

# Metal Fabrication and Joining Technologies Safety and Health Plan

This is a model. Districts should add and edit all plan information as needed to meet the needs of their specific programs and spaces.

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## Safety and Health Plan Introduction

The purpose of this plan is to ensure a safe working environment for staff and students in the program and classroom areas by describing the general rules of conduct and other information useful in helping to prevent laboratory incidents and to appropriately respond to and report any incidents that may occur. This plan was developed to assist you with the establishment and implementation of a safe work environment that both complies with safety and health regulations and minimizes exposure to Occupational Hazards.

Safety Issues concerning this Framework: Respiratory Protection Safety; Eye Protection Safety; Hand Safety (Pinch Points & Proper Use of Gloves); Heat and Fire and Explosion Safety (Hot Work); Welding, Cutting & Brazing Safety; Blade and Cutting Tools Safety; Electrical Safety (LOTO); Chemical, Hazardous Materials & Flammable Safety (SDS); Electrical Safety; Air Pressure and Gas Safety; Ergonomic Safety; Scaffold, Ladder, Hoisting & Rigging and Fall Protection Safety; Hard Hat Safety; Hearing Protection Safety; Specialized Clothing Safety; Slips, Trips and Falls Safety; Hearing Protection Safety; Foot Protection Safety; Vibration Safety; and Confined Space Safety.

**Districts should add and edit all plan information as needed to meet the needs of their specific programs and spaces.**

## Emergency Procedures

*Call 911 for serious injuries and life-threatening emergencies.*

*Contact the school office to report unauthorized visitors.*

Prevention, mitigation, preparedness, response, and recovery are the five steps of Emergency Management.

### Reporting Accidents and Injuries

Report all injuries involving students, faculty and staff to the school nurse and proper authorities. Accidents and injuries will be logged and tracked with the purpose of preventing these incidents in the future. A First Aid Kit is a bag, box, or pack containing lifesaving supplies that can be used to assist a sick or injured person until full medical assistance arrives. Only qualified and authorized persons should use First Aid Kits.

### Managing Chemical Spills

Programs should be equipped with absorbent materials to handle small, low-hazard spills. In the case of larger or hazardous material spills using the following procedure:

* Evacuate everyone from the immediate spill area using the nearest exits.
* Notify the facilities department and any necessary authorities.
* Follow proper protocol for handling and disposing of chemicals.

### Hazard Communication

Hazard Communication Standard (Refer to Safety Data Sheets)

In order to ensure chemical safety in the workplace, information about the identities and hazards of the chemicals must be available and understandable to workers. OSHA's Hazard Communication Standard (HCS) requires the development and dissemination of such information:

* Chemical manufacturers and importers are required to evaluate the hazards of the chemicals they produce or import and prepare labels and safety data sheets to convey the hazard information to their downstream customers.
* All employers with hazardous chemicals in their workplaces must have labels and safety data sheets for their exposed workers and train them to handle the chemicals appropriately.

## Safety Observation Review List

### Common Safety

* Hardcopy of department Safety and Health Plan is current and accessible.
* Work surfaces are free of materials. Clean benches and other work surfaces.
* Keep aisles and storerooms clear of clutter; add floor markings where necessary.
* Aisles and exits are properly marked. Means of egress are appropriate for the intended use of space.
* Material storage is safe and appropriate and storage area are properly rated for load.
* Check for a minimum of 18” of clearance below the sprinkler heads.
* Ensure that PPE is stocked and easily accessible; ensure that proper eye wear is available for the task.
* Safety Showers are in compliance and regularly tested.
* Eyewash stations are in compliance and regularly tested.
* Ensure eyewash stations are appropriately situated, correctly designed and visible across the program area.
* Ensure Emergency Stops are not blocked; ensure signage is appropriately situated, correctly designed and visible across the program area.
* Ensure fire extinguishers are not blocked; ensure signage is appropriately situated, correctly designed and visible across the program area. Ensure up to date inspection is reflected.
* Ensure fire blankets are not blocked; ensure signage is appropriately situated, correctly designed and visible across the program area. Fire blanket signage must say “Stop, Drop, and Roll”.
* Ensure SDS is updated with new materials and accessible; ensure signage is appropriately situated, correctly designed and visible across the program area.
* Ensure first aid kit is updated with new materials and accessible; ensure signage is appropriately situated, correctly designed and visible across the program area.
* Equipment specific safety signs and posters are properly displayed.
* Exhaust system vents are unobstructed and regularly tested.
* Room ventilation is appropriate for the program.
* Lighting is appropriate for the program.
* Wastes are labeled and removed promptly. Ensure that waste containers are emptied.
* Flammables are stored in flammable storage cabinet and cabinets are unobstructed.
* Chemical containers are clearly labeled, kept capped and properly stored.
* Electrical cords are in good condition (no fraying or extension cords for extended use) and properly employed.

### Program Specific Safety

* Hydraulic and Pneumatic Equipment Annual Inspections
* Complete NIOSH Safety Inspections Checklists
* Respiratory Protection Safety
* Eye Protection Safety
* Hand Safety (Pinch Points & Proper Use of Gloves)
* Heat and Fire and Explosion Safety (Hot Work)
* Welding, Cutting & Brazing Safety
* Blade and Cutting Tools Safety
* Electrical Safety (LOTO)
* Chemical, Hazardous Materials & Flammable Safety (SDS)
* Electrical Safety
* Air Pressure and Gas Safety
* Ergonomic Safety
* Scaffold, Ladder, Hoisting & Rigging and Fall Protection Safety
* Hard Hat Safety
* Hearing Protection Safety
* Specialized Clothing Safety
* Slips, Trips and Falls Safety
* Hearing Protection Safety
* Foot Protection Safety
* Vibration Safety
* Confined Space Safety

Date Safety Checklist Performed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_     Safety Checklist Completer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## Metal Fabrication and Joining Technologies Program-Specific Safety Policies

### Chemical Inventory

A chemical inventory will be maintained to comply with various regulations including Department of Homeland Security, Uniform Fire/Building Code, Emergency Planning, and Community Right-to-Know. A Safety Data Sheet (SDS) for each chemical will be readily accessible in the Metal Fabrication & Joining Technologies Shop and will be strictly followed. Each SDS describes the chemical’s properties, health and environmental hazards, safety precautions for handling, storing, and transporting the chemical and guidance for first aid procedures and spill clean-up. Reagents and chemicals used in the Metal Fabrication & Joining Technologies program include, but are not limited to:

* **Acids and Bases:** Hydrochloric acid, Sulfuric acid, Acetic acid, Sodium hydroxide, Ammonium hydroxide
* **Alcohols:** Isopropanol, Ethanol, Methanol
* **Solvents:** Acetone, Alcohol, Chlorinated solvents, Coil cleaner
* **Lubricants:** Mineral oil, Synthetic Oils, Lithium and petroleum grease, WD 40, Gear Oil, Cutting Oil, Refrigeration oils
* **Refrigerants:** R-22, R-404a, R-410a, R409a
* **Adhesives:** 2-part epoxy, Wood glue, silicone adhesive and sealant, Contact cement, Hot glue
* **Particulate Matter:** Basic materials related to the three types of particulate matter.

### Equipment Inventory & Safety

The shop will contain the following equipment, which shall be scheduled for routine maintenance and calibration according to the manufacturers’ recommendations. Department students and faculty will immediately inform the appropriate school official of malfunctioning or broken equipment. Students will not operate equipment unless they both have the permission of the instructor and have received documented training on the safe operation of the equipment.

#### Shop Equipment

List Equipment

List Safety Requirements and Documentation

## General Career & Technical Safety Policies

### Security and Safety

To prevent unauthorized entry to the program area and prevent theft of hazardous materials and equipment, the following security measures will be implemented:

* Close and lock doors when no one is present.
* Issue badges and escort guests to and from the program area.
* Do no leave hazardous materials unattended or unsecured at any time.
* Lock storage cabinets where hazardous chemicals or flammables are stored when not in use.
* Maintain an inventory of hazardous materials being ordered and shipped.

### Chemical Hazards

While each chemical has its own unique properties and hazards, the following common practices will be implemented to ensure safe handling and storage of all chemicals. (Refer to Safety data Sheets)

* Do not permit students to work with carcinogens, specialized toxins, or other acutely toxic chemicals.
* Ensure those working with hazardous chemicals are aware of potential hazards and are proficient in chemical hygiene practices and handling chemicals safely.
* Use appropriate personal protective equipment (PPE) at all times, including specific clothing, gloves appropriate to the chemical, safety glasses (or goggles or face shield) and full-coverage footwear (no flip flops or sandals).
* Wash hands after handling chemicals, after removing gloves, and before leaving the program area. Always remove gloves before touching phones, doorknobs, light switches, etc.
* Avoid touching your face with your hands or gloves when using chemicals.
* Store and dispose of chemicals properly.
* Maintain chemical storage cabinet containing labeled cans of adhesives, desk cleaners and other cleaning supplies.
* Ensure program area has designated Flammables cabinet.
* Ensure the ready availability of the SDS Binder.

## Industrial and Construction Hazards

OSHA has identified four hazards that are responsible for most losses. These are: “Focus Four Hazards” are Trip-and-Fall Hazards, Caught-In-Between Hazards, Struck-By Hazards, and Electrical Hazards.

### Preventing Trip and Fall Hazards

A trip-and-fall hazard occur when a worker slips or loses balance and results in a fall.

* Provide good housekeeping and keep work areas clear of debris and spills.
* Inspect ladders, scaffolds and other equipment used for working at heights. Ensure that unused equipment is secured.
* Remove any broken or defective equipment from service and secure it to prevent others from using it.
* Use proper ladders, scaffolds etc. as prescribed by the manufacturer.
* Use required PPE when using ladders or working at heights above 6’ including proper footwear, eye protection, and fall protection.
* Ensure working platforms at construction sites above 6’ have fixed rails and toe kicks as specified by OSHA regulations.
* Ensure working platforms in general industry sites above 4’ have fixed rails and toe kicks as specified by OSHA regulations.

### Preventing Caught-in-between Hazards

A caught-in or -between hazard occur when a person becomes caught, squeezed, crushed, pinched, or compressed between two or more objects or parts of an object.

* Inspect machine guarding every time the equipment is used.
* Ensure appropriate attire is worn around machinery, including required PPE.
* Ensure hair is secured around machinery.
* When working in trenches follow all OSHA laws and guidelines regarding sloping, benching, shoring, egress, spoils, and the use of trench boxes.
* Use all required safety precautions when working around motorized vehicles and forklifts.

### Preventing Struck-By Hazards

Struck-by hazards occur when a worker can be injured by contact or impact by an object or piece of equipment.

* Inspect tools and machinery before use.
* Ensure work area is established and maintained throughout the task.
* Wear proper PPE.
* If workers are working at heights the following precautions should be taken:
  + Ensure the location below the workers is marked off and barricaded to prevent people from walking under or near the hazard.
  + Ensure all tools are tethered to prevent a dropped object.
  + Use safe rigging techniques when lifting objects.
* Ensure materials are properly secured on approved shelves or racks.
* Ensure forklift and other powered industrial truck operators are licensed and/or trained on the proper use of the equipment.

### Preventing Electrical Hazards

Electrical hazards occur when a person contacts an electrical voltage.

* Wear proper PPE such as insulating gloves and eye protection.
* Check the insulation on power cords and extension cords before connecting to a power source to be sure there are no exposed wires.
* Ensure electrical equipment is grounded.
* Use Electrical protective devices including fuses, circuit breakers, and GFCIs.
* Follow lock-out/tag-out procedures by de-energizing electric equipment before inspecting or making repairs.
* Use electric tools that are in good repair; tools that are in questionable repair should be removed from service and tagged.
* Extension Cord use is a temporary measure. Also, ensure that you are not creating a tripping hazard.

## Respiratory Protection

E*xposure to airborne powders and vapors range from mild irritation to acute or chronic physical effects. These chemicals can also contaminate equipment and work surfaces, which can lead to ingestion. Below are best practices to prevent exposure when handling substances that pose a respiratory risk.*

* Purchase solid chemicals in pre-mixed liquid solutions, when possible, to avoid mixing chemicals.
* Wear N95 filtering facepieces (dust masks) when working with airborne fibers and dust.
* Wear a half face respirator with appropriate cartridges for the chemicals in use. This will provide protection against vapors and aerosols. If half face respirators are in use, students and teachers must follow the fit testing procedures in the Districts Written Respiratory Protection Plan.

## Hearing Conservation

Hearing Protection is required to prevent noise induced hearing loss. Hearing Protection devices reduce the noise energy reaching and causing damage to the inner ear. Earmuffs and Ear Plugs are the most common type of PPE. For best practices refer to the District Written Hearing Conservation Plan.

## Ergonomics

Ergonomics is the science concerned with fitting the job or task to the physical and mental capabilities of the worker. Applying ergonomics principles to the workplace can reduce fatalities, injuries, and health disorders, as well as improve productivity and quality of work. Review all shop tasks to ensure the safest way to complete them. Special emphasis should be placed on lifting techniques and the proper use of furniture and equipment. This leads to the prevention of musculoskeletal disorders in the workplace.

Musculoskeletal disorders (MSDs) affect the muscles, nerves, blood vessels, ligaments, and tendons. Workers in many different industries and occupations can be exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing, and pulling heavy loads, working in awkward body postures, and performing the same or similar tasks repetitively. Exposure to these known risk factors for MSDs increases a worker's risk of injury.

Work-related MSDs can be prevented. Ergonomics --- fitting a job to a person --- helps lessen muscle fatigue, increases productivity, and reduces the number and severity of work-related MSDs.

## Lockout-Tagout

What is hazardous energy?

Energy sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other sources in machines and equipment that can be hazardous to workers. During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers.

What are the harmful effects of hazardous energy?

Individuals servicing or maintaining machines or equipment may be seriously injured or killed if hazardous energy is not properly controlled. Injuries resulting from the failure to control hazardous energy during maintenance activities can be serious or fatal! Injuries may include electrocution, burns, crushing, cutting, lacerating, amputating, or fracturing body parts, and others.

* A steam valve is automatically turned-on burning workers who are repairing a downstream connection in the piping.
* A jammed conveyor system suddenly releases, crushing a worker who is trying to clear the jam.
* Internal wiring on a piece of factory equipment electrically shorts, shocking worker who is repairing the equipment.

Craft workers, electricians, machine operators, and laborers are among the millions of workers who service equipment routinely and face the greatest risk of injury.

What can be done to control hazardous energy?

Proper lockout/tagout (LOTO) practices and procedures safeguard workers from hazardous energy releases. OSHA's Lockout/Tagout [Fact Sheet](https://www.osha.gov/sites/default/files/publications/OSHA3529.pdf) describes the practices and procedures necessary to disable machinery or equipment to prevent hazardous energy release. The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) ([29 CFR 1910.147](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.147)) for general industry outlines measures for controlling different types of hazardous energy. The LOTO standard establishes the employer's responsibility to protect workers from hazardous energy. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures:

* Proper lockout/tagout (LOTO) practices and procedures safeguard workers from the release of hazardous energy. The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) ([29 CFR 1910.147](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.147)) for general industry, outlines specific action and procedures for addressing and controlling hazardous energy during servicing and maintenance of machines and equipment. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures. Workers must be trained in the purpose and function of the energy control program and have the knowledge and skills required for the safe application, usage, and removal of the energy control devices.
* All employees who work in an area where energy control procedure(s) are utilized need to be instructed in the purpose and use of the energy control procedure(s), especially prohibition against attempting to restart or reenergize machines or other equipment that are locked or tagged out.
* All employees who are authorized to lockout machines or equipment and perform the service and maintenance operations need to be trained in recognition of applicable hazardous energy sources in the workplace, the type and magnitude of energy found in the workplace, and the means and methods of isolating and/or controlling the energy.
* Specific procedures and limitations relating to tagout systems where they are allowed.
* Retraining of all employees to maintain proficiency or introduce new or changed control methods.

OSHA's Lockout/Tagout [Fact Sheet](https://www.osha.gov/sites/default/files/publications/OSHA3529.pdf) describes the practices and procedures necessary to disable machinery or equipment to prevent the release of hazardous energy.

The control of hazardous energy is also addressed in a number of other OSHA standards, including Marine Terminals ([1917 Subpart C](https://www.osha.gov/laws-regs/regulations/standardnumber/1917#1917_Subpart_C)), Safety and Health Regulations for Longshoring ([1918 Subpart G](https://www.osha.gov/laws-regs/regulations/standardnumber/1918#1918_Subpart_G)), Safety and Health Regulations for Construction; Electrical ([1926 Subpart K](https://www.osha.gov/laws-regs/regulations/standardnumber/1926#1926_Subpart_K)), Concrete and Masonry Construction ([1926 Subpart Q](https://www.osha.gov/laws-regs/regulations/standardnumber/1926#1926_Subpart_Q)), Electric Power Transmission and Distribution ([1926 Subpart V](https://www.osha.gov/laws-regs/regulations/standardnumber/1926#1926_Subpart_V)), and General Industry; Electrical ([1910 Subpart S](https://www.osha.gov/laws-regs/regulations/standardnumber/1910#1910_Subpart_S)), Special Industries ([1910 Subpart R](https://www.osha.gov/laws-regs/regulations/standardnumber/1910#1910_Subpart_R)), and Electric Power Generation, Transmission and Distribution ([1910.269](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.269)).

## Minimum PPE for Visitors and Volunteers

* Protective eyewear is the minimum PPE required for a visitor entering the HVAC shop.
* Whenever chemical, electrical, or mechanical hazards present a risk, protective eyewear and full-coverage footwear are the minimum PPE. This equipment shall be supplemented, as necessary, with the appropriate gloves and other PPE necessary for the tasks to be performed.
* The teacher (or other adult supervisor) shall enforce the use of required PPE.
* The teacher (or other adult supervisor) shall determine the appropriate footwear for the shop.

## Records of Staff and Student Training

* Maintain Records of staff and student Safety training.
* Refresher training for students and staff shall be conducted annually.

## Safety Equipment and Signage

* Minimum Personal Protective Equipment (PPE) rules posted at public entries.
* Visibly marked exits.
* Visibly marked fire extinguishers and fire blankets.
* Easily read and highly visible emergency exit procedures.
* Posted safety rules.
* Other emergency procedures that are posted and highly visible.
* Emergency Procedure Manuals such as SDS binders and Safety manuals. These will be available by doors and near Teacher's desk.
* A first aid kit readily accessible and stocked.
* Signage for proper operation of equipment.
* Fire drill procedures are posted.
* Computer workstations that are properly connected and maintained.
* Eyewash stations and an emergency shower with signage.
* Signage must be located so that it is visible across a fully populated and fully equipped shop.

## Equipment Care and Maintenance

* Keep equipment at waist level so it is easy to retrieve and reduce risk or dropping.
* Do not leave equipment plugged in when not in use (automation and networked equipment are an exception). Hard wired equipment should be powered down when not in use.
* Maintenance and calibration records for equipment should be stored in the department safety folder.
* Repair equipment promptly; if beyond repair, dispose of promptly (unless parts can be salvaged for use). Equipment not operational is to be marked "Out of Service".
* Keep all maintenance records for equipment on file.

## OSHA Standards Addressed in this Document

* The Hazard Communication Standard (29 CFR 1910.1200)
* The Personal Protective Equipment (PPE) Standard (29 CFR 1910.132)
* The Eye and Face Protection Standard (29 CFR 1910.133)
* The Hand Protection Standard (29 CFR 1910.138)
* The Bloodborne Pathogens Standard (29 CFR 1910.1030)
* The Fall Protection Construction Standard (29 CFR 1926.502)
* The Respiratory Protection Standard (29 CFR 1910.134)
* The Control of Hazardous Energy [Lockout-Tagout (29 CFR 1910.147)]
* The Occupational Noise Exposure Standard (29 CFR 1910.95)
* The Welding, Cutting and Brazing Standard (CFR 1910.252)
* The Machinery and Machine Guarding Standard (CFR 1910.212)
* The Personal Protective Equipment (PPE) Standard (29 CFR 1910.132)
* The Hazard Communication Standard (29 CFR 1910.1200)