- Use only approved spark igniters to light torches.
- If a leak develops in a cylinder and it cannot be immediately corrected, move the cylinder to a safe location outside the building if possible and contact the fire department.
- Keep oxygen and flammable gas regulators in proper working order and a wrench in position on the acetylene valve when in use.

Storage

- Valve protection caps must be in place when compressed gas cylinders are stored.
- Close cylinder valves and replace valve protection caps when work is complete and when cylinders are empty or moved.
- Keep cylinders at a safe distance or shielded from welding or cutting operations.
- Do not place cylinders where they can contact an electrical circuit.
- Cylinders must not be taken into or stored in confined spaces, including sheds, gang boxes and office/storage trailers.
- Do not store hoses and regulators in unventilated or closed containers or areas.
- If not connected to a manifold for immediate use, separate oxygen and flammable gas cylinders by 20-feet or a 5-foot high 30-minute fire rated barrier.

HOT WORK REQUIREMENTS

Hot work is prohibited under the following conditions:

1. Any area outside of a Safe Hot Work Area where a hot work permit has not been obtained.
2. Near areas where large quantities of flammable or combustible materials can ignite.
3. In close proximity to an explosive atmosphere.
4. On any drums, tanks, containers or any vessel that may have contained chemical materials that when heated may produce flammable, explosive, or toxic atmosphere.

HOT WORK PERMIT PROCEDURE

YSU personnel engaged in hot work must be authorized to do so by the Qualified YSU Supervisor or Project Manager who understands hot work hazards and what automatic fire detection devices may be affected by the hot work. In the absence of the above contacts, the Environmental Occupational Health and Safety (EHS) Office can authorize the planned hot work.

1. Obtain or request a current YSU Hot Work Permit by printing the permit from the EHS website listed under the Safety and Health Forms Quick Links and then select Hot Work Permit. (see Appendix A).
2. Complete the Hot Work Permit.
3. The Hot Work Permit must be signed by a Qualified YSU Supervisor or Project Manager authorizing the work. In the absence of both, the EHS Office can be authorized to sign off on the permit.

4. The Required Precautions Checklist noted on the Hot Work Permit must be in affect prior to starting the hot work and the permit must be posted in the work area.
5. The completed Hot Work Permit must be kept one year by department supervision then discarded after annual audit.

WELDING SAFETY GUIDELINES

1. Be sure the welder is properly installed and grounded.
2. Never weld without adequate ventilation.
3. Wear respiratory PPE when required. (Only medically evaluated and fit-tested personnel can wear respirators.)
4. Take proper precautions to prevent fires.
5. Protect your entire body with fire retardant clothing, shoes, and gloves. Consider wearing flame-resistant moisture wicking or all cotton undergarments/shirt/pants
6. Wear safety eye protection with ANZI Z87.1 markings. This includes safety glasses, goggles and welding helmets as required.
7. Weld only in a Safe Hot Work Area or where a hot work permit has been issued.
8. Never do any welding, cutting, or hot work on used drums, barrels, tanks, or other containers.
9. Electrode holders should be in good repair and rated for the maximum capacity of equipment used.
10. All cables and connectors should be in good repair, tightly attached, fully insulated, and rated for the maximum capacity of the work.
11. The welding lead will have a safe current capacity equal to, or greater than, the specified maximum output of the arc welding or cutting unit which it serves.
12. When a single work lead services more than one unit, its safe current carrying capacity should equal or exceed the total specified maximum output capacities of all the units which it services.
13. All electrical equipment (welding machines) and work should be properly grounded. The welding lead is not a ground lead. It is used only to complete the electrical circuit. A separate connection may be required to ground the work piece. Do not mistake the work lead for ground.
14. Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, should not be used as a ground.
15. When electrode holders are to be left unattended, the electrode should be removed, and the holders placed or protected so that they cannot make electrical contact with personnel or conducting objects. Always put stub ends in proper containers, not on the floor.
16. Do not weld while standing in water, or if clothing and gloves are wet.
17. Inspect equipment for loose connections or bare or damaged wires. Do not use faulty equipment.
18. Have workers turn off the welding machine at the end of the shift or when they will not be using it for an extended period.

FIRE PREVENTION

1. Sparks or spatter from welding or arc gouging may ignite burnable items in the area. Always be sure hot work areas have a minimum 35-foot clear area free of combustible materials.
2. Burnable materials should be removed from the area where welding or arc gouging is to take place or protected with flame-retardant materials. Use a fire watch as appropriate.
3. Sparks and spatter from arc gouging travel considerable distances. Whenever possible, orient the spark stream to minimize concern for fire or damage resulting from the spark stream. Use fire-retardant shielding and/or fire watch as appropriate.
4. Be sure to have full knowledge of the location and use of all fire extinguishing equipment in the area.

EXPLOSION PREVENTION

1. Do not weld or use arc gouging equipment when the smell of propane, acetylene, or any other fuel or gas is present. Determine the cause of the leak and get it corrected.
2. Do not perform any "hot work" (electric or gas welding, cutting, and brazing or similar flame-producing operations and grinding) in, or on, a tank or container unless it is properly vented.
3. Do not perform any "hot work" in, or on, any vessel, tank, or container which carries, or has carried, flammable materials, liquids, or gases until the container has been cleaned and tested and declared safe for "hot work" by the job safety authority.
4. Use appropriate ventilating devices before and during "hot work."
5. Ensure that hollow spaces are vented or purged prior to hot work activity.
6. Acetone and alcohol are commonly used for cleaning parts to be welded. Be sure to keep these containers and rags a safe distance from "hot work."
7. Disposable butane pocket lighters are not allowed where any "hot work" is being performed.
8. Never strike an arc on a compressed gas cylinder.

BURN PREVENTION

1. Exposed skin is an invitation to burns. Be sure to wear Flame Resistant Moisture Wicking or cotton undergarments and long-sleeved shirts that are not open at the chest and always fasten the top button of your shirt or jacket. Use leather or flame-resistant jackets when appropriate. Avoid polyester/synthetic clothing since they melt easily and can increase severity of burns.
2. Falling slag, spatter, or molten filler metal can cause burns to ankles and feet. Wear leather, steel-toed, high-topped boots during welding and cutting activities. Fire-resistant boot protectors may also be necessary. Avoid pants with cuffs.
3. Never carry flammable items such as matches and lighters in your pockets while involved with "hot work." Disposable butane pocket lighters are not allowed where any "hot work" is performed.
4. Always wear the appropriate type of leather gloves for the welding or cutting process.
5. Do not place hot work material where others can accidentally come in contact with it. Remember, metal can look normal but still be very hot.

ARC RADIATION SAFETY GUIDELINES

1. Infrared or ultraviolet radiation from the arc can burn the eyes or skin. Intense light can cause an irritation in the eyes known as "welder's flash," "arc-eye," or flash burn. Always view the arc when protected with a shield using protective altered lenses of the appropriate shade. Use appropriate area shielding for work area.

PORTABLE POWER TOOL SAFETY GUIDELINES

1. All manufacturer safety practices must be followed while using tools. This means all employees must read, know and understand all safeguards prior to using equipment. If an individual does not understand the safe operation of a piece of equipment, he/she should notify their Instructor/Competent Person to obtain clarification. All required personal protective equipment must be worn at all times when using equipment. Once you are trained, ask for Instructor/Competent Person's permission before using any tool.
2. Inspect tools before use.
3. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
4. Always wear safety eye protection with ANZI Z87.1 markings while operating any tool.
5. Wear hearing protection (ear plugs or ear muffs) when necessary.
6. Ask the Instructor/Competent Person for safety information specific to each tool.

7. Only use a tool for its intended purpose (ex. a flat screwdriver is not a chisel).
8. Select the correct tool to safely complete the task.
9. Use tools in the proper environment (i.e. Do not use a grinder that emits sparks around flammable vapors or dust).
10. Do not use hand tools with loose or damaged handles.
11. Do not use portable power tools which have frayed, cut, or separated cords from the tool housing.
12. Keep tools and equipment well maintained (i.e. blades sharp, cords well maintained, guards in good working order, etc.).
13. On all metal portable power tools make sure that a 3-pronged grounding type plug is always used.
14. When working outside always use a "Ground Fault Circuit Interrupter" (GFCI) type extension cord, and do not put extension cords around your or shoulders when using portable power tools.
15. Keep hands clear of all cut lines or areas of impact.
16. Never leave a blade or tool unattended.
17. Do not leave any tool hanging over the edge a workbench or table.
18. If hot, do not touch the tool, and let it tool cool down before returning it to its proper location.

HAND TOOL SAFETY GUIDELINES

1. All hand tools such as chisels, punches, etc. which develop “mushroomed” heads must be taken out of service and reconditioned.
2. Handles on hammers, axes and similar equipment that are cracked or fractured should be replaced prior to use. Care should be taken to assure the head is properly and securely attached.
3. Wrenches whose handles are bent or whose gripping surfaces are worn should be replaced.
4. Screwdrivers that are bent or whose ends are chipped should be replaced.
5. Tools should be stored in a secure, dry location where they won’t tampered with and stored in such a way that sharp edges do not present a danger when reaching into tool cribs and storage areas.
7. Tool cutting edges should be sharp so the tool will move smoothly and not bind.
8. All handles should be free of burs and splinters and should be firmly attached to the working head of the tool.

ABRASIVE WHEEL EQUIPMENT SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person’s permission before using abrasive wheel equipment.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety eye protection with ANZI Z87.1 markings while operating any tool.
4. Wear hearing protection (ear plugs or ear muffs) when necessary.
5. The work rest shall be within 1/8 inch of the wheel.
6. The adjustable tongue on the top side of grinder must be within ¼ inch of the wheel.
7. The grinder must be mounted in such a way that it is secure and will not shift or tip.
8. Check that on-off control switches are clearly marked and readily accessible to the operator for easy deactivation of equipment in case of emergency.
9. Never exceed the maximum RPM rating indicated on the wheel.
10. Assure grinding wheels are not cracked or otherwise damaged before use.
11. Grinders that use a coolant must be equipped with splash guards to prevent coolant from coming into contact with the operator.

JOINTER SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Jointer.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety eye protection with ANSI Z87.1 markings while operating the Jointer.
4. The guard should be covering the cutterhead at all times when not operating the machine.
5. Make all adjustments with the power off.
6. Be sure to check all material for loose knots, nails and other foreign objects.
7. Do not place your hands within 12 inches of the cutterhead.
8. Students should NOT adjust the height of the outfeed table.
9. Only joint boards with the grain.
10. Stand off to the left and out of line of the cutterhead.
11. Never joint stock less than 12 inches long.
12. Cut with the concave side of the board facing down.
13. Hold firmly against the fence and the table.
14. A push stick is required when hands would pass over or within 2 inches of the cutterhead.
15. Adjust the infeed table to cut 1/32 of an inch per pass.
16. Never make cuts more than 1/16 of an inch thick.
17. Material should be pushed through, not pulled.
18. Run stock the entire way through the jointer until the cutterhead guard has returned over the throat and knives.
19. Turn off and wait for the cutterhead to come to a complete stop before cleaning it. Do not use fingers to clean cutterhead.
20. Assure power is off then clean up all scraps and dust from the Jointer before you leave it.

LASER ENGRAVER/CUTTER SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Laser Engraver or Cutter.
2. Always wear the proper eye protection with ANSI Z87.1 markings while operating and observing the Laser Engraver or Cutter.
3. Never leave the Laser Engraver or Cutter unattended during operation.
4. Ensure exhaust is working for proper CO_2 ventilation.
5. All parts of the machine must be fully grounded in case the static electricity cuts out.
6. Flammable and explosive substances are not allowed near the Laser Engraver or Cutter.
7. Before cutting, ensure the lens housing (laser head and gantry) will not collide with any objects on the honeycomb (cutting) table.
8. Do not push and/or pull the laser head and its gantry.
9. The cover must remain down and in place during the entire operation.
10. The continuous working time for the Laser Engraver or Cutter can't exceed 5 hours.
11. Any total reflection objects or diffuse objects are prohibited inside the machine to prevent the laser beam from reflecting out to hurt people.
12. Do not attempt to engrave/cut: nylon, ABS, polyethylene, Lexan/polycarbonate, PVC, vinyl, Teflon, or carbon fiber. Also, do not inhale glass dust.
13. Make all adjustments with the power turned off.
14. If applicable, the water cycle must be kept clean and at a temperature recommended by the manufacturer.
15. Small sparks and smoke are acceptable, but large flames are not.
16. If there are large flames or the machine malfunctions, immediately cut off the power supply.

17. When the operation is finished, carefully remove parts.
18. Follow all safety guidelines provided by the Laser Engraver or Cutter manufacturer.

LASERS SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using and device with a laser.
2. Always wear the proper ANSI Z87.1 eye protection with markings when working around lasers.
3. Do not look directly into the laser.
4. Do not operate Lasers over a CLASS II rating.
5. NEVER point the laser at another individual.
6. NEVER point the laser at a reflective surface (e.g. mirrors, glass, Mylar balloons, etc.) unless granted permission by the Instructor/Competent Person.
7. Appropriate "Laser In Use" warning signage must be posted at all entrances.
8. Follow all manufacturer procedures and safety rules.

MOTORIZED MITER SAW SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Miter Saw.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Miter Saw.
4. Check all material for foreign objects before cutting.
5. ONLY CROSSCUTTING (cutting across the grain) is allowed on the Miter Saw.
6. Check to ensure that all the safety guards and tables are in place and working correctly.
7. Disconnect the power before making any angle or blade adjustments.
8. Have all cut lines clearly marked before operating the Miter Saw.
9. Keep your fingers away from the cut line and blade.
10. Do not start the blade while it is touching the stock.
11. Support long stock on the ends to prevent binding or jamming.
12. Hold the stock firmly on the down on the table and against the fence while cutting.
13. Allow motor to reach full speed before beginning to cut.
14. If using a Sliding Miter Saw, pull the blade toward you as far as possible, then cut down and away from you to avoid kickback.
15. Wait for the Miter Saw blade to come to a complete stop before cleaning it. Do not clean blade with your fingers.
16. Assure power is off then clean up all scraps and dust from the Miter Saw before you leave it.

PLANER SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Planer.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety eye protection with ANSI Z87.1 markings and ear protection while operating the Planer.
4. Be sure to check all boards for loose knots, nails, and other foreign objects.
5. If the machine is not working or sounding proper, immediately shut off the power and inform the teacher.
6. Feed boards into the planer going with the grain of the wood.
7. Do not force boards through the planer. Keep hands off the board and let the power feed operate.
8. Be careful not to pinch fingers between the board and table.

9. Do not attempt to plane a piece that is shorter than the distance between the rollers
10. Select the proper depth of cut and the rate of speed depending on the stock being planed.
11. Depth of cut should not exceed 1/16th of an inch per pass (1/2 turn of the handwheel).
12. To remove a board that is stuck, shut off, once Planer completely stops lower the table.
13. Never look or directly into the throat of a planer at table level while it is running or in operation.
14. Keep hands away from the chip guard and the point of operation. Never reach into the Planer.
15. Do not stand directly behind the board being planed in case of kickback.
16. Wait for the Planer blades to completely stop spinning before cleaning the machine. Do not clean blades with fingers.
17. Assure power is off then clean up all scraps and dust around the Planer before you leave the area.

ROBOT/COBOT SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using any Robot.
2. Understand the program of the robot actions and motions prior to use.
3. Before robot operation check for signs of damage to the robots, observe if there are any fluid spills, broken wires, loose cables, etc. Check for malfunction lights or messages before beginning.
4. E-stops must be operational and within reach at all times when the robot is powered on. E-Stop pushbuttons must always be within reach of any person working with the robot
5. Before starting any robot movement, communicate with others loud and deliberately on the operation about to be executed, such as "Starting robot motion".
6. Wear safety eye protection with ANSI Z87.1 markings and other suitable PPE for the task. Remove loose-fitting clothing (ties, scarves, extra-long or loose sleeves, hoodies with drawstrings, etc.). Tie up long hair.
7. Stay out of the designated safety zone during operation.
8. Ensure the safety zone is free of tools and materials.
9. When possible, run a simulation before having the robot execute the program.
10. Start with slow movements until points are confirmed.
11. If a malfunction occurs, immediately press the emergency stop button and contact the Instructor/Competent Person.
12. If you notice a damaged or possibly stuck robot arm, keep everyone clear and notify the Instructor/Competent Person immediately. Do not attempt to fix or free the robot arm.
13. If uncertain of the safety of the operation to be undertaken, notify the Instructor/Competent Person and obtain guidance before proceeding.
14. Use extra caution when performing motion experiments for the first time or if recovering from a collision. When running any new code, observe the robot carefully with a hand on the E-Stop (Emergency-Stop) button
15. During robot operation everyone in the vicinity of the robot must be mentally alert and paying attention (no headphones, etc.)
16. Do not operate robots/cobots alone.
17. For collaborative robots (ISO/TS 15066:2016), personnel can be within the robot's workspace while the robot is performing autonomous functions, but it is highly recommended to avoid entering the robot's workspace unless necessary.
18. For non-collaborative robots, all personnel must be outside of the robot workspace while the robot is performing any autonomous function.
19. Disable the robot after experimentation is complete.
20. Assure power is off then clean up area when finished and return robot to the home position.

SCROLL SAW SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Scroll Saw.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Scroll Saw.
4. Check all material for foreign objects (nails, staples, etc.) before cutting.
5. Clearly mark all lines to be cut.
6. Hold the material away from the blade before you turn on the Scroll Saw.
7. Keep your fingers 2 inches minimum away from the cut line and blade.
8. Hold material firmly down on table.
9. When cutting a tight curve, first cut relief cuts then push the work piece slowly without twisting or bending the blade.
10. Do not force the work into the blade.
11. Slowly cut around tight curves – speed up on the straight lines.
12. Be cautious when gently blowing sawdust away so that you can see the line of cut.
13. If the blade breaks turn the power off and notify the Instructor/Competent Person immediately.
14. Turn off the Scroll Saw when finished cutting.
15. Wait for the Scroll Saw to come to a complete stop before cleaning it.
16. Assure power is off then clean up all scraps and dust from the Scroll Saw before you leave it.

TABLE SAW SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Table Saw.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Table Saw.
4. Check all material for foreign objects before cutting.
5. Check to ensure that all the safety guards are in place and working correctly.
6. Always use the saw guard, splitter, and anti-kickback device if equipped.
7. Make all adjustments and remove chips or dust with the power off.
8. NEVER use the miter gauge and fence together in the same operation.
9. The saw blade should extend above the work piece until the gullets of the blade clear the material.
10. NEVER cut free hand. Use the miter gauge when cross cutting (cutting across the grain), and the fence when ripping (cutting with the grain).
11. NEVER reach over the saw blade.
12. Use a push stick when ripping narrow stock or when hands would be close to the blade.
13. Do not stand in line of the cut when operating the saw in case of kickback.
14. Use extra care and precaution when sawing large material, or when using a dado or molding cutter head.
15. Use a helper to support cutting long stock, but operator should control the cutting.
16. Be sure the machine has come to a full stop and lower the blade and before leaving.
17. Do not start the saw with the blade touching the material.
18. Turn off the Table Saw when finished cutting.
19. Wait for the Table Saw blade to come to a complete stop before cleaning it. Do not clean blade with fingers.
20. Assure power is off then clean up all scraps and dust from the Table Saw before you leave it.

LATHE SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Wood Lathe.
2. Remove all jewelry, neckties, loose clothing, hoodies/clothing with drawstrings and confine long hair. Button long sleeves.
3. Always wear safety glasses with ANSI Z87.1 markings or a face shield while operating the Wood Lathe.
4. Check the stock for any foreign materials, soundness, and proper centering before cutting. When centered properly, clamp tailstock firmly in place and tighten the tailstock spindle lock.
5. Be sure to allow laminated or glued-up blanks to dry thoroughly before turning.
6. Never leave the lathe running unattended.
7. The proper speed should be selected for the diameter and hardness of the material. In general, roughing stock and beginning cuts are done at low speeds.
8. Adjust the tool rest and turn the stock using the headstock handwheel before power is turned on to be sure it can run clear of the tool rest. All adjustments to tool rest are to be made when machine is COMPLETELY stopped.
9. The lathe tool rest should be set 1/4 of an inch or less from the rough stock. The tool rest should be 1/8 of an inch above the center of and parallel to the stock.
10. Be sure that you have selected the proper sharp tools for the operations and that the handles are secure.
11. Hold the lathe turning tool firmly down against the tool rest.
12. Never use your fingers to check the work for roundness while the lathe is running, especially during roughing operations. Stop the lathe to check the progress.
13. The tool rest shall be removed for all sanding operations.
14. Wear a dust mask when performing sanding operations.
15. Do not ever wrap sandpaper around hands to sand material in the lathe.
16. Tools should not be left on the bed of lathe while it is in operation.
17. Do not allow anyone to stand behind the lathe while it is in operation. (Lathe tools caught by the wood can be thrown in that direction.)
18. Assure power is off then clean up all scraps and dust with the power turned off before leaving the Lathe.

3D PRINTER SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the 3D printer.
2. Always wear safety glasses with ANSI Z87.1 markings while operating and observing the 3D printer, removing the model from the platform, and removing the support material.
3. Run the printer at the temperature specified by the manufacturer.
4. Make all adjustments with the power turned off.
5. DO NOT touch the print nozzle.
6. Select the correct scale and other settings to print your model.
7. Properly load the platform tray so it is level.
8. Doors of the printer must remain closed for the entire operation.
9. Once printer is completely finished, remove the platform (may still be HOT and require heat insulated gloves), and carefully remove the model using a putty knife.
10. Remove all support material from the printing platform to ensure a smooth surface for the next print.
11. Some printers allow the removal of support material by carefully using chisels, pliers, and wire cutters.
12. Some support material must be removed using hazardous chemicals. Refer to the manufacturer instructions provided with these chemicals. To avoid contact with skin, some removal chemicals require the use of

neoprene gloves, chemical splash goggles with ANSI Z87.1 markings, and steel or plastic (not aluminum) tongs.

13. If chemical manufacturer specifies, have a source of fresh water nearby to rinse chemical solutions from your skin or the model. If chemicals are hazardous or corrosive know emergency eyewash station locations and how to use them.
14. Only use the printer in a well-ventilated area which can accommodate potentially hazardous vapors and fumes.
15. Follow all safety precautions provided by the manufacturer.

BAND SAW SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Band Saw.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Band Saw.
4. Check all material for foreign objects before cutting.
5. Set the blade guard 1/8th of an inch above the piece to be cut.
6. Check to ensure that all the safety guards are in place and working correctly.
7. Have all cut lines clearly marked before operating the Band Saw.
8. Hold the material away from the blade before you turn on the Band Saw.
9. Hold the material firmly on the table while cutting on the Band Saw.
10. Keep your fingers 2 inches minimum away from the cut line and blade.
11. When cutting a tight curve, first cut relief cuts then push the work piece slowly without twisting or bending the blade. Do not force the work into the blade.
12. Do not cut a smaller radius than the blade width will allow.
13. Use a V-Block to cut material that is round.
14. Turn off the Band Saw when finished cutting.
15. Wait for the Band Saw to come to a complete stop before cleaning it.
16. Assure power is off then clean up all scraps and dust from the Band Saw before you leave it.

BELT/DISC SANDER SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Sander.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Sander.
4. Check all material for foreign objects before cutting.
5. Check to ensure that all tables are at the correct angle and secure.
6. Make sure the belt and disc are not loose, torn, or clogged up.
7. Hold the material firmly on the table while sanding.
8. Keep your fingers away from the belt/disc.
9. Use only the downward side of the disc while sanding.
10. Do not force material against sanding surfaces.
11. Make all adjustments with the power off, EXCEPT when adjusting the belt tension.
12. Hold the material away from the belt/disc before you turn on the Sander.
13. Turn off the Sander when finished.
14. Wait for the Sander to come to a complete stop before cleaning it. Do not clean blade with fingers.
15. Assure power is off then clean up all scraps and dust from the Sander before you leave it.

CNC MACHINES SAFETY GUIDELINES

1. Some CNC Machines may have unique, machine specific operation and safety requirements. Once you are trained, assure your Instructor/Competent Person reviews this information with you and ask permission before using the equipment.
2. Remove all jewelry, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating and observing a CNC machine.
4. Make sure the power is turned off (and if required under the Lockout/Tagout Procedure, properly locked out per lockout tagout instructions) before setting up the machine or making adjustments.
5. Check spindle rotation, speed, depth of cut, and all power feed adjustments before starting the cut.
6. Run a simulation or dry run (without a tool bit) before starting the final run to ensure all movements are correct and prevent tool or machine damage.
7. Keep set-up tools off of machine and out of the work area.
8. Make sure the work piece is mounted or clamped securely.
9. Make sure all doors to the work area are fully closed.
10. Remain with machine for the duration of its operation.
11. If a malfunction on occurs, immediately press the emergency stop (E-Stop) button and contact the Instructor/Competent Person.
12. Use brush to remove chips and shavings only when the machine is completely stopped.
13. Use the proper tools to tighten the bit/cutter head in the collet chuck, then remove all tools from the work area before operating the CNC machine.
14. Carefully remove bit when finished using gloves as bit can be hot and sharp.
15. Assure power is off then clean up area when finished and return the CNC to the home position.

DRILL PRESS SAFETY GUIDELINES

1. Once trained, ask for Instructor/Competent Person's permission before using the Drill Press.
2. Remove all jewelry and gloves, eliminate loose clothing, hoodies/clothing with drawstrings and confine long hair.
3. Always wear safety glasses with ANSI Z87.1 markings while operating the Drill Press.
   Center punch all holes to be drilled.
4. Check the end of the drill bit – Make sure it is not square.
5. Make all adjustments with the power turned off.
6. Use the chuck key to tighten the drill bit in the chuck.
7. REMOVE THE CHUCK KEY before turning on Drill Press.
8. Make sure drill bit lines up with the hole in the center of the table to avoid drilling into the table.
9. Back up stock being drilled to avoid splintering.
10. Clamp material to the table – It should extend to left.
11. Check the depth stop.
12. Do not force the drill bit through the material.
13. Carefully remove drill bit when finished using gloves as bit can be hot and sharp.
14. Assure power is off then clean up the Drill Press and area around it.

FOOT SHEAR SAFETY GUIDELINES

1. Personal protective equipment: Wear ANSI-approved safety glasses or goggles with side shields, and a face shield if needed. Also, wear a dust mask in dusty conditions. Avoid wearing loose clothing, jewelry, or dangling objects, and keep hair, clothing, and gloves away from moving parts.
2. Stay alert: Don't use the shears if you're tired or under the influence medication, etc.
3. Maintain a safe distance: Hold the shear by the handle while keeping a safe distance.
4. Keep hands away from the blade: Avoid contact with the moving blade, which can cause severe injury.
5. Keep your work area clean and organized: A cluttered work area can increase the risk of accidents.
6. Identify the emergency stop button: Know where the emergency stop button is located so you can disable the cutting blade in an emergency.
7. Don't exceed the tool's capacity: For foot-operated manual shears, don't put your unused foot under the treadle.

SHEET METAL BENDER SAFETY GUIDELINES

1. Always wear safety clothing, including eye protection and protective footwear, while operating the machine.
2. Keep all body parts and any foreign objects away from the nose bar and clamping area of the brake while in operation.
3. Never use a pipe or bar on the clamp handles for additional leverage.
4. Keep clear of the counterweight and apron swing area while operating the brake.
5. Keep the work area around the brake clear and clean to avoid slipping or tripping.
6. Do not operate the machine if it has been damaged or is not operating properly.
7. Do not wear jewelry (watches, rings, necklaces, etc.), or loose fitting clothing while operating or servicing the machine.
8. The machine shall only be operated or serviced by properly trained, authorized personnel.
9. Replacement parts should have the same specification and operation as the original parts on the machine.
10. All guards and covers must be in place before operating the machine.
11. Be sure brake is set on smooth, level floor and is set up properly.

VACUUM FORMER SAFETY GUIDELINES

1. Always wear necessary personal protective equipment when operating the machine. This usually includes safety glasses, gloves and protective clothing. If the machine makes a lot of noise, consider wearing ear protectors.
2. Keep work area clean and free of clutter. Remove any unnecessary objects or materials that may interfere with machine operation. Store tools and equipment properly to prevent tripping hazards.
3. Check the machine regularly for any signs of damage or wear. Make sure all guards, covers and interlocks are in place and functioning properly. Do not operate a machine that appears to be faulty or in need of repair.
4. Make sure the vacuum thermoforming machine is properly grounded to prevent the risk of electric shock. Follow the manufacturer's instructions for electrical connection and grounding procedures.
5. Follow the recommended operating procedures provided by the manufacturer. Pay attention to temperature settings, cycle times and other parameters to ensure safe and efficient operation. Avoid exceeding the machine's specified capacity or exceeding its limits.

6. During operation, certain parts of the machine, such as heating elements and molds, may become very hot. Always use caution when working near these surfaces to avoid burns or other injuries. Allow sufficient cooling time before touching or handling heated parts.
7. Please be aware of emergency shutdown procedures in case of any unforeseen circumstances such as power outage, equipment failure or material blockage. Become familiar with the location of the emergency stop button and how to shut down the machine safely.
8. Schedule regular maintenance and inspections of your vacuum thermoforming machine. This includes cleaning, lubricating moving parts and replacing worn parts as needed. Hire qualified technicians to perform maintenance tasks.

PIPE BENDER SAFETY GUIDELINES

1. Wear ANSI-approved safety goggles and heavy-duty work gloves during use.
2. As the pipe or tubing is being bent, there is a significant pinch hazard created. Keep hands, fingers, feet, and any item which may be injured or damaged away from the Tube Bender and hinge point areas of this tool when in operation.
3. Keep working area clean and free from unrelated materials.
4. Ensure all non-essential persons keep a safe distance while the pipe bender is in use.
5. When bending pipe or tube, the bender should be in a horizontal position with sufficient clear space for the end of the pipe to move through the bending arc.
6. Pipe benders designed to bend soft metal pipe or tubing, such as copper or aluminum, should not be used to bend hard metal pipe, such as black iron pipe. You will damage the equipment.
7. Do not attempt to bend brittle materials, such as glass or hard plastic. Those materials may shatter and potentially cause injury.

HORIZONTAL METAL BANDSAW SAFETY GUIDELINES

1. Wear appropriate PPE.
2. Lift the head of the unit up and lock it in a position of allowing the stock to pass under the blade.
3. Clamp workpiece firmly into the vise. Long material must be supported on the ends.
4. Ensure all guards are secure and functional.
5. Adjust blade guards to cover unused portion of blade.
6. Once the blade is turned on, allow the upper head assembly to come down slowly until the teeth are cutting the material. Then allow the automatic feed to take effect.
7. Keep your hand away from the cutting area once the blade has been started.
8. Do not leave a running saw unattended.
9. Do not leave the saw until it has come to a complete stop.
10. Ensure the head is securely locked in an upward potion before removing workpiece from the vise. The head should be far enough from work area, to keep your hands and arms from coming in contact with the blade while removing stock, and cleaning.
11. Use caution when removing cut stock from the machine. Sharp edges are created on both the cut and drop materials.
12. Once stock is removed, brush off chips from machine, and wipe down with paper towel.

PLASMA CUTTER SAFETY GUIDELINES

1. Follow welding guidelines above.
2. ELECTRIC SHOCK - May be fatal. Install and ground the welding machine properly. Do not touch live electrical parts or electrodes with bare skin, gloves or wet clothing. Isolate yourself from both the floor and the workpiece.
3. FUMES AND GASES - May be hazardous to your health. Keep your head away from fumes. Work in the presence of adequate ventilation and use ventilators around the arc to prevent gases from forming in the work area. Wear respirators when needed.
4. ARC RAYS - May injure the eyes and burn the skin. Protect your eyes with welding masks fitted with filtered lenses and protect your body with welding clothing. Protect others by installing welding shields or curtains.
5. RISK OF FIRE AND BURNS- Sparks (sprays) may cause fires and burn the skin; you should therefore make sure there are no flammable materials in the area and wear appropriate protective welding garments.
6. NOISE- Wear hearing protection as the plasma cutting/welding procedure may produce high noise levels.
7. EXPLOSIONS- Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes.
8. All cylinders and pressure regulators used in welding operations should be handled according to equipment.

OSCILLATING SPINDLE SANDER SAFETY GUIDELINES

1. Wear a dust mask or respirator.
2. Know the condition of the spindle sander. If any part is missing, bent, or does not operate properly, replace the part before using the sander.
3. Determine the type of work you are going to be doing before operating the spindle sander.
4. Secure your work. Support the workpiece securely on the table and hold it with both hands.
5. Be aware of the direction of feed. Feed the workpiece into the sanding sleeve against the direction of rotation of the sanding sleeve.
6. Always keep your hands out of the path of the sander and away from the sanding sleeves.
7. Avoid hand positions where a sudden slip could cause your hand to move into the spindle. Do not reach underneath the workpiece or around the sanding sleeve while the spindle is rotating.
8. Disconnect the sander after turning off the power switch. Wait for the spindle to stop rotating before performing maintenance. The sander must be disconnected when not in use or when changing accessories, sanding sleeves, rubber spindles, or other items.
9. Make sure there are no nails or other foreign objects in the area of the workpiece to be sanded.
10. Never use this sander for wet sanding. Failure to comply may result in electric shock causing serious injury or worse.
11. Use only identical replacement parts when servicing this spindle sander.
12. Make sure the spindle has come to a complete stop before touching the workpiece.
13. Take precautions when sanding painted surfaces. Sanding lead-based paint is NOT RECOMMENDED.
14. Do not eat, drink, or smoke in an area where painted surfaces are being sanded.
15. Use a dust collection system when possible. Seal the work area with plastic. Do not track paint dust outside of the work area.
16. Thoroughly clean the area when the paint sanding project is completed.

SAND BLASTER SAFETY GUIDELINES

1. Do not sandblast with silica containing materials.
2. Wear appropriate personal protective equipment (PPE) including a respirator or dust mask, safety glasses, hearing protection, gloves, and appropriate clothing.
3. Start up the sand blasting equipment according to manufacturer's instructions, ensuring that all safety interlocks are engaged.
4. Adjust the blasting pressure and nozzle angle to achieve the desired surface finish without causing damage to the workpiece.
5. Begin the blasting process, moving the nozzle back and forth evenly across the surface of the workpiece to remove contaminants or coatings.
6. Maintain a safe distance from the blasting area to avoid exposure to airborne
7. abrasive media or rebounding particles.
8. Be aware and investigate any unusual noises, vibrations, or odors during blasting.
9. If any issues or errors occur during blasting, stop the equipment immediately and troubleshoot the problem before resuming.
10. After blasting is complete, shut down the equipment and inspect the workpiece for quality and completeness.

HOBART MIXER SAFETY GUIDELINES

- Do not operate without guard closed and in place.
- Keep your hands, loose clothing, long hair and body away from the mixer while it's running. The force of the mixer can cause serious injury.
- Stop the mixer: Before adding ingredients, stop the mixer and wait for all motion to stop.
- Use the correct bowl and agitator: Use the correct sized bowl and agitator for the mixer.
- Use approved attachments: Only use attachments that are approved by Hobart.
- Service regularly: Have the mixer serviced as recommended by manufacturer.
- Clean regularly: Clean the mixer and attachments after each use.
- Keep it clean: Keep the mixer and work area clean to reduce the risk of tripping or slipping.
- Cover blades: Cover the blades when the mixer isn't in use.
- If dust is created use the dust collector. You must wear a dust mask and goggles.

FALL PROTECTION SAFETY GUIDELINES

Persons who are near an unprotected edge four feet or more above lower levels must be protected from falling by guardrails, safety nets, or personal fall arrest systems. See your Instructor/Competent Person if you will be encountering this situation. When working on scaffolding all scaffolding safety requirements must be followed.

SCAFFOLD GUIDELINES

Persons who erect or disassemble scaffolds must be trained. A competent person must inspect the scaffold before each shift it is used. Scaffolds must be inspected daily for damage and removed from service immediately if damaged. Fall protection and other pertaining regulatory requirements must be followed when using scaffolds.

Forklift Operations

Safety Training
• Only trained and certified workers may operate a forklift.
• Ensure operators are trained on types of trucks in use.
Forklift Operations
• Perform pre-use inspection
Always operate the vehicle according to the manufacturer's instructions.
• Always wear a seatbelt when the forklift has one.
• Never exceed the rated load and ensure it is stable and balanced.
• Do not raise or lower the load while traveling.
• Keep a safe distance from platform and ramp edges.
• Be aware of other vehicles in the work area.
• Have clear visibility of the work area and ensure you have enough clearance when raising, loading, and operating a forklift.
• Use proper footing and the handhold, if available, when entering the lift.
• Use horns at cross aisles and obstructed areas.
• Watch for pedestrians and observe the speed limit.
• Do not give rides or use the forks to lift people.
Forklift Maintenance
• Remove from service any forklift found to be in unsafe operating condition.
• Keep forklifts in clean condition; free of excess oil and grease.
• Repair and maintain according to the manufacturer's recommendations

Mobile Elevating Work Platform (MEWP)

• Only trained and certified workers may operate a MEWP.
• Ensure operators are trained on types of MEWP in use.
• Conduct pre-use inspections.
• Secure work area.
• Operate within load limits and safe locations.
• Use fall protection when required
• Properly maintain and inspect equipment

LOCKOUT/TAGOUT SAFETY GUIDELINES

Only Trained and Authorized Personnel are permitted to lockout/tagout equipment. Students are never permitted to lockout equipment alone.

RADIATION SAFETY GUIDELINES

All students will work under the direct supervision of an authorized user.

Before students are allowed to handle radioactive materials, the following procedures shall be completed. Faculty must be present at all time during the use of radioactive materials.

1. The specific procedures to be conducted by the students must be submitted to the RSO for review and approval.
2. The Radiation Safety Rules and General Safety Rules for Laboratories must be distributed and reviewed by authorized user with students.
3. The specific techniques to be performed must be demonstrated by authorized user with students.
4. The techniques for monitoring facilities and personnel must be reviewed by authorized user with students.
5. The procedures for the proper disposal of all generated wastes must be reviewed by authorized user with students
6. The procedures for handling spills or other emergency events must be reviewed by authorized user with students.

X-RAY GENERATING EQUIPMENT SAFETY GUIDELINES

Prior to working with x-ray generating equipment, all users will be required to review the EHS X-Ray Generating Equipment Procedure and training material provided to them by EHS. Verification that this training has been completed will be recorded on the *Appendix A Training and Instruction Checklist*. Individual faculty members will

be responsible for assuring that graduate and undergraduate students using x-ray generating equipment are adequately trained and the documentation of this training is recorded.

Ceramic Studio Safety

Ceramic art and pottery has a wide variety of hazards. The specific hazards and precautions can be divided into four areas:
1. working with clay
2. glazing and coloring
3. firing in a kiln
4. potential leaching of finished ware

Clay
Clays are minerals composed of hydrated aluminum silicates, often containing large amounts of crystalline silica. Other impurities may include organic matter or sulfur compounds. Sometimes, grog (ground firebrick), sand, talc, vermiculite, perlite, and small amounts of minerals such as barium carbonate and metal oxides, are added to modify clay properties. Clays can be worked by hand or on the potter's wheel, or cast in a clay slurry into molds. Clay is made by mixing dry clay with water in clay mixer. Clay slip is made by adding talcs which themselves can be contaminated with fibrous asbestos or asbestos-like materials. Geographical sources of talcs are relevant, for example, New York State talcs are notoriously asbestos contaminated, while Vermont talcs are not. Pfizer has some fiber-free talcs.

Hazards
1. There have been known cases of silicosis, or "potter's rot, from chronic inhalation of large amounts of free silica during clay mixing. Symptoms of silicosis include: shortness of breath, dry cough, emphysema, and high susceptibility to lung infections such as tuberculosis. The disease may take years to develop. Silica dust exposure is not hazardous by skin contact or ingestion.
2. Chronic inhalation of kaolin is moderately hazardous, and can result in kaolinosis, a disease in which the lungs become mechanically clogged.
3. Asbestos is extremely toxic by inhalation and possibly by ingestion. Asbestos inhalation may cause asbestosis, lung cancer, mesothelioma, stomach cancer, and intestinal cancer.
4. Sand, perlite, grog, and vermiculite contain free silica and are, therefore, highly toxic by inhalation. Vermiculite is also frequently contaminated with asbestos.
5. There is a danger of accidents if clay or water can be added while the mixer is in operation.
6. Bags of clay and glaze materials can be very heavy, and lifting can cause back problems.
7. Hypersensitivity pneumonia, asthma, or other respiratory problems may occur with exposure to molds growing in wet clay that is being soured or aged in a damp place, in slips that stand for months, or with inhalation of dry aged clay. Molds can cause or exacerbate skin problems and change the workability of clay.
8. Throwing on a potter's wheel for long periods of time can result in carpel tunnel syndrome because of the awkward position of the wrists. Pain, numbness and/or pins and needles in the thumb and first three fingers, are common symptoms. Back problems can occur from bending over the potters wheel for long periods of time.
9. Hand contact with wet clay can result in abrasion and dryness of fingertips and hands. Moving parts of kickwheels can cause cuts and abrasions.
10. Clay scraps on the floor, bench and other surfaces can dry and pulverize, producing an inhalation hazard due to the presence of free silica. Similarly, reconditioning clay by pulverization and sanding finished green ware, can create very high concentrations of hazardous silica dust.

Precautions

1. Use premixed clay to avoid exposure to large quantities of clay dust.
2. Clay storage and mixing should take place in a separate room. Bags of clay (and other pottery materials) should be stacked on palettes or grids off the floor for easier clean-up.
3. All clay mixers should be equipped with local exhaust ventilation to remove fine silica dust particles from the air.
4. Clay mixers should be equipped with proper machine guards so that they cannot be opened to add clay or water while the mixer blades are turning.
5. Wear separate work clothes while in the studio. Choose clothes of material and design that don't trap dust. Wash these clothes weekly, and separately from other laundry.
6. Avoid contact of clay with broken skin. Use a skin moisturizer.
7. To prevent back problems, always lift with knees bent. Also, use a standup wheel (Cranbrook style treadle wheel), or elevate electric wheels to a height that doesn't require bending over. Exercise and massage may relieve minor muscular pain.
8. Keep wrists in unflexed position as much as possible to prevent carpel tunnel syndrome. Take frequent work breaks.
9. Be careful of the moving parts on kickwheels.
10. Recondition clay by cutting still-wet clay into small pieces, letting them air-dry, and soak in water.
11. Finish green ware while still wet or damp with a fine sponge instead of sanding when dry. Do not sand greenware containing fibrous talc.
12. Wet mop floors and work surfaces daily to minimize dust levels and prevent dry scraps from becoming pulverized.

Glazes

Glazes used to color or finish clay pieces are a mixture of silica, fluxes and colorants. Common fluxes include lead, barium, lithium, calcium and sodium, and are used to lower the melting point of silica. The actual colorants, which are an assortment of metal oxides usually account for less than 5% of the glaze by weight.

Originally, soluble raw lead compounds including red lead, white lead, galena, and litharge were used as fluxes in low-fire glazes. In fact, over 400 cases of lead poisoning were reported in British potters in 1897. Lead frits and good housekeeping greatly lowered the number of potters that had been poisoned by these highly toxic lead compounds. Frits are made of melted minerals and metal compounds that are sintered and ground into powder form. While lead frits are sometimes assumed to be insoluble and nontoxic, leaching tests with acids have shown that many frits are as soluble as raw lead compounds and, in fact, there have been cases of lead poisoning from both inhalation or ingestion of these.

High fire porcelain and stoneware techniques eliminate the need for lead as a flux. Also, alkali earth or alkaline earth fluxes can be used for low-fire conditions instead of lead. Silica may also be removed from leadless type glazes. The substitution can be based on boric oxide as the glass-former, instead of silica. Alkali earth fluxes include sodium, potassium, and lithium oxides; alkaline earth fluxes include calcium, magnesium, barium, and strontium oxides. Minerals containing these fluxes include certain feldspars, nepheline syenite, petalite, bone and plant ashes, whiting, and dolomite.

An assortment of metal oxides or other metal compounds produce particular colors when fired. These are added in such small amounts to the glaze, that they aren't usually a great hazard. Luster or metallic glazes are fired in a reduction atmosphere. These glazes can contain mercury, arsenic, highly toxic solvents such as aromatic and chlorinated hydrocarbons, and oils such as lavender oil. The common metals are often resinates of gold, platinum, silver, and copper. Some underglazes and overglazes use mineral spirits as the vehicle instead of water.

Glaze components are weighed, sorted and mixed with water. These materials are often in fine powdered form, and result in high dust exposures. Glazes can be dipped, brushed, poured, or sprayed on the ceramic piece.

Hazards

1. Lead compounds are highly toxic by inhalation or ingestion. Symptoms of lead poisoning include: damage to the peripheral nervous system, brain, kidney, or gastrointestinal system, as well as anemia, chromosomal damage, birth defects and miscarriages.
2. Lead-glazed foodware can leach lead if not fired properly, or if the glaze composition is not correctly adjusted. For example, the addition of copper to lead frits renders a higher solubility of lead in the final fired ware. Acidic drinks and foods such as tomato juice, citric juices, sodas, tea, or coffee, can increase this hazard.
3. A glaze label marked "lead-safe" means that the finished ware, if fired properly, will not release lead into food or drink. The actual glaze is still hazardous to handle and fire and may contain lead. Adequate control over firing conditions is very difficult in the craft studio.
4. Other fluxes such as barium and lithium are also highly toxic by inhalation, but less so than lead.
5. Certain colorant compounds of particular metals are known or probable human carcinogens, including: arsenic, beryllium, cadmium, chromium (VI), nickel, and uranium.
6. Antimony, barium, cobalt, lead, lithium, manganese, and vanadium colorant compounds are highly toxic by inhalation.
7. Antimony, arsenic, chromium, vanadium, and nickel compounds are moderately toxic by skin contact.
8. Free silica occur in many of the clays, plant ash, flint, quartz feldspars, talcs, etc. used in glazes. See the discussion above for the hazards of silica and the disease silicosis. Weighing and mixing glazes can result in the inhalation of these toxic materials.
9. Soda ash, potassium carbonate, alkaline feldspars, and fluorspar used in glazes are skin irritants.
10. Spray application of glazes is very hazardous because of the potential inhalation of glaze mists.
11. Dipping, pouring, and brushing certain glazes may cause skin irritation and accidental ingestion due to careless personal hygiene habits.
12. Glazes containing solvents are both flammable and hazardous.

Precautions

1. Use lead-free glazes. If the glaze does not state "lead-free" or "leadless" on the label, assume it contains lead until proven otherwise.
2. Lead glazes should only be used on non-foodware items. Design lead-glazed pieces so that they won't be used for food or drink. Lead-glazed pottery should be labeled as lead containing.
3. If possible, don't use colorants that are known human carcinogens and avoid probable human carcinogens. There is no known safe level of exposure to carcinogens.
4. Consider wearing a respiratory when weighing and mixing powdered. Wet glazes are not an inhalation hazard. Good housekeeping procedures and cleanup of spills reduce the risk of inhalation or ingestion of toxic dusts. Wet mop spilled powders.
5. Gloves should be worn while handling wet or dry glazes.
6. Good dilution ventilation or local exhaust ventilation should be available when applying solvent-containing glazes.
7. Basic personal hygiene rules should be followed including restricting eating, drinking, or smoking in the studio, and wearing personal protective equipment such as gloves, and separate work clothes or coveralls. Wash hands after work. Leftover glazes and glaze scrapings can be homogenized, combined, tested, and used as a glaze.

Kilns

Electric kilns and fuel-fired kilns are used to heat the pottery to the desired firing temperature. The most common type are the electric kilns. Heating elements heat the kiln as electric current passes through the coils. The temperature rises until the kiln is shut off.

Fuel-fired kilns are heated by burning gas (natural or propane), oil, wood, coke, charcoal or other materials. Propane gas or natural gas is used most often. These kilns can be either located indoors or outdoors. The fuels produce carbon monoxide and other combustion gases. Fuel fired kilns are usually vented from the top through a chimney.

Firing temperatures can vary from as low as 1382˚F for raku and bisque wares, to as high as 2372 ˚F for stoneware, and 2642 ˚F for certain porcelains. The early stages of bisque firing involves the oxidization of organic clay matter to carbon monoxide and other combustion gases. Sulfur breaks down later producing highly irritating sulfur oxides. Also, nitrates and nitrogen-containing organic matter break down to nitrogen oxides.

Galena, cornish stone, crude feldspars, low grade fire clays, fluorspar, gypsum, lepidolite and cryolite can release toxic gases and fumes during glaze firings. Carbonates, chlorides, and fluorides are broken down to releasing carbon dioxide, chlorine, and fluorine gases. At or above stoneware firing temperature, lead, antimony, cadmium, selenium and precious metals vaporize and the metal fumes can either escape from the kiln, or settle inside the kiln or on ceramic ware in the kiln. Nitrogen oxides and ozone can be generated from oxygen and nitrogen in air.

Hazards

1. Chlorine, fluorine, sulfur dioxide, nitrogen dioxide, and ozone are highly toxic by inhalation. Bisque firings of high-sulfur clay have caused the production of great amounts of choking sulfur dioxide. Other large acute exposures to gases are not common. Inhalation of large amounts of these gases can result in severe acute or chronic lung problems. Long-term inhalation of low levels of these gases can cause chronic bronchitis and emphysema. Fluorine gas can also cause bone and teeth problems.
2. Many metal fumes generated at high temperatures are highly toxic by inhalation. Since lead vaporizes at a relatively low temperature, it is especially hazardous.
3. Carbon monoxide from fuel-fired kilns or the combustion of organic matter in clays is highly toxic by inhalation and can cause oxygen starvation. One symptom of carbon monoxide poisoning is an intense frontal headache, unrelievable by analgesics.
4. Hot kilns produce infrared radiation, which is hazardous to the eyes. There have been reports of cataracts, from years of looking inside the hot kilns.
5. Heat generated by the kiln can cause thermal burns. The Edward Orton Jr. Ceramic Foundation reported that when a kiln was operated at 2370 ˚F, the surface temperature, was at and above 595 ˚F, and the temperature one foot away from the peephole was 156˚F.
6. Heat produced by even small electric kilns can cause fires in the presence of combustible materials or flammable liquids.
7. If an electric kiln fails to shut off, the heating elements melt which can cause fires. Gas kilns also generate a lot of heat, and room temperatures often exceed 100 ˚F.

Precautions

1. Infrared goggles approved by the American National Standards Institute (ANSI) or handheld welding shields should be worn when looking into the operating kiln. Shade number from 1.7 to 3.0 is recommended, but a darker shade may be required if spots appear in front of one's eyes after looking away from the kiln.
2. Do not use lead compounds at stoneware temperatures since the lead will vaporize.
3. Lumber, paper, solvents, or other combustible and flammable materials should not be stored in kiln areas.
4. Always check that the kiln has shut off.
5. If gas leaks are suspected (e.g. gas odor): shut off gas at the source; shut off power to the kiln room at the circuit breaker; and call the gas company. Test for leaks with nonfat, soapy water or use approved leak-detection solutions.

Special Processes

While most glaze firings refer to firing a glaze-coated pot in the kiln, special processes sometimes are used. Salt glazing and raku firing are two examples.

Salt Glazing

This process involves throwing wet salt (sodium chloride) into the heated kiln while the bisque ware is being fired. Wet salt at high temperatures decomposed to sodium and chlorine. The sodium reacts with the bisque ware to form a glaze. Large amounts of hydrogen chloride gas and possibly chlorine are also formed. Sodium carbonate (washing soda) can also be used. Carbon dioxide is generated instead of hydrogen chloride.

Hazards

1. Hydrogen chloride gas is highly toxic by inhalation. Health effects are both similar and more irritating compared with most other kiln gases. Often, local environmental protection laws ban salt kilns.
2. Hydrogen chloride and water vapor form hydrochloric acid, which can corrode metal fittings in the area.

Precautions

1. Substitute safer sodium carbonate for sodium chloride.
2. Sodium chloride salt glazing should only be done outdoors. Kilns should be equipped with canopy hoods and chimney stacks that are tall enough to disperse the hydrogen chloride safely.
3. All gas piping, and metal fixtures should be routinely checked for corrosion.

Raku Firing

Raku involves first firing ware at a low temperature in a regular gas kiln, and then removing the still hot pieces and placing in them in sawdust, leaves or other organic materials for a reduction phase.

Hazards

1. See above for the hazards and safety precautions used with gas kilns.
2. The reduction step produces large amounts of smoke and carbon monoxide.
3. Treated wood or other materials can yield an exposure to highly toxic preservatives or pesticides, such as arsenic and chromium compounds.

Precautions

1. Raku should only be done outdoors because of smoke. Be careful to not locate raku near air intakes or open windows of buildings.
2. Do not use materials that have been treated with preservatives or pesticides for the reduction phase.

Electric Kilns

CAUTION: The kiln produces extreme heat.

Before using the machine, perform the following general safety checks :

1. Make sure you understand all of the instructional material before operating this equipment. Failure to follow safety instruction and warnings may result in serious personal injury, fire or property damage.
2. If you have any questions or uncertainties, please ask your studio technician before use.
3. Long hair, scarves, loose clothing, jewelry and ties pose an entanglement hazard. Please make sure these are all constrained prior to operating the equipment.
4. Do not conduct any maintenance or repairs on this equipment.

Loading the Kiln

1. Ensure the kiln is off.
2. Make sure the ventilation system is working properly.
3. Open the lid.
4. Load the kiln as fully and evenly as possible to ensure even heat distribution and oxygen circulation. Do not rush loading.
5. For bisque firing: pieces may touch one another and some can be stacked.
6. For glaze firing: the pieces should not touch each other or have glaze on the bottom touching the shelf
7. Determine firing schedule.
8. Prepare to fire-observe caution when firing as the surface becomes very hot and can result in burns; alert others when firing.

Firing the Kiln

1. Set firing program in Bartlett Controller (reference Bartlett Controller Manual)
2. Push in the kiln sitter's plunger and press “Start” to begin firing.
3. Close the lid-do not attempt to use the kiln with the lid open. Do not touch the kiln’s surface.
4. Allow the kiln to fire until target temperature is reached and kiln sitter has been triggered.

After Using the Kiln

1. Never open the kiln unless you know it is cool. Allow sufficient time for kiln to completely cool and use extreme caution before unloading
2. Clean the kiln to remove contaminants.
3. Clean the surrounding area. **NEVER** clean the kiln while it is running.

Gas Kilns

1. Ensure the kiln is off.
2. Check structural condition of the kiln. Report any problems.
3. Ensure that combustible and flammable materials are not stored in kiln areas.
4. Make sure that location and use of fire extinguishers are known.
5. Make sure the ventilation system is working properly.

Loading the kiln

1. Secure door while loading.
2. Load the kiln as fully and evenly as possible to ensure even heat distribution and oxygen circulation. Do not rush loading.
3. For bisque firing: pieces may touch one another and some can be stacked.
4. For glaze firing: the pieces should not touch each other or have glaze on the bottom touching the shelf
5. Determine firing schedule.
6. Prepare to fire-observe caution when firing as the surface becomes very hot and can result in burns; alert others when firing. **Do not leave kiln unattended**

Firing the Kiln

6. Create a cone pack and place in front of eyelet to monitor temperature during firing.
7. Open the door to the kiln.
8. Wait several minutes for any escaped gas to clear the firing chamber and then light the kiln.
9. Follow manufacturer's operating procedures when firing gas kilns.
10. Close the door - do not attempt to use the kiln with the door. open. Do not touch the kiln's surface.
11. Allow the kiln to fire until target temperature is reached and cone has began to slump

After Using the Kiln

1. Never open the kiln unless you know it is cool. Allow sufficient time for kiln to completely cool and use extreme caution before unloading
2. Clean the kiln to remove contaminants.
3. Clean the surrounding area. **NEVER** clean the kiln while it is running.

Pottery Wheels

Before using the machine, perform the following general safety checks :

1. Make sure you understand all of the instructional material before operating this equipment. Failure to follow safety instruction and warnings may result in serious personal injury, fire or property damage.
2. If you have any questions or uncertainties, please ask your studio technician before use.
3. Long hair, scarves, loose clothing, jewelry and ties pose an entanglement hazard. Please make sure these are all constrained prior to operating the equipment.
4. Do not conduct any maintenance or repairs on this equipment.

Using the Pottery Wheel

1. Be cautious of other people working in the proximity.
2. Center your clay on the wheel head.
3. Position your body around the potter wheel (see picture 2), keeping elbows in and not over-exerting or slumping your body over the work.
4. The pottery wheel has a plug which may be used to disable the machine in the event of an emergency.
5. Turn on the power switch - do not operate any switches with wet hands, as this may cause electric shock.
6. Change the direction of the wheel head using the switch only when the wheel has come to a complete stop.
7. Press the foot pedal gently to increase speed
8. Step the foot pedal all the way down to stop the wheel.

9. Dispose of the bucket of water as waste.
10. Clean the wheel with a damp cloth and sweep the floor.

Pneumatic Clay Extruder

Before using the machine, perform the following general safety checks:

1. Make sure you understand all of the instructional material before operating this equipment. Failure to follow safety instruction and warnings may result in serious personal injury, fire or property damage.
2. If you have any questions or uncertainties, please ask your studio technician before use.
3. Long hair, scarves, loose clothing, jewelry and ties pose an entanglement hazard. Please make sure these are all constrained prior to operating the equipment.
4. Do not conduct any maintenance or repairs on this equipment.
5. Make sure the cord is kept away from heat, oil, sharp edges or moving parts and does not pose a trip hazard.
6. Ensure you know where the emergency stops for your equipment are prior to use and within reach during operation. In the absence of an emergency stop, ensure that the power switch is within reach.

Using the Extruder

1. Do not insert hands into the pneumatically actuated plunger or the die chute that presses out the clay (see picture 1) to prevent pinch points.
2. Select the die square for forming the shape (see picture 2).
3. Clamp the square to the extruder (see picture 3) – be careful of pinch points.
4. Be cautious of other people working in the proximity.
5. Lift the extruder arm and allow it to lock up.
6. Load the clay into the clay barrel.
7. Lower the extruder arm.
8. Turn on the power switch – do not operate switches with wet hands as this may cause shock.
9. Press the foot pedal to control the air flow – do not stamp it
10. Keep hand away from the system to prevent injury and keep them free to control the form.
11. Stop operation of the extruder if anything unusual happens.
12. Once the process is complete, turn off the extruder when not in use.
13. Remove the clay from the extruder.
14. Clean the extruder.

Clay Mixer

Before using the machine, perform the following general safety checks:

1. Make sure you understand all of the instructional material before operating this equipment. Failure to follow safety instruction and warnings may result in serious personal injury, fire or property damage.
2. If you have any questions or uncertainties, please ask your studio technician before use.
3. Long hair, scarves, loose clothing, jewelry and ties pose an entanglement hazard. Please make sure these are all constrained prior to operating the equipment.
4. Do not conduct any maintenance or repairs on this equipment.
5. Ensure you know where the emergency stops for your equipment are prior to use and within reach during operation. In the absence of an emergency stop, ensure that the power switch is within reach.
6. Inspect the mixer for any visible damage, loose parts, or worn-out components

Using the Clay Mixer

1. If mixing from reclaim, break down large chunks of clay into smaller, manageable pieces before loading them into the machine. If mixing from dry materials, weigh out components and add them in gradually.
2. Load the machine with the appropriate amount of clay, following the manufacturer's guidelines. Overloading can strain the motor and reduce the efficiency of mixing.
3. Ensure the lid and ventilation hood is securely in place before starting the machine.
4. Turn on the mixer using the designated switch. Gradually increase the speed if adjustable.
5. Always stop machine when readjusting clay. Never put your hands in mixer while it is in operation.
6. Continuously monitor the machine during operation. Listen for unusual noises that could indicate a problem.
7. Turn off the machine when clay is at desired consistency.
8. Clean the clay mixer according to studio etiquette standards. Do not leave clay residue in mixer.
9. If required, lubricate moving parts according to the manufacturer's recommendations.

Slab Roller

1. Make sure you understand all of the instructional material before operating this equipment. Failure to follow safety instruction and warnings may result in serious personal injury, fire or property damage.
2. If you have any questions or uncertainties, please ask your studio technician before use.
3. Long hair, scarves, loose clothing, jewelry and ties pose an entanglement hazard. Please make sure these are all constrained prior to operating the equipment.
4. Do not conduct any maintenance or repairs on this equipment

Using the Slab Roller

1. Prepare the material to be compressed with powder release agent on both sides to prevent canvas from sticking.
2. Place a canvas/board on to the table (see picture 1);
3. Place the material to be flattened on to the canvas/board - Never put hands under the roller when positioning your material to prevent pinch points.
4. Place another canvas/board on top of the material-straighten it so that it lies centered on the bed.
5. Raise or lower the roller based on the thickness of the slab.
6. Stand directly in front of the handle (see picture 4).
7. Keep hands as far away from the rolling mechanism as possible to prevent 'NIP' points.
8. Firmly hold the handle with both hands and rotate it so that the carriage moves along the bed (see picture 5), forcing the clay to flatten - careful that nothing comes in contact with the rotating handle to prevent an entanglement hazard.
9. Move the carriage back and forth to flatten.
10. Ensure that the material and canvasses/boards are kept flat.
11. Move the carriage all the way to the end of the bed.
12. Make the desired passes until the clay is compressed.
13. Once compressed, return the carriage to the original position-do not slam it against the end of the frame.
14. Remove the top canvas and the compressed clay.

YOUNGSTOWN STATE UNIVERSITY
Office of Environmental Health & Safety

Youngstown State University

Makerspaces

(WIP, WTC, ETC, Art, Ceramics, Theatre, Scene Shop)

General Safety Orientation Acknowledgement

After reading this document, please sign below and give to your Professor, Instructor, Competent Person who will keep this document and send a copy of this page to the EHS Department

Student Name (Print): _____

Student Name (Signature)_____

Course/Club/Organization: _____ Date: _____

Instructor/Competent Person/Advisor/Competent Person Name: _____

Safety is of utmost importance at Youngstown State University. I take responsibility for myself and will follow all laboratory and makerspaces safety and health rules, policies and procedures. I will complete all safety and health training.

I understand that laboratory and makerspaces activities may involve high risk work with chemical or physical hazards (high voltage, mechanical hazards) and must NOT be conducted alone. All high-risk laboratory and makerspaces work must be conducted with a partner or co-worker and MUST always have a Competent Person in site of the activity.

I understand that high risk work on YSU campus outside of normal business hours (M-F 7:30am to 5pm) must be pre-approved in writing by the department chair and must include emergency contact information.

I understand that experiments or other tasks that continue to operate while someone is not present (unattended) must be pre-approved in writing by the department chair and must include emergency contact information.

The first offense for a safety and health violation is a grade of zero for that session. The second offense will result in a grade of F in the course.

Your Instructor/Competent Person/advisor/Competent Person will discuss each of these at the start of the semester and during each session as needed.

There are no exceptions to the safety and health requirements. By signing this document, you, the student, acknowledges that you understand the safety and health expectations for the YSU makerspaces.