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PURPOSE

The purpose of this document is to establish a standardized set of safety rules and guidelines for operating in academic spaces that use potentially hazardous machines, equipment, and tools for teaching, research, and fabrication. These spaces include machine shops, studios, research facilities, and makerspaces, among others. The guidelines aim to ensure the safety of students, faculty, staff, and visitors while they engage in teaching, research, or fabrication activities in these facilities.

1 SCOPE

The requirements in this document apply to all academic shops and studios operated by the university, regardless of their location or department. This includes metal fabrication shops, woodworking shops, welding shops, art and architecture studios, makerspaces, high-bays, and any other spaces that use heavy machinery, specialized equipment, or tools. These requirements cover all activities involving machinery, hand tools, chemicals, electrical systems, and other equipment within these facilities.

Machine shops managed by Facilities Maintenance are not covered by this policy unless they are also used by students.

This document has been approved by:

OFFICIAL	SIGNATURE	DATE
Dr. Lesley Netter-Snowden Interim Executive Vice President and Chief Business Officer	Signed by: Lesley Netter-Snowden 68D07D17A269485...	October 24, 2025
Dr. Lawrence Whitman *Dean*, Southern Polytechnic College of Engineering and Engineering Technology Chair, University Safety Council	DocuSigned by: Lawrence Whitman D0113751A9DC463...	October 17, 2025
Stephen Ndiritu *Executive Director,* Environmental Health, Safety	DocuSigned by: Stephen Ndiritu 00196B3D85454D8...	October 17, 2025

2 RESPONSIBILITIES

2.1 Environmental Health and Safety Department (EHS)

EHS is responsible for:

- Develop overall safety policies and guidelines.
- Provide guidance and technical assistance to faculty, supervisors, and managers in identifying, evaluating, and mitigating health and safety hazards.
- Provide safety information and training to faculty and staff.

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- Conduct periodic audits, inspections, and risk assessments of space covered by this document to ensure safety and compliance.
- Investigate incidents and recommend appropriate corrective actions.

2.2 Deans and Heads of Department

Deans and Heads of department have primary responsibility for the management and enforcement of these guidelines in their areas. They must:

- Provide adequate resources for maintenance, repairs, and safeguarding of machines/equipment to ensure safe use.
- Ensure that adequate supervision is provided for each shop.
- Ensure shop managers, supervisors, and users, including students and visitors, have completed the appropriate training based on the roles and associated risks.

2.3 Member in charge, Principal Investigator (PI), or Faculty Adviser

- Provide appropriate safety training for specific projects, tasks, and equipment.
- Monitor students and staff under their supervision to ensure compliance with safety guidelines.
- Ensure hazards, incidents, and near-misses are promptly reported in accordance with the university's procedures.

2.4 Shop Managers/Supervisors

- Oversee daily operations of the shop and ensure compliance with safety protocols outlined in this document and other university safety policies, procedures, and guidelines.
- Develop and conduct user training and ensure all users of the shop are familiar with general and shop-specific safety rules and practices.
- Provide tool/equipment-specific training for each user for the equipment they will be using.
- Enforce all safety rules and make all users aware of the consequences of rule violations.
- Ensure proper and prompt repair and maintenance of equipment and tools to ensure safe use.
- Enforce access controls and supervise shop users to ensure only authorized and trained users have access to the shop space and/or the machines/equipment.
- Halt unsafe operations at any time and restrict shop access to anyone who violates the rules.
- Ensure all accidents and near-miss incidents are promptly reported through the university's incident reporting system.

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- Clearly display Shop Safety Rules signs and shop hours on the shop door and inside the area.
- Report problems to the instructor, head of department, and/or EHS as appropriate.
- Communicate with EHS about any difficulties with implementing this guideline so that the guideline can be updated as needed.
- Maintain records for training, inspection, maintenance, and incidents.

2.5 Machine Shop Technicians

- Conduct routine inspections and maintenance of equipment.
- Assist in the implementation of safety procedures.
- Guide users on proper machine operation and safety practices.

2.6 Shop Users – Students, Faculty, and Staff

- Complete all required training before using any machine.
- Observe all shop safety rules and protocols when working in machine shops.
- Use the "Buddy System" when working in specified shops.
- Promptly report all safety incidents to the faculty supervisor, and/or the shop manager/supervisor.
- Promptly report unsafe conditions, actions, or near-miss incidents to the faculty supervisor, and/or shop manager/supervisor.

2.7 Maintenance & Operations Department

- The Maintenance & Operations Department has direct control over the operations of the machine shops' general and local ventilation systems and utility systems. Maintenance personnel must be informed of hazards present in the laboratory before starting any work in a shop, sanitary waste lines, or the heating, ventilation, and air conditioning (HVAC) system. The Maintenance & Operations Department has the following responsibilities:
  a) Inform shop personnel in advance of scheduled utility or maintenance shutdowns (gas, water, chemical fume hoods, etc.).
  b) Maintain a proactive preventative maintenance program to ensure the shop's utilities, controls, and emergency equipment (e.g., ventilation systems, detectors, shut-off devices, emergency eyewash, and safety shower) are in proper operating condition to maintain safe laboratory working conditions.
  c) Inform EHS when a major change of HVAC or exhaust ventilation is contemplated, completed, and coordinate planned maintenance with the end user.

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2.8 Planning, Design, and Construction

a) Coordinate shop demolition, construction, and renovation activities with EHS to ensure that proper design review is performed and that work areas and equipment meet current requirements, specifications, standards, and codes.

b) Coordinate with current space occupants to ensure that all chemicals, radiological material, and waste are removed, and that all visible residues are cleaned before demolition, construction, or renovation activities are initiated.

3 PROCEDURES

3.1 Machine Shop Hazard Classification

The university has a variety of spaces with heavy machinery or specialized equipment. Each of these spaces contains a range of machines, equipment, and tools that pose different levels of hazard and risk to students, faculty, and staff. KSU's approach is a structured framework that classifies machines and machine shops into distinct risk levels—referred to as KSU Machine Safety Levels (MSL) based on the hazards associated with the machines in each shop. This framework provides a systematic method for assessing and managing risks across various operations in KSU machine shops and is essential for prioritizing safety measures, guiding training protocols, and implementing effective controls.

3.1.1 Machine Safety Levels

- The hazard classification levels are divided into four categories based on the severity and complexity of the risks involved:

Classification	Description
MSL 1	Machines or processes that involve minimal hazards where routine tasks pose negligible risk. Examples include the use of basic hand tools and low-speed equipment such as screwdrivers, hammers, and manual saws. These pose minimal risk when used correctly but still require proper training and attention to safety.
MSL 2	Encompasses spaces with moderate risks typically associated with standard machinery and tasks that require basic personal protective equipment. Examples include the use of power tools and medium-speed machinery, such as drills, sanders, and band saws. These tools require additional precautions, including Personal Protective Equipment (PPE) and specific operating procedures.

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MSL 3	Spaces with high-risk operations involving heavy machinery, hazardous chemicals, or high voltage, necessitating advanced safety precautions. These include spaces with high-speed machinery and heavy equipment, such as lathes, milling machines, and CNC equipment. These tools demand advanced training, strict adherence to safety protocols, and constant supervision. Include Personal Protective Equipment (PPE).
MSL 4	Spaces that present critical risks where non-routine or emergency procedures could lead to serious injury or fatality if not properly managed. These include spaces with specialized equipment and processes that involve complex hazards including Personal Protective Equipment (PPE) and require specialized training, engineering controls, and rigorous safety measures, such as table saw, shear machine, and handling of explosive or highly toxic substances.

- EHS, in consultation with the respective College/Department, will review, evaluate, and classify the shop according to this framework. The shop's safety control measures, including engineering controls, training, and access control, should be based on the shop's MSL.
- See Appendix B for the Machine Safety Levels matrix with examples.

3.2 Shop Hazards and Risk Assessment

- The hazards associated with projects/tasks involve multiple aspects, including the machines/equipment, tools, and materials being used, the process, work environment, and the level of training.
- Each project/task involving equipment/machines with MSL 2 or above must undergo a formal safety review with a shop supervisor, and, where applicable, with the faculty advisor/instructor.
- The shop supervisors and/or faculty advisor should:
  a) Review potential hazards and communicate with the student about any needed concerns and changes to the project.
  b) Implement controls to mitigate identified risks.
  c) Track progress and the quality of work during the project to verify that the student has the requisite skills to safely perform the work.
  d) Conduct a safety check prior to activation/use of the device.

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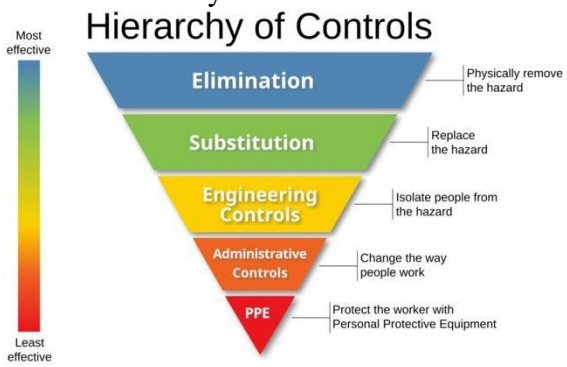
e) Review and update risk assessments annually or when the project is modified, or new equipment is introduced.

- EHS may be consulted for assistance with hazard review.

3.3 Hazard Prevention and Control

The Faculty Adviser, PI, and Shop Manager should use the "hierarchy of controls" framework to systematically reduce or eliminate hazards identified in the shop during the hazard assessment. The hierarchy of controls framework prioritizes interventions from the most to the least effective, ensuring that safety measures are not solely reliant on individual behavior or PPE. Below is an explanation of each level of the hierarchy and how it can be applied in the shop/lab setting:



3.3.1 Elimination

Definition: Completely remove the hazard from the workplace.

Application in Machine Shops:

- Replace hazardous processes with safer alternatives. For example, use pre-cut materials to eliminate the need for cutting operations.
- Remove outdated or malfunctioning equipment that cannot be repaired to a safe standard.

3.3.2 Substitution

Definition: Replace the hazard with a safer alternative.

Application in Machine Shops:

- Substitute high-risk equipment with safer models (e.g., replace a regular table saw with a Saw Stop saw with an automatic shutoff feature).
- Replace flammable coolants with industry-accepted non-flammable alternatives.
- Use low-vibration tools to reduce ergonomic risks.
- Example: Replace traditional solvent-based degreasers with industry-accepted water-based solutions to reduce chemical exposure and fire risks. For required solvent-based degreasers, quantities will be minimized.

3.3.3 Engineering Controls

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Definition: Isolate people from hazards through physical modifications.

Application in Machine Shops:

- Install machine guards on lathes, mills, and saws to prevent contact with moving parts.
- Use local exhaust ventilation (LEV) systems to remove fumes, dust, and particulates from the air.
- Implement emergency stop buttons and interlocks on machinery to quickly shut down equipment in case of an emergency.
- Design workstations with ergonomic considerations to reduce strain and fatigue.

3.3.4 Administrative Controls

Definition: Change the way people work through policies, procedures, and training.

Application in Machine Shops:

- Develop and enforce standard operating procedures (SOPs) for all equipment and processes.
- Limit access to high-risk machinery to trained and authorized personnel only.
- Implement a buddy system for inexperienced users or high-risk tasks.
- Schedule regular maintenance and inspections to ensure the equipment is in safe working conditions.
- Post clear signage and warnings for hazardous areas or processes.
- Example: Require all users to complete a mandatory safety training program before operating any machinery, with refresher courses conducted annually.

3.3.5 Personal Protective Equipment (PPE)

Definition: Protect students or employees with equipment designed to reduce exposure to hazards.

Application in Machine Shops:

- Provide and **enforce** the use of safety glasses, face shields, and hearing protection.
- Provide and **enforce** the use of task-specific gloves when handling sharp or hot materials.
- Provide and **enforce** the use of respirators when students/employees are exposed to elevated levels of hazardous dust or fumes.

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- Provide and **enforce** the use of flame-resistant clothing when working with highly flammable materials.

4 SAFETY RULES AND PROCEDURES

4.1 Machine Shop Safety Rules

All KSU students, faculty, staff, and visitors must adhere to the following basic laboratory rules and guidance while in machine shops to ensure a safe environment:

Access and authorization

1. Only **authorized** and appropriately **trained** personnel should have access to machine shops or be allowed to operate equipment.
2. Visitors, especially children, are not allowed in machine shops without prior authorization. Authorized visitors must not be allowed in laboratory areas unless they have been given a brief safety orientation and have been provided with all required PPE.
3. If minors are expected in a machine shop (e.g., as part of an educational or classroom activity), they must be directly supervised by a PI, professor, or shop manager. Any activities involving minors must be in accordance with the KSU Programs Serving Minors Policy.
4. Animals not meant for research or experimental purposes, including Emotional Support animals, are prohibited in machine shops. Service animals are generally prohibited in the laboratory areas. If a service animal is needed, the owner must be referred to Student Disability Services to explore an alternative accommodation.

Preparation and Awareness

1. Ensure you understand the hazards of the equipment and materials you will be working with by reviewing work/operating procedures, Safety Data Sheets (SDS), and other available safety information, including reading the labels and instructions before use.
2. Make sure others in the shop are aware of any special hazards associated with your work.
3. Always follow the appropriate standard operating procedures (SOP) and plan appropriate emergency procedures before beginning any operation.
4. Always be aware of the potential hazards from ongoing experiments/operations in the shop.
5. Familiarize yourself with the locations and proper use of the emergency safety equipment for your shop, such as eyewash unit, safety shower, fire extinguisher, first aid kit, fire

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blanket, emergency telephone, and fire alarms, and know the appropriate emergency response procedures.

Behavior and Conduct

1. Never work when you are impaired. The use of alcohol or drugs before the use of the machine shop is strictly forbidden and is grounds for suspension or termination of shop access privileges. Be aware of other situations that may impair your ability to work safely, including illness, tiredness, stress, or the use of medication that could make you drowsy.
2. Horseplay is prohibited on the shop floor or laboratory areas. Never distract or startle other students or employees when they are managing hazardous chemicals or working with hazardous equipment.
3. Adhere to all safety warning signs and labels in the shop, including in areas with unique hazards.
4. Never remove, impair, or otherwise interfere with machine safety control devices, including guards, interlocks, barriers, and switches

Restrictions

1. Do not perform hazardous procedures/experiments or projects that have not been approved by your PI, faculty adviser, or the shop supervisor.
2. Do not eat, drink, smoke, chew gum, insert or remove contact lenses, or apply cosmetics while in the machine shop.

Incident reporting

1. Immediately report any unsafe conditions, including inadequate safety guarding, ventilation, and unsafe procedures in the shop, to the supervising instructor/faculty adviser or shop manager for resolution. Additionally, report any unresolved issues to EHS.
2. Report all injuries, incidents, and near misses to the shop supervisor, PI, instructor, or EHS in accordance with KSU's Incident Management Procedures.

4.1.1 Appropriate Shop Attire

- Wearing the appropriate laboratory/shop attire and PPE is required upon entrance into the shops.

Eye protection is required for all faculty, staff, students, and visitors in all areas in the machine shop where equipment is used, or chemicals are manipulated or stored, whether one is working with the machines or performing chemical operations or not.

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- Long hair, loose clothing, jewelry, etc., should be properly confined while in the machine shop to avoid being entangled in machines and equipment or coming into contact with chemicals or a source of ignition.
- When working with processes, operating machinery, using tools, or handling hazardous materials that present a risk to the hands, appropriate gloves may be required. Always inspect gloves for holes, tears, or other defects before use. However, in some cases, wearing gloves while operating certain machines or tools can introduce additional hazards and may be prohibited. Glove use should be clearly outlined in a shop- or task-specific SOP.
- Always wear footwear that completely covers the foot up to the ankle. Sandals, open-toed, and high-heeled shoes are prohibited in machine shops.

4.2 Working Alone in the Laboratory

- It is not prudent for anyone to work alone in spaces involving dangerous equipment, hazardous materials, or hazardous procedures. When working alone, the ability to respond to an accident could be severely impaired, resulting in serious personal injury, death, or catastrophic property damage.
- Working alone is prohibited in machine shops. When working in such spaces, you should have at least one other person present to ensure that assistance is available in case of emergencies (Buddy System).

4.3 General Safety Procedure for Working with Machines

- Only operate machines you have been trained and authorized to use.
- Inspect the machines/equipment before each use for breaks, leaks, tears, and other damage.
- Use appropriate Personal Protective Equipment (PPE).
- Ensure all safety guards and safety devices are in place and functional.
- Be familiar with the location of the machine's emergency stop switch or lever controls.
- Only use machines, equipment, and tools for their intended purposes unless modifications have undergone a thorough hazard assessment and have been proven to be safe.
- Follow the equipment manufacturer’s operating instructions and the shop’s machine-specific safety guidelines.
- Ensure proper setup to eliminate awkward posture or hand positioning – sudden slippage can cause serious injury.

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- Follow the machine's recommended feed rates. Never force materials into or pull them through faster than the machine can process them.
- Machines, equipment, and processes known to produce harmful fumes, vapors, or particulates should be used with adequate ventilation, including exhaust ventilation such as a dust/fume collection system or containment devices, such as chemical fume hoods.
- Never attempt to stop moving or spinning parts with your hands.
- Do not attempt to clean, adjust, or repair the machine while it is running.
- Completely stop and de-energize the machinery before performing adjustments or maintenance work.
- Store tools properly on carts or workbenches, not on the machine, unless specifically designated (Ex, lathe chuck wrench in kaizen foam on lathe headstock).
- Do not leave machinery unattended while in operation.
- Keep the workspace and walkways around the machine clear of obstructions.
- Clean work areas after each use and report any irregularities or malfunctions to the shop manager/supervisor.

4.4 General Safety Procedure for Working with Hand Tools

- Only use tools for their intended purpose.
- Inspect tools for wear and damage before each use. Do not use a damaged tool.
- Store hand tools in designated areas and maintain them according to the manufacturer's recommendations.
- Use appropriate Personal Protective Equipment (PPE).
- Disconnect all portable electric tools and appliances when not in use or when adjusting, inserting cutters, bits, etc.
- Keep all machines and wiring in good repair. Avoid the use of extension cords, which can create electrical issues, fire, and tripping hazards.

4.5 General Safety Procedure for Working with Chemicals

- Some chemicals have inherent safety hazards that require special handling and safety controls. Ensure shop personnel wear proper Personal Protective Equipment (PPE) while handling chemicals.

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- Store chemicals in designated areas, away from incompatible materials, and containers that are properly labeled and sealed. Use flammable cabinets for flammable materials/chemicals and corrosive cabinets for storing corrosive chemicals.
- Take out only the amount of chemicals needed for the immediate task and return unused chemicals to their proper storage.
- Ensure chemical spills are promptly cleaned up while following KSU procedures for spill response. Clean up any small spills if you are trained to do so and dispose of spill clean-up materials appropriately. Contact EHS at (470-578-3321) or email ehs@kennesaw.edu for assistance with cleaning up large spills.
- Dispose of all chemical waste in accordance with KSU's Hazardous Waste Management Procedures. Keep the lid to the waste container closed unless you actively add waste to the container. Do not pour chemicals down the drain or discard them in regular waste containers.
- Wash your hands thoroughly with soap and water after handling chemicals and removing gloves.
- For more information on procedures for working with chemicals in labs, consult the University's Chemical Hygiene & Safety Program.

4.6 Welding Safety Guidelines

- All welding work should be approved by the Shop supervisor.
- All welding equipment should be inspected for possible damage prior to each use.
- Welders, assistants, and anyone else in the welding area shall wear glasses or shields of recommended shade during welding operations.
- The appropriate PPE, including insulated gloves, aprons, and arm guards, should be used when welding.
- A welding screen should be erected around the welding area to protect other personnel in the shop from eye injury.
- Welding compressed gas tanks should always be secured to a welding cart or a fixed object. Never allow a gas cylinder to be free-standing. Replace the safety cap on all cylinders when not in use.
- Do not arc weld in a wet area. When arc welding, make sure the work and/or worktable is properly grounded.

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- Always be alert to fire hazards. Move the object to be welded to a safe location or remove all flammable materials from the work area, including charging batteries.
- Suitable fire extinguishing equipment should be available at the exit of the welding area.
- Gas cylinder valves should be closed after the welding or cutting torch task is completed; release pressure from the regulators by opening the torch valves momentarily and backing out the regulator adjusting valves.
- Never leave the torch unattended with pressure in the hoses.
- Welding should never be performed in enclosed or confined spaces without adequate ventilation or the use of breathing apparatus. Approval must be given for any task regarding confined space (no student should ever complete a task within a confined space)
- Turn on the ventilation system before starting to weld and check periodically thereafter to ensure adequate performance. Welding fumes should not be allowed to get into the rest of the shop's working areas.
- Any container that has held explosive or flammable materials should never be cut or welded before it has been appropriately cleaned and vented. Chemical Cabinets that have been used for the storage of flammable liquids or liquids that off-gas flammable vapors should not be stored or introduced in the welding area.
- Only wrenches or tools provided or approved by the gas cylinder manufacturer should be used to open valves. Never use a hammer to open or close valves.
- Brazing or soldering should be conducted with proper ventilation.

4.7 Machine Shop Electrical Safety

- Ensure that all electrical installations and equipment are professionally installed and maintained.
- Check all electrical tools, cords, and equipment for damage (frayed wires, broken plugs, etc.) before using and removing damaged items from service.
- Never work on live circuits unless you are qualified and authorized to do so.
- Develop and implement lockout/tagout procedures to isolate and de-energize electrical circuits and equipment during maintenance or repair.
- Avoid overloading outlets by plugging in too many instruments and tools, which can cause fires or damage to equipment.
- Always unplug equipment by pulling on the plug, **not the cord**, to avoid damaging the cord.
- Ensure proper grounding and use properly insulated tools to minimize the risk of electric shock.

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- Use GFCIs when working outside, near wet areas, or when using extension cords.

4.8 Lock-Out Tag-Out (LOTO)

- Shop Manager must develop and implement clear procedures for de-energizing, locking, and tagging machinery before maintenance in accordance with KSU's LOTO Safety Program.
- Ensure the LOTO procedures are followed when servicing or repairing equipment.
- All machine operators and maintenance personnel should be trained in LOTO procedures. Only trained and authorized personnel should implement LOTO procedures.
- Only the person who applied the lock/tag may remove it.

4.9 Machine Shop Fire Prevention

- Minimize the accumulation of combustible materials and keep them away from heat and ignition sources.
- Regularly clean chip pans and other areas to prevent the accumulation of flammable debris.
- Store flammable materials in designated, well-ventilated areas, using approved flammable cabinets or containers.
- Keep incompatible (i.e., chemically reactive) substances away from each other to prevent unwanted chemical reactions.
- Perform "hot work" (welding, etc.) in controlled and well-ventilated areas.
- Regularly inspect electrical equipment and cords for damage and avoid overloading circuits.
- Ensure emergency equipment such as fire extinguishers and fire blankets is accessible (i.e., not obstructed) and inspected regularly.
- Do not block or otherwise damage sprinkler systems or fire alarm systems.
- Ensure that doors, hallways, stairs, and other exit routes are kept free of obstructions.

4.10 Use of Personal Protective Equipment (PPE)

PPE is to be used as a supplement, not a substitute, for engineering controls. PPE is considered the last layer of defense and protection between the worker and the hazard. To be effective, employees must understand the uses and limitations of PPE and use it appropriately.

4.10.1 PPE Use Requirements

- Machine shop users, including faculty, staff, students, and visitors, must wear at a minimum:

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  - Safety glasses that meet ANSI Z87.1 standards.
  - Footwear that completely covers the foot up to the ankle. Sandals, open-toed, and high-heeled shoes are prohibited.
- Use other types of PPEs, such as hearing protection and respirators, as required based on the hazards of specific machines or processes.
- Respirators must be used in accordance with KSU's Respiratory Protection Program.
- Choose PPE that is specifically designed to protect against the identified hazards.
- Select and use PPE that fits comfortably and allows for ease of movement.
- Consult EHS for assistance on the proper selection and fitting of PPE.
- Students, faculty, and staff should be trained in proper PPE usage, limitations, and care.
- Regularly inspect PPE for damage or wear and tear before each use.
- Clean and disinfect reusable PPE according to the manufacturer's instructions.
- Store PPE in a clean, dry place when not in use.
- Replace damaged or worn-out PPE promptly.

4.11 Hazardous Waste Management

- Materials used in the fabrication shop are considered hazardous (e.g., solvents, paints, chemicals, oils, etc.) and should be managed properly.
- Establish specific areas in the shop for the collection and storage of hazardous waste, ensuring they are safe, secure, and compliant with regulations. A "Hazardous Waste Satellite Accumulation Area" label or sign should be posted.
- Use appropriate containers for each type of hazardous waste, ensuring they are leak-proof, durable, and compatible with the waste.
- Store hazardous waste in a secondary container to prevent spills.
- Separate different types of hazardous waste to prevent mixing and potential reactions.
- Ensure all hazardous waste containers are clearly labeled with the type of waste, date of generation, and any necessary warnings.
- Maintain proper storage conditions, such as temperature control, ventilation, and protection from the elements, to prevent degradation or accidents.
- Hazardous waste areas should be inspected regularly.

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- Once the waste is ready for pickup, submit a waste card (i.e., pick-up request) to EHS through the University's chemical and hazardous waste management system.

5 STANDARD OPERATING PROCEDURES

- This document outlines general safety rules and requirements for machine shops. Instructors, Principal Investigators (PIs), and Shop Managers should develop and implement Standard Operating Procedures (SOPs) specific to each machine, project, experiment, or process, identifying any unique hazards and safeguards before work begins. The EHS department is available to provide consultation or assistance in developing these SOPs.

6 PRE-PURCHASE APPROVALS

- Some chemicals and equipment have inherent safety hazards that require special controls, facilities, or regulatory compliance measures. These controls must be in place before the materials or equipment are purchased and used.
- All laboratory chemicals must be purchased through the University Procurement Office and receive prior approval from EHS.
- Specialized equipment must be reviewed and approved by EHS and the Facilities Planning and Design department before purchase. The Purchasing department should complete and submit the University's Equipment Purchase Safety and Facilities Review Request Form for this purpose.
- EHS will then conduct a hazard assessment before approving the procurement of these materials or equipment to ensure that all necessary control measures are factored in and authorizations are in place, in accordance with KSU's procedures for Managing Environmental and Occupational Safety Risks and Impacts.

7 TRAINING REQUIREMENTS

- Shop personnel and users must receive the required training in accordance with the University's Safety Training Program.
- Both the EHS department and the department (instructors, PI, and shop Managers) have shared responsibilities for providing the required training to personnel and students.
- The shop safety training involves these levels:
    a) New employee safety orientation.
    b) Specialized and compliance training.
    c) Shop Operations and procedure-specific training.

7.1 New Employee Safety Orientation

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- This training will be provided by the EHS and the employee's supervisor. New hires must receive a general safety orientation offered by EHS, which includes the mandatory Right to Know (Hazard Communication) training.
- In addition, each new Shop personnel must receive job-specific orientation provided by the individual's direct supervisor that covers safety matters specific to their job and to their working environment in the individual shop. Completion of the job-specific orientation must be documented by the supervisor.

7.2 Specialized and Compliance Training

- In addition to the New Employee Safety Orientation, EHS will provide general and compliance training to shop personnel.
- General training covers topics such as incident reporting, roles and responsibilities, and hazard control, while compliance training covers topics such as electrical safety, chemical safety, fire safety, etc.

7.3 Shop Operations and Equipment-Specific Training

- This training is to be provided by the PIs, instructors, or shop supervisors. This training should include the following:
    - **Shop General Safety Training**: This training covers general safety protocols for a specific shop (e.g., Woodworking Shop).
    - **Machine/Tool-Specific Training**: This training covers both theoretical and hands-on user training on the use of a specific type of machine, tool, or process.
- All new shop personnel must receive all levels of training before commencing work with dangerous equipment and/or hazardous substances.
- All students and employees expected to use the machine shop must receive Shop General Safety training and Machine/procedure-specific training.

7.4 Frequency of Training

- All Shop users are required to complete the required training prior to initial use of the shop, and periodically thereafter, as required or necessary.

8 INSPECTIONS AND AUDITS

- Periodic inspections and audits must be conducted in accordance with the University's requirements for Environmental and Occupational Safety Inspections and Audits to keep machine facilities and equipment in a safe operating condition.

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- The goals of an inspection and audit program are to:
  (a) Ensure the machine shop facilities and equipment are maintained in safe operating conditions.
  (b) Ensure that all shop activities and procedures are conducted safely and prudently.

8.1 Shop Self-Inspections

- Shop users should inspect machines and tools before each use.
- Shop supervisors must conduct monthly inspections of their shop and equipment using the Machine Shop Self-Inspection Form and follow up to ensure problems identified are promptly resolved.
- Appendix A provides a template for a machine shop self-inspection checklist that departments can adapt for their own use.

8.2 Compliance Inspections and Audits

- In addition to self-inspections, each shop will be subject to routine compliance inspections and audits conducted by EHS. The inspections/audits will be scheduled by the EHS Department at a frequency ranging from three months to one year.

9 ACCESS CONTROLS

- Access to shops must be restricted to authorized and trained students and employees only.
- Visitors will only be allowed in machine shops with prior authorization and after they have been given a brief safety orientation and have been provided with all required PPE.
- Visitors must be issued a temporary pass and be accompanied by authorized KSU personnel.
- The Shop Manager must develop and implement an access control process for the machine shop.

9.1 Machine Shop Hours

- The Machine shop's working hours should be clearly posted.
- Access to shops outside of normal working hours should be reviewed and approved by the shop manager. The shop manager should ensure that appropriate supervision is available for access outside normal hours.

10 RECORDKEEPING

- Instructors, PIs, and shop supervisors must maintain records of job-specific training, self-inspection reports, observations, and action items. EHS will maintain records of compliance training and inspections, and audits conducted by EHS or by a third party. EHS must also maintain a record for

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each employee of any exposure monitoring, medical consultation, and examination, including tests and written opinions.

- Such records will be kept, transferred, and made available in accordance with BOR records management policies.

11 EMERGENCY PROCEDURES

- Shop managers should develop emergency procedures for the shop, including emergency shutdown procedures for specialized machinery, equipment, and/or processes.
- In the event of an emergency such as fire, explosion, spill, or medical accidents in the machine shop or laboratory, the following basic emergency procedures are recommended:
  - Call, or have someone call, the KSU Police emergency number at 470-578-6666 (or extension 6666 from a KSU phone)
  - Assess the safety of the situation and do not enter or re-enter the area if it is unsafe. KSU Public Safety and/or Fire Marshals will provide instructions on when reentering the facility is permitted.
  - Warn personnel in adjacent areas of any potential risks to their safety.
  - Help the people involved and remove them from exposure to further injury if it is safe to do so.
  - Extinguish small fires using a portable extinguisher if you have been trained in the use of fire extinguishers and are comfortable doing so.
  - In case of a medical emergency, remain calm and do only what is necessary to protect life.
    a) Do not move an injured person unless the individual is in danger of further harm.
    b) If clothing is on fire and a safety shower is immediately available, douse the person with water. If a safety shower is not immediately available, roll the person on the floor or use a fire blanket to smother the flames. Once the flames are extinguished, escort the victim to the nearest emergency shower, activate it, and drench with water.
    c) If harmful chemicals have spilled on the body, flood the exposed area with sufficient running water from the safety shower and immediately remove any contaminated clothing.
    d) If a chemical has splashed into the eye, immediately wash the eyeball and the inner surface of the eyelid with plenty of water for 15 minutes. All eye exposures require a medical evaluation. If possible, determine the identity of the chemical involved and inform the emergency response team/medical personnel attending to the injured person. It may be helpful to provide the Safety Data Sheets (SDS) if it is accessible.

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e) Remain in the area in a safe place until help arrives.

11.1 Spill Response Procedures

- Shop personnel may clean up small spills (1 liter or less) of hazardous materials if **all** the following conditions are met:
    - The hazards of the material(s) are known, and appropriate precautions can be taken to prevent personal exposure or exposure to others.
    - The spill does not involve highly toxic, highly reactive chemicals or elemental mercury. Special cleanup is required for such substances; contact EHS for assistance.
    - There is no potential for release to the environment.
    - There are no personal injuries because of the spill.
    - The clean-up procedures are known, and the proper equipment (e.g., PPE and spill cleanup materials) is available.
    - The spill can be cleaned up safely.
- If all these conditions are not met, EHS must be contacted for assistance by calling 470-578-3321 or by dialing the University emergency number 470-578-6666.
- Inform your supervisor of all spills and clean-ups and enter the incident into the KSU incident reporting system (Reliance).

11.2 Emergency Equipment

11.2.1 Emergency Eyewash Stations and Emergency Showers

1. Emergency eyewash stations and emergency showers must be provided in areas where splash hazards to corrosives, eye irritants, or chemicals that are toxic via skin and/or eye contact exist. Plumbed eyewash stations and emergency showers should be provided.
2. The location of each emergency eyewash station and emergency shower must be posted with a highly visible sign.
3. Emergency showers and emergency eyewash stations must not be obstructed. Keeping the immediate areas around these safety devices clear at least 36 inches is recommended.
4. Maintaining a basic first-aid kit is recommended.

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11.2.2 Fire Extinguishers

- Machine Shop must have at least an ABC-rated, dry-chemical fire extinguisher within 50 feet of any exit for use on ordinary combustibles, flammable liquids, and electrical fires.
- Special-purpose portable fire extinguishers may be required in certain shops depending on the materials used.
- Class D extinguishers are required in shops using combustible metals such as magnesium, titanium, and sodium.
- If additional extinguishers are needed for an area or if special extinguishers and extinguishing media are needed for materials such as alkali metals, contact EHS for information concerning recommendations and requirements.

11.2.3 Automated External Defibrillators

- KSU buildings are equipped with Automated External Defibrillators (AEDs) to provide first aid for life-threatening cardiac events.
- A tourniquet is in each AED box on the ground and first floor in case of uncontrolled bleeding.
- AEDs should only be used by individuals trained in providing first aid with an AED.
- For additional information on AEDs, including first aid training, contact the Office of Emergency Management at 470-578-6985.

12 INCIDENT AND EMERGENCY INVESTIGATION

- Safety-related incidents in the shops must be promptly reported to the instructor, PI, laboratory supervisor/manager, and to the EHS Department in accordance with the University process for Incident Reporting and Investigations through the Reliance system.
- Any of the following that occurs in the shop must be reported:
  - Incidents resulting in injury or illness.
  - Incidents or near misses with no injuries.
  - Incidents resulting in environmental damage (e.g., chemical released into storm drain, contamination of soil)
  - Incidents resulting in property damage.
  - Each situation or condition observed on the job has the potential for injuring or endangering the health of people or causing damage to property or the environment.

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- Serious incidents or incidents requiring immediate medical attention should be reported immediately by calling the campus emergency number: 470-578-6666 (extension 6666 from a KSU phone).
- Serious incidents are those which result in:
    - A fatality
    - The hospitalization or medical treatment (beyond first aid) of KSU or non-KSU personnel
    - Fires
    - Property damage exceeding $1,000.00.
- All other incidents must be reported within 24 hours of becoming aware of the incident, injury, or illness.

13 LABORATORY FACILITIES DESIGN AND DECOMMISSIONING

13.1 Design

- All new machine shops must be designed and constructed in accordance with the USG Design Criteria for Laboratories and industry's best practices.
- The design should ensure shop and equipment layout minimizes hazards and facilitates safe use, maintenance, and emergency egress.
- Proper ventilation, lighting, and ergonomic design should be incorporated in the design, depending on the equipment, processes, and materials to be used.
- No space shall be converted into a shop/lab that will use machines, equipment, and chemicals without prior review and approval by the EHS Department.
- Any new equipment must be reviewed and approved by EHS before purchase.
- New equipment purchases that require modification to the laboratory space or machine shop shall be directed to the Planning, Design, and Construction unit via Project Request.

13.2 Decommissioning

- Shop decommissioning involves the formal deactivation of a shop/laboratory while ensuring the safety of the space to safeguard the health and safety of personnel who may be involved in cleaning, demolition, renovation, and construction activities. It is the responsibility of PIs, instructors, and supervisors of the spaces to ensure that chemical, physical, and radiological hazards have been removed before releasing the space to the facility department or to new occupants.
- When a laboratory is vacated:

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- All chemical and radioactive materials (if applicable) must be removed and disposed of properly.
- All non-fixed equipment must be cleaned and put into a safe condition – deenergized and locked and tagged out.
- Chemicals and products, including cleaning compounds, surplus chemicals, stock solutions, experimental products, and hazardous waste, must be removed.

13.3 Evaluation and Release of Shop Spaces

- Following the decontamination of work surfaces and the removal of chemical, physical, and radiological hazards, the EHS Department will perform a final inspection prior to the space's release.

14 PROGRAM EVALUATION

- This manual shall be reviewed annually and revised if necessary.

15 REFERENCES

1) OSHA Machinery and Machine Guarding – 29 CFR 1910 Subpart O
2) ANSI Standard B11.0: Safety of Machinery

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Appendix A – Safety Self-Inspection Checklist

All observations should be entered in the Audit/Inspection management system in Reliance.					
Shop/Lab Name:		Department:		Supervisor Name:	
Building Name:		Location (campus):		Room #:	
Inspection Date:		Inspection Completed By:			

HOUSEKEEPING and GENERAL SAFETY	**Y**	**N**	**N/A**	**Comments/Notes**
Work areas are free of clutter, blockades, and obstructions that would create hazards for students and employees.				
Safe clearances are maintained around machines and equipment to facilitate safe working, loading, and maintenance.				
There are no equipment cords/cables creating trip hazards.				
Isles and walkways are not blocked.				
PERSONAL PROTECTION EQUIPMENT (PPES)	**Y**	**N**	**N/A**	**Comments/Notes**
The appropriate PPE are provided and in use (gloves, safety glasses, etc.).				
Students, employees, and visitors are properly using safety glasses while in the shop.				
Hearing protection is worn and properly used, where required.				
Respirators are properly used where required.				
Respirator users have received training and have been medically evaluated.				
Are reusable PPE cleaned after each use?				
Are PPE properly stored when not in use?				
Are used PPE properly disposed?				
MACHINE & TOOLS SAFETY	**Y**	**N**	**N/A**	**Comments/Notes**
Machines with moving parts are properly guarded.				
All machine guards are secured in place.				
Evidence that the safeguards have been tampered with or removed.				
Safety interlocks/ E-stops clearly marked (Ask Operator to identify).				
E-stops interlocks are operating properly (Ask Operator to demonstrate).				
The E-stops are within easy reach of the operator.				
All power tools are in good and safe operating condition.				
All hand tools are properly stored and maintained.				
Are storage cabinets and shelves properly secured to wall studs or floor?				
Hand/power tools are properly grounded or insulated.				
ELECTRICAL SAFETY	**Y**	**N**	**N/A**	**Comments/Notes**
Electrical enclosures such as switches, receptacles, and junction boxes provided are properly covered.				
Three feet (36 inches) clearance is maintained in front of electrical panels.				
All electrical panel doors are closed and latched.				
The electrical panels are labeled with voltage, wattage, or current ratings.				
Insulation on electrical and equipment wires are free from fraying or cuts.				
Extension cords are not being used in place of permanent wiring (not to exceed 6-feet in length). Extension cords are not frayed, spliced, or cut.				

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Bonding and Grounding are connected correctly during tasks/storage.				
CONTROL OF HAZARDOUS ENERGY (LOTO)	**Y**	**N**	**N/A**	**Comments/Notes**
Operators know when to perform lockout-tagout (LOTO) on energized equipment.				
Machines/equipment are properly de-energized, locked, and tagged before performing maintenance tasks on them.				
Operators can locate the appropriate interlocks and local disconnect. (Ask operator).				
Operator can identify their personal LOTO lock upon request				
CHEMICAL SAFETY/HAZARDOUS WASTE	**Y**	**N**	**N/A**	**Comments/Notes**
All chemical containers are properly labeled.				
All chemical containers are closed when not in use.				
All chemicals have been entered into the KSU chemical inventory system.				
All flammable liquid is stored in flammable cabinets or rated containers.				
Corrosive chemicals are stored in corrosive cabinets.				
Incompatible chemicals/materials are stored separately.				
All hazardous waste is collected and properly stored for disposal by EHS.				
Is each container for hazardous waste labeled with product identity, start date, and a hazard warning?				
Hazardous waste storage area is designated and clearly marked "Hazardous Waste Satellite Accumulation Area."				
Is EHS notified when waste containers are full and ready for pick-up?				
FIRE AND LIFE SAFETY	**Y**	**N**	**N/A**	**Comments/Notes**
There is no excessive accumulation of combustible materials in the shop.				
Appropriate types of fire extinguishers are available and not obstructed.				
Monthly extinguisher inspections are up to date.				
Sprinkler heads are clear and free of damage.				
Fire doors are not propped open with wood blocks or any other items.				
Emergency egress paths are free of obstructions.				
VENTILATION & EXPOSURE CONTROL	**Y**	**N**	**N/A**	**Comments/Notes**
Operations producing dust, fumes and gases are properly vented using local exhaust ventilation.				
The exhaust ventilation is properly used when dust/fume producing operations are running.				
Dust collection containers for the ventilation system are routinely emptied.				
The ventilation system is inspected and maintained.				
MATERIAL HANDLING	**Y**	**N**	**N/A**	**Comments/Notes**
Proper lifting techniques are practiced.				
Overhead cranes, manual, or powered lifting devices are inspected regularly and documented by the user.				
The hoisting equipment available and used for lifting heavy objects is labelled with load capacity.				
Annual inspection of overhead cranes is conducted and documented by an attached tag. **Document last inspection date:**				
Only trained and certified operators use lifting equipment.				
SAFETY TRAINING, PROCEDURES & SIGNAGE	**Y**	**N**	**N/A**	**Comments/Notes**

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Safe Operating Procedures (SOP) have been developed for all potentially hazardous equipment/operations and/or processes.				
All students and employees using the shop have received the appropriate safety training to work safely in the shop.				
The training is properly documented. {review training records}				
The shop's safety policies and rules are appropriately communicated to the affected employees and students.				
Access to the shop is restricted to authorized personnel only – KSU employees and students who have received the appropriate safety training.				
The appropriate signage is posted on the shop doors - (required PPEs use, Authorized Personnel, Hazards, and Emergency Contacts etc.)				
EMERGENCY PREPAREDNESS	**Y**	**N**	**N/A**	**Comments/Notes**
The shop/lab has the appropriate emergency equipment (extinguisher; safety shower/eye wash; spill control kits; emergency phone etc.)				
The correct shop/lab emergency contact information is clearly posted.				

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Appendix B – Safety Classification System

SAFETY CLASSIFICATION FOR ACADEMIC MACHINE SHOPS				
	MSLMSL 1	**MSL 2**	**MSL 3**	**MSL 44**
Power	**Manual hand tools and Low power hand/small bench tools**	**Powerful portable and small benchtop tools**	**Light industrial tools**	**Large industrial tools**
Examples	• Manual hand tools • Cordless drill under 18V • Palm sander • Soldering iron/gun • Heat guns • Glue guns • Sewing machines • Small 3D printers	• Circular Saw • Belt sander • Framing Nailer • 1/2 hp geared drill • Reciprocating saw • >18V cordless tools • Chop/miter saws • Routers • Mini lathe • Printing presses • Jig saw • Cordless drill <1/3 hp 8V-24V • 3/8" hand drill • Corded devices •	• Small bandsaw • Small drill press • Small benchtop milling machine • Small/benchtop lathe • Belt/disc sander • Horizontal saw • Scroll saw • Planer, jointer • Bench grinder • Saw Stop-style table saw	• **Full sized milling machine** • **Full sized metal lathe** • **Table saw (non- Saw Stop style)** • Radial arm saw • Large drill press • Large bandsaw • Surface grinder • Large jointer/planer • Robotic Arm

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Tool Use Restrictions and Oversight	Undergrads & Grads – Instructor / Supervisor Permission	Undergrads – Supervised Grads - Buddy System	Undergrads – Supervised Grads - Buddy System	• Undergrads - Only under professional supervision after extensive training • Grads - Buddy system
User Training	• General shop safety training by instructor/ shop supervisor • Directions in manual or on wall postings • Required to read operator manual	• General shop safety training by instructor/ shop supervisor • Tool-specific Training • Demonstrate proficiency by performing certain operations safety to specified accuracy	• General shop safety training by instructor/ shop supervisor • Tool-specific Training • Hands-on use training/experience • Demonstrate proficiency by performing certain operations safety to specified accuracy	• General shop safety training by instructor/ shop supervisor • Tool-specific Training • Extended hands-on user training with evaluation • Demonstrate proficiency by performing certain operations safety to specified accuracy • Signed agreement regarding code of conduct and list of tools approved for use
Tool Access Controls	Shop level access	Shop level access	Shop level access	Tool lockout
Shop Supervisor Training	Tool experience	• Tool experience • EHS Shop Safety Training	• Tool experience • EHS Shop Safety Training	• Professional-level experience • EHS Shop Safety Training
Remote Monitoring	• As desired	• Cameras in shop	• Cameras in shop	• Cameras in shop

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Appendix C – Revision History

Version #	Implemented By	Initial or Revision Date	Revision Summary
1.0	Stephen Ndiritu	03/2025	Initial Document
1.0	University Safety Council	09/15/2025	The University Safety Council approved the document in quarterly meeting