

# POLICY 4210 - SHOP AND SHOP/LAB SAFETY

## INTRODUCTION

This Section is designed to present general safety information for mechanical shops/labs that are located in multiple areas at the University and for employees who perform shop-related tasks. **Budget Units with these shops/labs and employees that perform shop-related duties are Physical Plant (Trades, Grounds, Custodial, Mechanics), Mechanical Engineering, Civil Engineering, Trenchless Technology, Physics, Art, Performing Arts, Forestry, Agricultural Sciences, Housing, and Athletics. The information in this Section covers the more common tasks performed in shops and is not intended to be all-inclusive. If a Budget Unit performs tasks or has shop equipment not covered in this section, the Budget Unit Head for that area must develop their own site-specific/equipment-specific safety policies for these task, including instituting and maintaining an appropriate training program for these tasks. Examples of site-specific task/equipment include those related to farming/field operations, grounds keeping, trenchless technology, power generation and distribution, technical services. Safety issues related to traditional science/engineering labs are found in the Laboratory Safety Manual section of this Plan.**

## GENERAL INFORMATION

The information in this subsection applies to tasks and equipment assigned to many shops/lab, and to other task performed outside these traditional work settings (ex; Athletics).

### 1. USE OF COLOR TO INDICATE SAFETY HAZARDS

Color is used extensively for safety purposes in shops and physical facilities. While never intended as a substitute for good safety measures and the use of mechanical safeguards, standard colors are used to identify specific hazards. Standards have been developed and are given in American National Standard Z53.1, "Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment." In summary, they are as follows:

- RED identifies fire protection equipment, danger, and emergency stops on machines.
- YELLOW is the standard color for (a) marking hazards that may result in accidents from slipping, falling, striking against, etc.; (b) flammable liquid storage cabinets; (c) a band on red safety cans; (d) materials handling equipment such as lift trucks and gantry cranes; and (e) radiation hazard areas or containers (with purple). Black stripes or checkerboard patterns are often used with yellow.
- GREEN designates the location of first aid and safety equipment (other than firefighting equipment). (Also, see "BLUE" below.)

- BLACK AND WHITE and combinations of these in stripes or checks are used for housekeeping and traffic markings. They are also permitted as contrast colors.
- ORANGE is the standard color for highlighting dangerous parts of machines or energized equipment such as exposed edges of cutting devices and the inside of (a) movable guards and enclosure doors, and (b) transmission guards
- BLUE is used on informational signs and bulletin boards not of a safety nature. (If of a safety nature, use green.) Also has railroad uses.
- REDDISH-PURPLE identifies radiation hazards; check Nuclear Regulatory Commission (NRC) regulations.

The piping in a plant may carry harmless, valuable, or dangerous contents. Therefore, it is highly desirable to identify different piping systems. The American National Standard A13.1, "Scheme for Identification of Piping Systems," specifies standard colors for identifying pipelines and describes methods of applying these colors to the lines. The contents of pipelines are classified as such:

- Fire Protection-Red
- Dangerous-Yellow
- Safe-Green
- Protective Materials-Bright Blue (i.e., inert gases)

The proper color may be applied to the entire length of the pipe or bands 8-10 inches (20-25 cm) wide near valves, pumps, and at repeated intervals along the line. The name of the specific material is stenciled in black at readily visible locations such as valves and pumps.

Piping less than 3/4 inches in diameter is identified by enamel-on-metal tags.

The code also recommends highly resistant colored substances for use where acids and other chemicals may affect paints.

## 2. ILLUMINATION FOR OCCUPATIONAL TASKS

Proper lighting is critical to safe and efficient work in shops/labs. Glare, diffusion, direction, uniformity, brightness, color, and brightness ratios effect visibility and the ability to see easily, accurately, and quickly. Poor lighting is uncomfortable and possibly hazardous.

The desirable quantity of light for any particular installation depends primarily upon the work that is being done. As the illumination of the task is increased, the ease, speed, and accuracy of accomplishing it are also increased. Following are two tables of levels of illumination for industrial area as recommended by the American National Standard A11.1 "Practice for Industrial Lighting"

Quantity of illumination is stated in foot-candles (1 foot-candle equals approximately 10.8Lux) and is measured with a light meter.

<b>MAXIMUM LUMINANCE RATIOS</b>			
<b>ENVIRONMENTAL CLASSIFICATION</b>			
	<b>A</b>	<b>B</b>	<b>C</b>
Between tasks and adjacent darker surroundings	3 to 1	3 to 1	5 to 1
Between tasks and adjacent lighter surroundings	1 to 3	1 to 30	1 to 5
Between tasks and more remote darker surfaces	10 to 1	20 to 1	*
Between tasks and more remote lighter surfaces	1 to 10	1. to 20	*
Between luminaries (or windows, skylights, etc.) and surfaces adjacent to them	20 to 1	*	*
Anywhere within normal field of view	40 to 1	*	*

\*Brightness Ratio control not practical.

A. Interior Areas where reflectance of entire space can be controlled in line with recommendations for optimum seeing

B. Areas where reflectance of immediate work area can be controlled, but control of remote surroundings is limited.

C. Areas (indoor and outdoor) where it is completely impractical to control reflectance and difficult to alter environmental conditions.

Note: From the normal view point, brightness ratios of areas of appreciable size in industrial areas shall not exceed those in the above table.

From: American National Standard A11.1-1973, Practice for Industrial Lighting, Illuminating Engineering Society

## HOT ENVIRONMENTS AND HEAT-RELATED DISORDERS

Many of the tasks performed by shop/lab personnel are performed in the outdoors or in areas where the air is not conditioned, and many of the tasks involve exertion. If the environment is hot or when the rate of heat transfer from the body by convection, radiation, and sweat evaporation is not adequate, then warming of the body occurs.

Excessive warming of the body can lead to heat stroke which can be fatal unless treated promptly and properly. Other consequences of heat stress include heat exhaustion, heat cramps, and a rash called "prickly heat."

All employees who work in hot environments shall be trained in the recognition of heat stress warning signs and the appropriate emergency treatments should symptoms occur. It is important for the employer to provide training in the symptoms and effects of heat stress and heat stroke. It is also important to stress the importance of drinking fluids and maintaining proper electrolyte levels.

### **Heat Exhaustion**

Symptoms: Fatigue, weakness, profuse sweating, normal temperature, pale, clammy skin, headache, cramps, vomiting, fainting.

Treatment:

1. Medical alert
2. Remove worker from hot area
3. Have worker lie down and raise feet
4. Apply cool, wet cloths
5. Loosen or remove clothing
6. Allow small sips of water or electrolyte beverage if victim is not vomiting, then encourage victim to drink as much as possible.
7. Instruct victim to stay out of heat for the remainder of the day.

Prevention:

1. Take frequent breaks
2. Increase fluid intake
3. Allow workers to become acclimatized to heat

Causes:

1. High air temperature
2. High humidity

3. Low air movement
4. Hard work
5. Not enough breaks
6. Insufficient fluid intake
7. Full body clothing
8. Workers not acclimated to heat

### **Heat Stroke**

Symptoms: Dizziness; nausea, severe headache; hot and dry skin; confusion; collapse; delirium; coma; death.

Treatment:

1. Medical emergency alert B life threatening situation
2. Remove worker from hot area
3. Remove clothing
4. Have victim lay down
5. Cool body by any means available B cold water, chemical cooling ice packs, ice rubbed vigorously over body
6. Do not give stimulants
7. Give cold drinks if patient can cooperate
8. Call 9-911 to summons transportation of the victim immediately to nearest medical facility

Causes:

1. High air temperature
2. High humidity
3. Low air movement
4. Hard work
5. Not enough breaks
6. Insufficient fluid intake
7. Full body clothing
8. Not acclimatized

NOTE: Before beginning the project, provisions shall be made for prompt medical attention in case of serious injury. Telephone numbers of physicians, hospitals, or ambulances shall be conspicuously posted. Personnel trained in basic first-aid shall always be on the project.

### **Evaluation and Control of Hot Environments**

1. Measurement of the Environment

Dry-bulb, a natural wet-bulb, a globe thermometer, and a stand are required instruments for the simplest and most suitable technique to measure the environmental factors.

## 2. Prevention Measures

Prevention measures fall into three categories: engineering, administrative, and use of personal protective equipment.

- Engineering methods - mechanical procedures used to reduce the stress of hot environments, i.e., increasing general ventilation, use of local exhaust, cooling fans, shielding, isolation, relocation, redesign or substitution of equipment and/or processes.
- Administrative methods - work practice controls used to limit duration of heat stress or rest areas for rapid body cooling such as acclimating to heat, a work-rest regimen, distribution of work load, and doing hot work in the coolest part of the day.
- Personal protective equipment - used only when a person must remain in a hot environment long enough to cause unacceptably high heat strain without protection. This varies in the amount and type of clothing, from short-sleeved cottons to body cooling suits.

NOTE: All these methods of prevention shall incorporate increased high electrolyte fluid and water intake.

## CONFINED SPACES

### **A. PURPOSE AND SCOPE**

This policy provides procedures for the safe entry and work practices in confined spaces. The policy applies to all employees who enter confined spaces at Louisiana Tech University.

### **B. TRAINING**

All employees who enter, attend, or supervise employees entering confined spaces must be trained. New hires that will participate in confined space entry should be trained prior to entering a confined space.

### **C. HAZARDS OF CONFINED SPACE-** Confined spaces can be hazardous for several reasons:

- Lack of oxygen can cause a worker to collapse almost instantly.
- Toxic gases or vapors can poison or suffocate workers.
- Combustion, a buildup of flammable/combustible gases or vapors, can burn or explode.
- Heat can cause heat exhaustion, cramps, etc.

- Noise intensifies in small spaces and can cause hearing loss, as well as interfere with communication.
- Mechanical equipment can cause sparks to ignite flammable or combustible gases, or cause physical injury.
- Falls can cause injury – falls from one level to another or by slips and trips.

#### **D. DEFINITION OF CONFINED SPACES**

OSHA states that, "a confined space has limited or restricted means for entry or exit, and it is not designed for continuous employee occupancy. Confined spaces include, but are not limited to underground vaults, tanks, storage bins, manholes, pits, silos, process vessels, and pipelines." A confined space is normally not intended for human occupancy or entry when the process/equipment is in operation. An "enclosed space" is a confined area that is suitable for human entry during operation, such as a manhole.

There are two types of confined spaces:

1. Non-Permit Required Confined Space – is a space that meets the definition of a confined space but does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.
2. Permit Required Confined Space – this is a confined space that meets the definition of a confined space but has one or more of the following characteristics:
  - a. Contains or has a potential to contain a hazardous atmosphere;
  - b. Contains a material that has the potential for engulfing an entrant;
  - c. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
  - d. Contains any other recognized serious safety or health hazard.

**In accordance with a campus-wide survey of Louisiana Tech University by the Environmental Health and Safety Office, no areas were discovered which meet the OSHA "Permit Required" Confined Space; however, the boilers at the Power Plant, the steam tunnels, the some manholes, as well as, the storm drains have been identified as areas of concern and could potentially be hazardous if entered. Louisiana Tech University has a verbal agreement with the Ruston Fire Department that if any of these areas have to be accessed, then prior to any work being done in these areas, The Director of the Physical Plant or the Director of the Office of Environmental Health and Safety will first contact the Ruston Fire Department.**

This is not comprehensive and employees may discover additional confined spaces. It should also be noted that non-permit required spaces may become permit required confined spaces according to the type of work being performed (i.e. welding in a non-permit confined space can create a hazardous atmosphere, thus making it a permit confined space).

## PROCEDURES FOR ENTERING CONFINED SPACES

STEP 1- The Ruston Fire Department has all of the personnel, equipment and training necessary for entry into confined spaces. The Ruston Fire Department will first check the atmosphere of the area to determine if it is safe for entry, then once it has been deemed safe, will send one of their people into the area along with a Louisiana Tech employee until the task has been completed. In addition the Ruston Fire Department will also have a person as a “hole-watch” along with a Louisiana Tech employee until the task has been completed.

**In the event that work is done in the above mentioned areas by outside contractors, the bids for contracts must specify that the bidder will furnish a copy of their Confined Space Program and all necessary documentation that the individuals to be working in the area have received the proper training. A copy of this information should be forwarded to the Physical Plant and to the Environmental Health and Safety Office for record retention.**

STEP 2- Review Guidelines

- A. Determine potential hazards.
- B. Determine the classification, permit required or not.
- C. Review safety equipment required.
- D. Review emergency measures.

STEP 3- Get Proper Approval

- A. Obtain an entry permit from your supervisor.
- B. Post it at the worksite, if required.

STEP 4- Lockout/Tagout Sources of Danger (See'Lockout/Tagout')

STEP 5- Test for Potential Hazards (DONE BY RUSTON FIRE DEPARTMENT)

- A. All confined spaces shall be tested for possible oxygen deficiency and flammable/combustible gas/vapor content by a qualified person.
- B. If hazardous gases/vapors are detected, ventilate and clean the space then test again.

STEP 6- Ventilate – If inadequate ventilation is suspected, a blower shall be made available to assure a sufficient air supply.

STEP 7- Assemble Proper Equipment and Post Observers

STEP 8- Require respirators, lifelines, tools, etc., shall be gathered before entering.

STEP 9- An observer shall be posted near the entrance in case an emergency rescue is needed.

STEP 10- In a permit required space, rescue equipment must be at the worksite, and a lifeline must be used. Also, a log of entries must be kept, and unauthorized people must be prohibited from entering.

## STEP 11- Miscellaneous

- A. Before welding, burning, cutting, or brazing work starts, a hotwork permit shall be obtained.
- B. If asbestos pipe insulation is to be removed in a confined space, it shall be done by employees trained in asbestos removal techniques using proper personal protective equipment.
- C. NEVER Enter a confined space unless authorized to do so.
- D. NEVER Enter a confined space unless an observer is posted near the entrance.
- E. NEVER smoke in a confined space.

Confined spaces are dangerous work environments and should always be treated with extreme caution. This policy attempts to provide safe procedures for entry and work in confined spaces, but, there are may be confined spaces that are more dangerous and may not be appropriate for any entry. Before entering these spaces, the Louisiana Tech University Environmental Health and safety Office must approve that entry. .Also, note that any employee who feels unsafe or uncomfortable about entering a confined space cannot be forced to enter the space and perform the work. Some employees are claustrophobic and have a fear of confined spaces or the employee may fear the spaces for other reasons. Do not force or command anyone to enter a confined space.

## APPLICABLE REGULATIONS

This policy is based on regulations of the Occupational Safety and Health Administration (OSHA). Specific regulations on confined spaces are found in 29 CFR 1910.146.

## EXCAVATIONS, TRENCHING, AND SHORING

Excavation and trenching in an integral part of many tasks performed on campus. Many times the excavation or trench must be shored up to prevent cave-ins. All excavations over 5 feet deep shall be sloped, shored, sheeted, braced, or otherwise supported. When soil conditions are unstable, excavations more shallow than 5 feet shall be sloped, supported, or shored.

### **Methods of Excavations, Trenching, and Shoring**

- One method is to slope the sides of the cut to the  $\alpha$  angle of repose.<sup>@</sup> This varies with different types of soil and shall be determined on each individual project.
- A second method of support is shoring, i.e., sheeting, tightly placed timber shores, bracing, trench jacks, piles, or other materials installed in a manner strong enough to resist the pressure surrounding the excavation.
- A third method is to use a trench box. A trench box is a pre-fabricated movable trench shield composed of steel plates welded to a heavy steel frame.

### **Factors for Adequate Protection**

- Soil Structure- Carefully identify soil structure. Wet soil, sandy soil, or areas that have been back-filled are relatively unstable and need strong support.
- Weather Conditions- Changing weather conditions shall be taken into consideration. Excess rain water loosens the soil and increases the pressure of the shoring system. Superimposed Loads- Heavy equipment and materials such as pipes or timbers shall be kept as far back from the excavation as possible. If this cannot be done, these added pressures are to be taken into consideration. Any additional vibration in the surrounding area shall be taken into consideration.

### **Installation**

- Support systems shall be installed starting at the top and working to the bottom. Care shall be taken to place cross beams or trench jacks in true horizontal position and to space them vertically at appropriate intervals. Braces shall be secured to prevent sliding, falling, or kickouts.
- All material used shall be in good condition.
- Shoring shall closely follow excavation work.
- Unstable excavation bottoms below the water line shall be guarded. Adequate drainage is required to prevent surface water from entering the excavation.
- Barricades shall be placed around all excavated openings. Signage stating “DANGER: EXCAVATION” shall be placed around the opening.
- When employees are in a trench of 4 feet or more, a ladder or steps shall be provided and located for quick exit. There shall not be more than 25 feet lateral travel to ladder or steps.
- Ladders used in excavations shall be in good condition, secured, and they shall extend 3 feet above the excavation.

### **Removing the Material**

After the trench has been cleared, workers shall remove the shoring from the bottom up taking care to release jacks or braces slowly. In unstable soil, ropes shall be used to pull out the jacks or braces from above.

### **Inspection**

Shoring shall be inspected daily by a competent person.



ANGLE OR REPOSE FOR SLOPING SIDES OF EXCAVATIONS	
ANGLE (RATIO)	KIND OF EARTH
90°	Solid rock, shale or cemented sand and gravels.
63° (1/2:1)	Compacted angular gravels.
45° (1:1)	Recommended slopes for average soils
33° (1 1/2:1)	Compacted sharp sand.
26° (2:1)	Well-rounded loose sand.
<p><b>NOTE:</b> Clays, silts, loams, or non-homogenous soils require shoring and bracing. The presence of ground water requires special treatment.</p>	

## EQUIPMENT LOCKOUT/TAGOUT PROCEDURE

### **PURPOSE**

Personnel in shops and labs in all areas of the University perform tasks with, in, or around equipment that must be de-energized before these task can commence. Often this energy or equipment can injure or kill the employee if the equipment is not properly de-energized. Control of Hazardous energy is the purpose of the Lockout/Tagout Program. This program establishes the requirements for isolation of both kinetic and potential electrical, chemical, thermal, hydraulic and pneumatic and gravitational energy prior to equipment repair, adjustment or removal. Reference: OSHA Standard 29 CFR 1910.147, the control of hazardous energy.

### **DEFINITIONS**

1. Authorized (Qualified) Employees: are the only ones certified to lock and tagout equipment or machinery. Whether an employee is considered to be qualified will depend upon various circumstances in the workplace. It is likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person, is considered to be "qualified" for the performance of those duties.

2. Affected Employees: are those employees who operate machinery or equipment upon which lockout or tagging out is required under this program. Training of these individuals will be less stringent in that it will include the purpose and use of the lockout procedures.
3. Other Employees: are identified as those that do not fall into the authorized, affected or qualified employee category. Essentially, it will include all other employees. These employees will be provided instruction in what the program is and not to touch any machine or equipment when they see that it has been locked or tagged out.

## **TRAINING**

- Authorized Employees Training- All pertinent Maintenance Employees and Department Supervisors will be trained to use the Lock and Tag Out Procedures. The training will be conducted by the Budget Unit's Safety Coordinator. Retraining shall be held at least annually.
- Affected Employee Training
  - a) Only trained and authorized employees will repair, replace or adjust machinery, equipment or processes.
  - b) Affected employees may not remove locks, locking devices or tags from machinery, equipment or circuits.
- Other Employee Training
  - a) Only trained employees will repair, replace or adjust machinery or equipment.
  - b) Other employees may not remove locks, locking devices or tags from machinery, equipment or circuits.

## **PREPARATION FOR LOCK AND TAG OUT PROCEDURES**

1. Before any work is to be done on any piece of equipment, all energy sources will be located and identified. In addition, the location of disconnects, types of disconnects, special hazards and special safety procedures will be located and identified as well.
2. This procedure will be reviewed each time to ensure employees properly lock and tag out equipment and machinery.

## **ROUTINE MAINTENANCE AND MACHINE ADJUSTMENTS**

Lock and Tag Out procedures are not required if equipment must be operating for proper adjustment. This rare exception may be used only by trained and authorized employees when specific procedures have been developed to safely avoid hazards with proper training. All consideration shall be made to prevent the need for an employee to break the plane of a normally guarded area of the equipment by use of tools and other devices.

## **LOCKS, HASPS, AND TAGS AS LOCK OUT/TAG OUT DEVICES**

All shops where personnel have to practice lock out procedures have their own lock out devices. All locks will be keyed differently, except when a specific individual is issued a series of locks for complex lockout-tagout tasks. In some cases, more than one lock, hasp and tag are needed to completely de-energize equipment and machinery. All locks and hasps shall be uniquely identifiable to a specific shop.

### **GENERAL LOCK AND TAG OUT PROCEDURES - SHUTDOWNS**

1. Before working on, repairing, adjusting or replacing machinery and equipment, the following procedures will be utilized to place the machinery and equipment in a neutral or zero mechanical state.
2. Before authorized or affected employees turn off a machine or piece of equipment, the authorized employee will have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the means to control the energy.
3. Notify all affected employees that the machinery, equipment or process will be out of service.
4. The machine or equipment will be turned or shut down using the specific procedures for that specific machine. An orderly shutdown will be utilized to avoid any additional or increased hazards to employees as a result of equipment de-energization.
5. If the machinery, equipment or process is in operation, follow normal stopping procedures (depress stop button, open toggle switch, etc.)

### **MACHINE OR EQUIPMENT ISOLATION**

1. All energy control devices that are needed to control the energy to the machine or equipment will be physically located and operated in such a manner as to isolate the machine or equipment from the energy source.
2. Move switch or panel arms to "Off" or "Open" positions and close all valves or other energy isolating devices so that the energy source(s) is disconnected or isolated from the machinery or equipment.

### **LOCKOUT OR TAGOUT DEVICE APPLICATION**

1. Lockout or tagout devices will be affixed to energy isolating devices by authorized employees.
2. Lockout devices will be affixed in a manner that will hold the energy isolating devices in the "safe" or "off" position.
3. Where tagout devices are used they will be affixed in such a manner that will clearly state that the operation or the movement of energy isolating devices from the "safe" or "off" positions is prohibited.

4. The tagout devices will be attached to the same point a lock would be attached. If the tag cannot be affixed at that point, the tag will be located as close as possible to the device in a position that will be immediately obvious to anyone attempting to operate the device.
5. Lock and tag out all energy devices by use of hasps, chains and valve covers with assigned individual locks.

### **STORED ENERGY**

1. Following the application of the lockout or tagout devices to the energy isolating devices, a potential or residual energy will be relieved, disconnected, restrained, and rendered safe.
2. Where the re-accumulation of stored energy to a hazardous energy level is possible, verification of isolation will be continued until the maintenance or servicing is complete.
3. Release stored energy (capacitors, springs, elevated members, rotating fly wheels, and hydraulic/air/gas/steam systems) must be relieved or restrained by grounding, repositioning, blocking and/or bleeding the system.

### **VERIFICATION OF ISOLATION**

1. Prior to starting work on machines or equipment that have been locked or tagged out, the authorized employees will verify that isolation or de-energization of the machine or equipment have been accomplished.
2. After assuring that no employee will be placed in danger, test all lock and tag outs by following the normal start up procedures (depress start button, etc.).
3. Caution: After Test, place controls in neutral position.
4. Special Electrical Note: Check Voltage as part of testing procedures.

### **EXTENDED LOCKOUT/TAGOUT**

Should the shift change before the machinery or equipment can be restored to service, the lock and tag out must remain. If the task is reassigned to the next shift, those employees must lock and tag out before the previous shift may remove their lock and tag.

### **RELEASE FROM LOCKOUT/TAGOUT**

1. Before lockout or tagout devices are removed and the energy restored to the machine or equipment, the following actions will be taken:
2. The work area will be thoroughly inspected to ensure that nonessential items have been removed and that machine or equipment components are operational.

3. The work are will be checked to ensure that all employees have been safely positioned or removed. Before the lockout or tagout devices are removed, the affected employees will be notified that the lockout or tagout devices are being removed.
4. Each lockout or tagout device will be removed from each energy isolating device by the employee who applied the device.

### **LOTO PROCEDURE FOR ELECTRICAL PLUG-TYPE EQUIPMENT**

This procedure covers all electrical plug-type equipment such as battery chargers, some product pumps, office equipment, powered hand tools, powered bench tools, lathes, fans, etc. When working on, repairing, or adjusting the above equipment, the following procedures must be utilized to prevent accidental or sudden startup:

- Unplug electrical equipment from wall socket or in-line socket.
- Attach “Do Not Operate” tag on plug box and lock on end of power cord. An exception is granted to not lock and tag the plug if the cord and plug remain in the exclusive control of the employee working on, adjusting or inspecting the equipment.
- Test equipment to assure power source has been removed by depressing the “on” switch.
- Perform required operations.
- Replace all guards removed.
- Remove lock and plug box and tag.
- Inspect power cord and socket before plugging equipment into power source. Any defects must be repaired before placing the equipment back in service.

### **LOTO PROCEDURES INVOLVING MORE THAN ONE EMPLOYEE**

In the preceding SOPs, if more than one employee is assigned to a task requiring a lock and tag out, each must also place his or her own lock and tag on the energy isolating device(s) unless crew/craft LOTO procedures are used.

### **MANAGEMENT’S REMOVAL OF LOCK AND TAG OUT**

Only the employee that locks and tags out machinery, equipment or processes may remove his/her lock and tag. However, should the employee leave the facility before removing his/her lock and tag, the maintenance manager/supervisor may remove the lock and tag. The maintenance manager/supervisor must be assured that all tools have been removed, all guards have been replaced and all employees are

free from any hazard before the lock and tag are removed and the machinery, equipment or process are returned to service. Notification of the employee who placed the lock is required prior to lock removal.

## **CONTRACTORS**

Contractors, working on university property and equipment must use a lockout/tagout procedure while servicing or maintaining equipment, machinery, or processes. They must provide their procedure for lock out/tag out to any University employee who may be assisting them on a project and verify that these employees understand and practice their procedure. This procedure is also provided to the Office of Finance and Administration.

## **MATERIAL HANDLING**

Material handling is done by every person in every department on campus. It is done as either his/her sole duty or as part of his/her regular duties. Material handling can either be done by hand or with mechanical help (fork lift, hoist, hand trucks, slings, etc.).

The following are general safety rules and requirements regarding material handling and material handling equipment regularly used on campus.

**Lifting by hand-** Lifting and carrying can be done without injury by using the following criteria: Personal Protection- NOTE: Minor office material lifting is exempt from Personal Protection section of "Lifting By Hand" Hand Protection shall be used when lifting; however, gloves or loose clothing shall not be worn around moving equipment. Leather gloves and aprons shall be worn when handling rough or sharp objects.

Chemical gloves, splash suits, and eye protection shall be worn when handling chemicals of any nature.

Eye protection should be worn at all times.

Warehousing, trades, and other occupations involving lifting of heavy objects shall wear steel-toed shoes and/or shin guards.

**Body Condition-** How much should you lift? Lifting capacity depends on body condition; that is, flexibility and strength, and physical make-up. To help your condition, build up your strength by a regular exercise program and stretch your body before doing any lifting.

### **Sizing Up The Load**

Questions to ask:

1. Is it too big for you to handle?
2. What about the shape? Is it irregular, square, rectangular, etc.?
3. Can you get a firm, comfortable grip?

4. How many loads are there and where are they going?

**Lifting It Right-** There are six steps to proper lifting:

1. Keep feet parted one beside the object and one behind the object. Comfortably spread feet give greater stability; the rear foot is in position for the upward thrust of the lift.
2. Keep back straight, nearly vertical. Use the sit-down position to do so, but remember that straight does not mean absolutely vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the guts that can cause hernia.
3. Tuck in chin so the neck and head continue the straight back line and keep spine straight and firm.
4. Grasp the object with the whole hand. The palm grip is one of the most important elements of correct lifting. The fingers and hand are extended around the object to be lifted. Use the full palm; fingers alone have very little power. Wearing gloves is recommended.
5. Tuck elbows and arms in and hold load close to body. When the arms are held away from the body, they lose much of their strength and power. Keeping the arms tucked in also helps keep body weight centered.
6. Keep body weight directly over feet. This provides a more powerful line of thrust and ensures better balance. Start the lift with a thrust of the rear foot.
7. When setting the load down, the same six proper lifting steps shall be used in reverse.
8. To place an object on a bench or table, the worker shall first set it on edge and push it far enough onto the support to be sure it will not fall.
9. The object shall be released gradually as it is set down. It shall be moved in place by pushing with the hands and body from in front of the object. This method prevents fingers from being pinched. It is especially important that an object placed on a bench or other support be securely positioned so that it will not fall, tip over, or roll off. Supports shall be correctly placed and strong enough to carry the load. Heavy objects like lathe chucks, dies, and other jigs and fixtures shall be stored at approximately waist height.
10. To raise an object above shoulder height, the worker shall lift it first to waist height. He/she shall rest the edge of the object on a ledge, stand, or hip. He/she shall then shift hand position so the object can be boosted after the knees are bent. The knees shall be straightened out as the object is lifted.
11. To change direction, the worker shall lift the object to the carrying position and turn the entire body including the feet. He/she shall avoid twisting the body. In repetitive work, the person and the material both shall be positioned to prevent twisting of the body when moving the material.

### **Team Lifting**

1. When two or more people carry one object, they shall adjust the load so that it rides level.
2. When long sections of material (pipe, lumber) are carried, the load shall be carried on the same shoulder and both persons shall walk in step.
3. When team lifting, one person shall be designated to give the signal when to lift.

### **Handling of Barrels and Drums**

1. It is recommended that a hand truck or other type of material handling equipment be used for lifting and transporting barrels or drums.
2. If it is necessary to roll a barrel or drum, the employee shall push against the sides with both hands. To change directions, the drum or barrel shall be stopped, the direction changed by grabbing the upper and lower rim seams and movement re-started.
3. When uprighting a full drum, the 6 steps to safe lifting shall be followed.

#### **Items to Remember When Lifting by Hand:**

- Avoid twisting while turning with a load.
- Watch for narrow places when moving materials.
- Avoid high reaching and lifting. A suitable ladder or platform shall be used to get up to load.
- Do not jump with a load.
- Do not catch or throw loads.
- Check the materials to be lifted for nails, splinters, rough strapping, or other things that might injure hands.
- Ascertain good visibility, especially on stairs.

#### **Hand trucks**

##### **A. General**

- Keep truck under control at all times.
- Trucks shall be stored in designated area, not in aisles.
- Always move the truck at a safe speed. Do not run.
- Loads shall be packed securely; avoid overhanging.
- No riders or horseplay.
- Hands shall be kept inside to protect them in narrow areas if the truck does not have knuckle guards or handles.

B. One Axle Hand trucks

- Keep the center of gravity of the load as low as possible. Place heavy objects below higher objects.
- Place the load so it is carried by the axle, not the handles.
- Load only to a height that will allow a clear view ahead.
- When lifting from a horizontal position, have a straight back and lift with the legs. The load shall be put down the same way.
- Let the truck carry the load. The operator shall balance and push only.
- Never walk backwards with a handtruck.
- For extremely bulky or pressurized items, such as gas cylinders, strap or chain the item to the truck. Valve caps shall be on valves.
- Always move the truck at a safe speed. Do not run.

C. Two Axle Trucks- NOTE: Many one axle handtruck rules apply here also.

- Load evenly to prevent tipping.
- Push. Do not pull.
- The truck shall not be loaded so high that the operator cannot see well in the direction of travel. If the load is high, two person are needed; one to push and one to guide.
- Truck contents shall be arranged so they will not fall if accidently bumped.
- When entering elevators or tight areas, enter with the load forward. Make sure load is bound to truck.

**Rollers, compactors, Front-end Loaders, Bulldozer**

- All vehicles of these types shall have a suitable horn available is used.

- Operators shall wear seat belts at all times when machinery is in operation.
- All controls (brakes, steering, etc.) shall be checked before the vehicle is used.
- No riders shall be allowed on machines unless the machine is designed to carry riders.
- Blades, buckets, and shovels on earth-moving machines shall be lowered to the ground when the equipment is parked or unattended.
- All earth-moving equipment shall have a roll-over protection structure (ROPS) and seat belts.
- Trucks that are loaded by a crane, power shovel, loader, or similar equipment shall have a cab shield and/or canopy strong enough to protect the operator from shifting or falling materials. Operators shall be out of the vehicles while they are being loaded. Brakes shall be set.
- All trucks, excluding pickup trucks and earth-moving equipment, shall have an audible warning device that sounds automatically when they are backing up. The sound shall be able to be heard at least 200 feet away.
- Smoking during vehicle refueling and operation is prohibited.
- All vehicles shall be operated in a safe manner. Earth moving equipment shall not exceed 15 mph.
- All vehicles shall be inspected before each use.

#### **Fork trucks/lifts**

1. Fork trucks are used to carry, push, lift, stack, and tier materials.
2. Training- Only trained and authorized operators shall be permitted to operate a powered industrial truck.
3. Guarding
  - Hazardous moving parts such as chain and sprocket drives and exposed gears shall be guarded to protect the operator in his normal operating position.
  - All fork trucks shall have an overhead guard in accordance with ANSI B 56.1
  - Exposed tires shall have guards that will stop particles from being thrown at the operator.
  - Hydraulically-driven lifting systems shall have a relief valve installed and suitable stops shall be provided to prevent travel over of the carriage.
  - A load backrest extension shall always be used when the type of load presents a hazard to the operator. The top of a load shall not exceed the height of the backrest.
4. Loading

- If the material being handled is obstructing the view, the operator is required to travel backwards. The operator shall face the direction of travel at all times.
- Only loads within the rated capacity of the truck shall be handled. No counter weights shall be allowed. A nameplate showing the weight of the truck and its rated capacity shall be located in plain view of the truck.
- Backwards tilt shall be used to stabilize the load.
- Loads shall be checked for overloading and for loose material before making the lift.
- Extreme care shall be taken when handling long items, i.e., bar stock and lumber.
- The load shall never be driven in an upward position, nor raised or lowered while moving.
- Forks shall be locked to the carriage, and the fork extension designed so as to prevent unintentional lifting of the toe or displacement of the fork extension.
- Bridge plates and dock boards shall be strong enough to support the intended load. They shall also have side boards, anti-slip surfaces, and be secured to the dock.
- Chocks shall be used on truck wheels when unloading.

## 5. Inspections

All fork trucks shall be inspected before each use and thoroughly on a regular basis.

## 6. Miscellaneous

- Powered industrial trucks shall be equipped with horn, and.
- Have steering wheel without knobs, and
- Be equipped with an ABC fire extinguisher, and
- Not be used on upper level floors unless the floors are designed for that load capacity.
- Be used in adequately vented areas only.
- Never give rides on the truck unless the truck is designed for it.

## 7. General Operating Requirements

- No excessive speed or reckless driving.
- When the operator will be farther than 25 feet from the truck, the forks shall be down, motor cut off, and emergency brake applied.
- No one shall be allowed to pass under the elevated portion of any truck.
- The operator shall come to a stop at blind corners and before passing through doorways.
- Extreme caution shall be taken when operating on turns, ramps, grades, or inclines.
- Reverse control shall never be used for braking.
- Always drive with the load pointing upgrade unless a bulky load causes poor visibility.
- Trucks shall not be used for any purpose other than the one for which they were designed, i.e., bumping skids, pushing piles of material out of the way, using forks as a hoist, etc.
- Trucks shall ascend or descend grades slowly. When ascending or descending grades in excess of 10%, loaded trucks should be driven with the load upgrade. Unloaded trucks should be operated on all grades with the load-engaging means downgrade.
- When standard forks are used to pick up round objects such as rolls or drums, care shall be taken to see that the tips do not damage the load or push it against workers.
- Operators of lift trucks shall not move improperly loaded skids or pallets, broken pallets, or loads too heavy for the truck.

NOTE: Using a lift truck as an elevator for employees shall only be done if the work platform is securely seated on the forks, fastened to the vertical face, and provided with handrails and toeboards. The truck shall also have an overhead guard for the operator feet protection.

The operator shall not leave the controls while the truck is being used as a man lift.

## **Hoist**

### **A. General-**

- Hoists are used to raise, lower, and transport heavy loads for limited distances.
- Hoists shall not be used to lift, support, or otherwise transport people unless designed for that purpose.

- The load capacity of each hoist shall be shown in conspicuous figures on the hoist body. Lifts shall not be made beyond the rated capacity of the hoist, slings, chains, ropes, straps, etc.
- All hoists shall have safe operating procedures affixed to them.
- Hoists operating on rails, tracks, or trolleys shall have positive stops or limiting devices on the equipment, rails, tracks, or trolleys to prevent overrunning of safe limits.
- Pick up loads only when they are directly under the hoist.
- Unless they are grounded, rope-operated electric hoists shall have non-conducting control cords.
- Control cords shall be clearly marked "hoist" or "lower" or a similar combination.
- The block shall not be lowered below the point where less than two full wraps of rope remain on the hoisting drum.
- When lifting and moving material, the area should be clear. No one shall be allowed to walk under the load.
- No load shall be left suspended without an operator at position.
- When not in use, the hoist shall be lifted in the upward position.

#### B. Inspections

- Hoists shall be inspected before each use. Regularly scheduled detailed inspections shall pay special attention to load hooks, ropes, brakes, limit switches, wear damage, and railstops.
- During inspection and/or repair, the power shall be disconnected. A warning sign stating such shall be posted.

### **Slings**

#### A. Materials Used

- The type of sling to be used is determined by the load to be lifted.
- Fiber rope is particularly suitable for the handling of loads that may be damaged by contact with metal slings. Fiber rope is generally made from manila, sisal, benequen,

nylon (2.5 x breaking strength & 4 x elasticity of manila), polyester, and polypropylene (special applications). Manila and nylon ropes give the best uniform strength and service.

- Wire rope is used widely instead of fiber rope because:
  - a) It has a greater strength and durability under severe working conditions.
  - b) Its physical characteristics do not change when used in varying environments.
  - c) It has controlled and predictable stretch characteristics.
  - d) Where mechanical type loop endings are employed or where swayed or pressed on terminations are used.
- Chain slings are used when a high resistance to abrasion and corrosive substances is needed. Chain slings are generally made from alloy steels such as stainless steel, monel metal, bronze, etc.
- Web slings are used when lifting loads in need of surface protection; used on tubular, nonferrous, ceramic, painted, polished, highly machined, and other products with a fine or delicate surface.
- Two types of web slings:
  - a) Synthetic web—nylon or polyester
  - b) Metal mesh web—alloy steel = sharp edges, concrete, high temperature

#### B. Rated Capacity

- As the sling is used, factors such as abrasion, nicking, distortion, corrosion, and other factors affect the load rating.
- Slings can be used at various angles, but stress increases rapidly with the angle of lift. All slings shall be ordered with this in mind.
  - a. NOTE: Most slings have catalogs and rating tables for load rating worked out—consult them.
- Each sling shall bear a tag indicating its rated load capacity. Rated capacity is based on newly manufactured slings.
- Allowances shall be made when hitches are used.
- If loads having sharp edges or corners are to be lifted, pads or saddles shall be used to protect the ropes and chains.

#### C. Inspection

1. Slings shall be checked daily by trained employees.

2. Any damaged or suspected damaged slings shall be removed immediately from service and made unusable.
3. Fiber ropes shall be inspected every 30 days and more often if used in critical applications. Rope shall be examined over the length of the rope for wear, abrasions, powdered fibers between strands, variations in size or roundness of strands, dislocation, and rotting.
4. Wire rope shall be inspected when installed, weekly during use, and regularly by a trained inspector. Wear of crown wire, broken wires, kinking, high strands, corrosion, loose wires, nicking, and lubrication shall be checked. Experience and judgement of all factors, combined with the length of time in service and the tonnage hoisted by the rope, determines when it should be discarded.
5. Chain slings shall be inspected daily by personnel using the chain and semi-annually or more often by persons qualified by experience or training. A link-by-link inspection shall be made to detect bent links, cracks in welded areas, transverse nicks and gouges, corrosion pits and elongation (stretching by overloading).
6. Web slings shall be inspected by the user each time they are used. Also, periodic inspections shall be made by a person experienced in the inspection of web slings. Web slings shall be checked for abrasive wear, cuts, tears, snags, punctures, etc.

<b>MAXIMUM ALLOWABLE WEAR AT ANY POINT OF LINK</b>	
<b>CHAIN SIZE (IN)</b>	<b>MAXIMUM ALLOWABLE WEAR (IN)</b>
1/4	3/64
	5/64
2	7/64
	9/64
3/4	5/32

	11.64
1	3/16
1	7/32
1 1/4	1/4

### PROPER USE OF LADDERS AND SCAFFOLDING

Many tasks are performed above ground and require the use of ladders or scaffolds to. Because of the potential for personal injury and property damage due to the improper use and handling of ladders, there is a need to communicate safe handling procedures for handling this equipment.

#### **Ladders**

##### Ladders- General Rules

The following practices shall be promoted to avoid mishaps when working with ladders:

1. The base of each ladder shall be set firm and level on the floor or ground.
2. Walkways for access to and from ladders, as well as areas at the base and top, shall be kept clear of ice, mud, materials, equipment, or debris. Ladder rungs or steps shall be free of ice or mud.
3. Ladders shall not be used as support for scaffolds. While ladder jack scaffolds are acceptable under certain federal regulations, they are for light duty use only.
4. Ladders shall be long enough so that workers can perform their functions without climbing higher than the third step from the top.
5. Never use two ladders spliced together.
6. Manufactured ladders used on floors or other set surfaces shall be quipped with safety feet.
7. A ladder shall never be set up in a driveway or in front of a door where the swing of the door could cause the ladder to fall. Where this must be done, barricades shall be used and a worker stationed at the foot of the ladder to keep the ladder from being struck.

8. When using a ladder in a walkway, barricade the work area.
9. Workers shall face the ladder and use both hands when ascending or descending. Tools and materials shall be raised and lowered by hand lines or other means; they shall not be carried by the worker except via use of a tool belt, etc.
10. Workers shall never attempt to move a ladder while they are on it and they shall avoid overreaching. Both actions can cause a ladder to fall.
11. The length of straight manufactured ladders shall not exceed 30 feet for a single ladder or 60 feet for an extension ladder.
12. The length of job-made ladders shall not exceed 24 feet for a double cleat ladder or 30 feet for a single cleat ladder.

#### Step Ladders

Step ladders shall be used only in a fully opened position with spreader bars locked. The top two steps shall never be used for standing purposes.

#### Straight Ladders/Extension Ladders

Straight ladders and extension ladders (except fixed ladders) shall be placed so that the base of the ladder is horizontally approximately  $\frac{1}{4}$  the distance from the base to the upper point of support away from the base of the wall or structure.

#### Wood Ladders

Standard manufactured ladders shall be of proper size and construction, well-cared for, and unpainted. While they shall not be painted, a clear coat of shellac or varnish on a ladder shall protect the wood but not cover up defects. They shall be discarded when cracked or split.

Job-built ladders shall be made of good stock, free from knots, and according to accepted standards. The cleats shall be recessed into the side rails, or filler blocks shall be attached to the side rails between the cleats. The cleats shall be secured with three (3) nails at each end. When cracked or split, the ladder shall be destroyed and discarded.

#### Metal Ladders

Metal ladders shall not be used when working on electric circuits.

#### Rules for Using Ladders When Working Above Second Floor Level:

1. When a scaffold or mechanical lift is available and appropriate for the work, do not use a ladder.

2. When working from a ladder, the base of the ladder shall be stabilized by sandbags or an employee shall stabilize the ladder by holding it. When sandbags are used, two fifty pound sandbags shall be placed behind each leg of the ladder to brace it from slipping backwards.
3. Ladders shall be fastened securely to a stable support at the tip, if possible, with a rope of sufficient strength to prevent side to side movement.
4. The employee shall wear a safety belt or harness when there is a safe place to anchor it. The line used to connect the belt/harness to a stable support of a building shall have a maximum length of 5 feet.

### **Scaffolds**

A scaffold is a temporary, elevated working platform for supporting employees and materials.

#### General rules when working with scaffold

1. The footings or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, lobes, loose bricks, or concrete blocks shall not be used to support scaffolds or planks [OSHA 1926.451(2)].
2. A scaffold shall support four times its maximum load (employees and material).
3. Scaffold planking shall be of scaffold grade or equivalent with a maximum width of 2 inches x 10 inches. Planking shall extend over the end supports not less than 6 inches nor more than 12 inches.
4. Scaffolds 10 feet or more off the ground require the use of guardrails and toeboards.
  - a) Toeboards shall be a minimum of 4 inches in height.
  - b) Guardrails shall be 2 inches x 4 inches. Toprail height shall be 42 inches with a centered midrail. Guardrail supports (minimum of 2 inches x 4 inches) shall be at maximum intervals of 8 feet.
  - c) Midrails shall be 1 inch x 6 inches or wider, centered between the guardrail and toeboard. The midrail shall be nailed to the inside of the support post.
5. If the scaffold is erected in an area where workers or other persons will pass under it, a screen of #18 gauge U.S. Standard wire of 2 inches mesh or equivalent shall be erected between the toeboard and toprail of the guardrail.
6. A safe access ladder shall be provided to all scaffolds.
7. Overhead protection shall be provided for scaffold workers when overhead hazards exist.
8. The use of lean-to-scaffolds or shore scaffolds is prohibited.
9. When suspended scaffolds (or equivalent) are to be used, the Environmental Health and Safety Department should be contacted for consultation.

- 10. Damaged scaffolding or components shall be replaced before the scaffold is used.
- 11. All rented scaffolds shall be examined thoroughly for condition of the scaffold (structural damage) and lack of or non-matching components (no guardrails, toeboards, etc.).
- 12. For wooden-pole, portable, tubular, horse, outrigger, etc., type scaffold requirements, refer to OSHA 1926.451(a) through .451(y).
- 13. Only limber inspected and graded as “ scaffold planking” shall use with scaffolds

Planks shall overlap by at least 12 inches. They shall extend 6 inches to 12 inches beyond the center of the supports. Planks shall be secured to the scaffold. The working surface of a scaffold shall be no less than 20 inches wide. If the scaffold base is more than 30 inches wide, additional planking shall be used.

<b>PLANKING</b> <b>2 inches x 10 inches</b>	<b>FULL THICKNESS</b> <b>UNDRESSED LUMBER</b>	<b>NOMINAL*</b> <b>THICKNESS LUMBER</b>
<b>Working load (p.s.f.)</b>	25 50 75	25 50
<b>Permissible span (ft.)</b>	10 8 6	8 6

\*Nominal thickness lumber not recommended for heavy duty use.

**Heavy trades wooden-pole scaffolds**

Heavy trades wooden-pole scaffolds are recommended for use by bricklayers, stone masons, concrete workers and other workers who use heavy equipment or store heavy material on scaffolds.

Open sides and ends of intermediate working levels 7 2 feet or more above the grade shall be guarded with a 2 inches x 4 inches top rail nailed to the uprights so that the top edge is 42 inches to 45 inches above the platform. Midrails of at least 2 inches x 4 inches lumber shall be provided.

Platforms shall be within 14 inches of the structure wall. They shall be at least 20 inches wide and constructed of planks at least 2 inches x 10 inches laid close together. Planks that are butt-ended (not over-lapped) shall be nailed together to supporting ledgers of 2 inches x 6 inches or heavier material. If the planks are not nailed, they shall overlap the ledgers at each end by at least 6 inches. No plank shall overlap an unsupported end of another plank.

The scaffold shall be rigidly tied to the structure with double-wrapped No. 12 wire or a stronger binding used in combination with spacer blocks between inside uprights and the structure. Ties shall connect to

inside uprights, and be spaced no more than 15 feet apart, horizontally and vertically. There shall be at least one row of ties.

Shore scaffolds, lean-to scaffolds, boxes, barrels, loose tile, loose brick, loose blocks, or other unstable objects shall never be used unless they are bolted through a wall, welded to a tank, or securely hooked over the top of a supporting wall.

Scaffolds that shall support buggies loaded with concrete need to be strong enough at every point on girders, ledgers, beams, and planking to bear the load.

Material at least 2 inches x 6 inches shall be used for footblocks and sills. Sills shall be continuous when uprights rest on sidewalks or other pavement.

If material on a platform is piled higher than the toeboard, one or more intermediate backrails shall be added between handrail and toeboard. One-half inch wire rope or an equivalent shall be used.

For heavy trades wooden-pole scaffolds more than 20 feet high, 4 inches x 6 inches uprights shall be used.

### **Light-duty metal scaffolds**

Metal scaffolds need to be built to support all live, dead, and wind loads they are likely to be subjected to.

Materials used in metal scaffolds shall be of standard manufacture to meet strength, size and weight specifications. Never use material that is broken, structurally weak, or deteriorated.

All scaffold legs shall rest on base plates. Each base plate needs support adequate to sustain the load and prevent horizontal movement. When the scaffold is resting on earth or other such material, each base plate shall rest on the equivalent of a 2 inches x 10 inches x 10 inches wooden block. A 1 inch x 10 inches x 10 inches piece of exterior-grade plywood may be used as a base.

All scaffolds shall be plumbed and leveled as erection proceeds. Braces shall not be forced to fit; it is better to level the scaffold until a proper fit is easy.

Adjusting screws shall be used instead of blocking to level scaffolds on uneven grades. Not more than 12 inches of adjusting screw thread shall be exposed.

Metal scaffolds shall be tied securely to buildings or other structures with durable no. 12 wire or the equivalent. Ties shall be placed no more than 26 feet apart, both vertically and horizontally.

Railings are suggested for all open sides and ends of work platforms more than 7 2 feet high. Platform planks shall be 2 inches x 10 inches or wider and long enough to overlap the ledgers at each end by at least inches

Workers shall use ladders, not scaffold cross-braces, to climb scaffolds.

### **Rolling metal scaffolds**

Rolling scaffolds, when securely tied or guyed, shall be at least on-third as wide at the bottom as they are high.

Screwjacks shall extend into scaffold legs for at least on-third of their length. In no case shall more than 12 inches of thread be exposed.

The uprights or legs of rolling scaffolds more than 24 feet high shall be braced according to the manufacturer feets specifications.

Wheels or casters of rolling scaffolds shall have effective locking devices and shall be kept locked when workers are climbing or working on the scaffold. At least two of the four wheels or casters shall swivel. All wheels and casters shall support at least four times the maximum intended load.

Joints of metal scaffolds, including caster joints, shall have positive-locking pins, bolts, or equivalent fasteners.

Platform planks on rolling scaffolds shall not project more than 18 inches beyond the support at the edges of the scaffolds. Planks can be prevented from slipping by nailing dents of 1" material in the undersides of projecting ends, or by some equally effective means. Platforms shall be tightly planked to the full width of the scaffold except for necessary openings.

Workers shall not place platform planks on guard rails to climb higher. Workers may ride on rolling scaffolds moved by others if the floor or surface is within 3° of level and free of pits, holes, or obstructions, and if the smallest dimension of the scaffold feets base is at least one-half its height. If outriggers are used, they shall be installed on both sides of the staging.

Ladders or stairways shall provide access to all platforms and rolling scaffolds. Ladder rails shall extend at least 36 inches above the platform unless other suitable handrails are provided. If stairs are used, rails shall be put on both sides.

Ladders or other unstable objects shall not be put on top of rolling scaffolds to climb higher. Aluminum scaffolding shall have a greater base-to-height ratio.

### **Platforms and Stairways**

1. Handrails shall be made of 2 inches x 4 inches or 1 inch x 4 inches material, nailed at right angles.
2. Platform handrails shall be at least 42 inches and not more than 45 inches above the platform.
3. Stairway handrails shall be 30 inches to 40 inches above the nose of the tread.
4. Posts shall be 2 inches x 4 inches or heavier, and spaced not more than 8 feet apart.

5. Midrails shall be at least 1 inch x 6 inches. They shall be spaced midway between platform and top rail on platforms and midway between the nose of the tread and the top rail on stairs. Midrails shall be nailed to the insides of posts.

6. Toeboards at least 1 inch x 6 inches shall be placed along the floor of the platform and nailed to the insides of posts.

Using ladders or scaffolds to access floor, roof, and elevator openings

If sheathing or any other surface provides passageways to any side of a floor or roof opening that a worker or material might fall through, the opening shall be covered with planks or other material strong enough to support any load placed on it, or fenced on all sides with the standard guard railings. The cover shall be secured to prevent accidental removal or displacement. A pressure sensitive sign or equivalent shall be posted on this protective covering with letters at least 1 inch high, reading ⚠Floor (Roof) Opening. Do Not Remove.Ⓢ Openings in concrete forms need similar safeguards.

If any part of a runway or scaffold platform is directly above or adjacent to a floor or roof opening, the entire opening shall be covered with planking or railings, with toe boards on the runway or scaffold.

All temporary protection shall be left in place until permanent protection has been provided or the hazard has been eliminated.

Ladder-way openings in floors and platforms shall be guarded by standard railings and toeboards on all sides.

Elevator shafts shall be guarded on all open sides with standard railings and toeboards. Overhead protection shall be provided when employees are in the shaft while other employees are working above them.

## **SAFE USE OF HAND AND PORTABLE POWER TOOLS**

Hand and portable power tools are used for some purpose in virtually all areas of campus. The safety rules specified in the subsection apply to the use of these tools in all work settings.

### **Screwdrivers**

1. A screwdriver is the most commonly used and abused tool. The practice of using screwdrivers as punches, wedges, pinch bards, or pry bars shall be discouraged as this practice dulls blades and causes employee injury.

2. Screwdriver tips shall be selected to fit the screw. Sharp-edged bits will not slip as easily as ones that are dull. Redress tips to original shape and keep them clean.
3. Always hold work in a vise or lay it on a flat surface to lessen the chance of injury if the screwdriver should slip.
4. When working near electrical equipment, screwdrivers shall be equipped with insulated handles (some also come with insulated blades). Current shall be cut off.

### **Hammers**

Wooden handles shall be straight grained and free of splinters or splinters. Once split, handles shall be replaced. Make sure handles are tightly wedged.

1. Never strike a hammer with another hammer.
2. Discard any hammer that shows chips, dents, etc. Redressing is not recommended.
3. Safety glasses shall be worn while using a hammer or any other striking tool.
4. Never use a common nail hammer to strike other metal objects such as cold chisels.

### **Punches**

Never use a punch with a mushroomed struck face or with a dull, chipped, or deformed point. Punches that are bent, cracked, or chipped shall be discarded. Safety glasses shall be worn while using a punch.

### **Chisels**

Choose a chisel only large enough for the job so the blade is used, rather than only the point or corner. Never use chisels with dull blades—the sharper the tool, the better the performance. Chisels that are bent, cracked, or chipped shall be discarded. Redress cutting edge or struck end to original contour as needed. When chipping or shearing with a cold chisel, the tool shall be held at an angle that permits one level of the cutting edge to be flat against the shearing plane.

### **Hacksaws**

Hacksaws shall be adjusted and tightened in the frame to prevent buckling and breaking, but shall not be tight enough to break off the pins that support the blade. Install blade with teeth pointing forward.

Pressure shall be applied on the forward stroke only. Lift the saw slightly, pulling back lightly in the cut to protect the teeth. Do not bend and twist the blade. Never continue an old cut with a new blade.

### **Files**

Select the right file for the job, making sure that it has a secure handle.

Files shall be cleaned only with file-cleaning cards; never by striking. Never use a file as a pry or hammer, as chipping and breaking could result in user injury.

Grasp the file firmly in one hand and use the thumb and forefinger of the other to guide the point.

### **Axes and Hatchets**

The cutting edges are designed for cutting wood and equally soft metal. Never strike against metal, stone, or concrete.

Never use an axe or hatchet as a wedge or maul, never strike with the sides, and never use them with loose or damaged handles.

Proper axe grip for a right-handed person is to have the left hand about 3 inches from the end of the handle and the right hand about 3/4 of the way up.

Sharp, well-honed axes and hatchets are much safer to use because glancing is minimized.

Safety glasses and safety shoes shall be worn and clear swinging checked before using axes and hatchets. Axes and hatchets shall be carried with the covers on.

### **Knives**

Knives cause more disabling injuries than any other hand tool. The hazards are that the hands may slip from the handle onto the blade or that the knife may strike the body or the free hand. Use knives with handle guards if possible. Knives shall be kept sharp and in their holders, cabinets, or sheaths when not in use; the cutting stroke shall be away from the body.

Do not wipe dirty or oily knives on clothing. To clean, the blade shall be wiped with a towel or cloth with the sharp edge turned away from the wiping hand. Horseplay of any kind (throwing, fencing, etc.) shall be prohibited.

### **Crowbars**

Use the proper kind and size for the job. Never use makeshifts such as pieces of pipe, as they may slip and cause injury. Crowbars shall have a point or toe of such shape that it will grip the object to be moved and a heel to act as a pivot or fulcrum. A block of wood under the heel may prevent slippage and help reduce injuries.

### **Shovels**

Shovel edges shall be kept trimmed and handles checked for splinters and cracks. Workers shall wear safety shoes with sturdy soles. They shall have feet well separated to get good balance and spring in the knees. The leg muscle will take much of the load. To reduce the chance of injury, the ball of the foot (not the arch) shall be used to press the shovel into the ground or other material.

Dipping the shovel in water or greasing or waxing the shovel will prevent some materials from sticking.

When not in use, hang up shovels, stand them against the wall, or keep them in racks or boxes.

## **Box and Socket Wrenches**

The use of box and socket wrenches is indicated where a heavy pull is necessary and safety is a consideration. Box and socket wrenches completely encircle the nut, bolt or fitting and grip it at all corners as opposed to two corners gripped by an open end wrench. They will not slip off laterally, and they eliminate the dangers of sprung jaws.

Never overload the capacity of a wrench by using a pipe extension on the handle or strike the handle of a wrench with a hammer. Hammer abuse weakens the metal of a wrench and causes the tool to break. Special heavy-duty wrenches are available with handles as long as 3 feet. Where possible, special penetrating oil shall be used to first loosen tight nuts.

Air shall be shut off before attempting to disconnect the air hose from the air line. Any air pressure inside the line shall be released before disconnecting.

## **SAFETY RULES FOR WOODWORKING AND OTHER POWER TOOLS, INCLUDING PPEs**

Woodworking and other tasks requiring the use of power tools are performed by personnel in the Physical Plant, Architecture, Art, Performing Arts, Forestry, Engineering, Agricultural Sciences. The following rules apply to all these applications.

### **General Rules**

1. All machines shall be constructed and maintained so that they are free of excessive noise and harmful vibration.
2. All machines, except portable or mobile ones, shall be level and shall be securely fastened to the floor or other suitable foundation.
3. Small units shall be secured to benches or stands of adequate strength and design.
4. Tools shall be used only on machines for which they were designed.
5. All safety devices shall be regularly checked for proper adjustment.
6. Machines shall be securely locked and tagged out before cleaning.
7. Loose clothing, long hair, jewelry, and gloves shall not be worn around rotating parts of machinery.
8. Adjustments shall not be made while machines are running.
9. All metal framework on electrically driven machines shall be grounded and shall comply with the National Electrical Code (NFPA-70) and applicable local codes.
10. All machines shall have a cut-off device within reach of the normal operating position.

11. Power controls and operating controls shall be located within easy reach and away from a hazardous area. They shall be positioned so the operator can remain at the regular work location.
12. Each operating control shall be protected against unexpected or accidental activation.
13. There shall be ample marked work space around each machine.

### **Housekeeping When Using Woodworking Equipment**

1. Good housekeeping shall be maintained to prevent build-up of dust, chips, sawdust, and scraps.
2. The working surface of machines shall be kept clear of scrap and waste materials.

### **Guards on Woodworking Tools**

1. All belts, shafts, gears, and other moving parts shall be fully enclosed or be grounded in accordance with American National Standard B 15.1, "Safety Standards for Mechanical Power Transmission Apparatus@"

NOTE: See Item, "MACHINE SAFEGUARDING REQUIREMENTS" in this section for more information.

### **Illumination When Woodworking**

1. The machines and the adjacent stock areas shall be adequately illuminated.
  - A. General work areas - 50 foot-candles;
  - B. Fine work - 100 or more foot-candles.

There should be no shadows or reflected glare.

NOTE: See item ILLUMINATION FOR OCCUPATIONAL TASKS in this section for more information.

### **Inspection OF Woodworking Tools**

1. Machines shall be inspected before each use. Areas of inspection include operating controls, safety control, power drives and sharpness of cutting edges, and other parts to be used.
2. Cutting edges and tools shall be kept sharp at all times. They shall also be properly adjusted and secured.
3. All shops and machines shall be inspected on a regular basis. See INSPECTION SCHEDULES AND REPORTS for information on frequencies and inspection forms to use..

## **Personal Protective Equipment When Working With Woodworking and Other Power Tools**

1. Individuals in the work area shall wear eye protection at all times.
2. All workers shall wear close-fitting apparel and avoid loose clothing, neck ties, gloves, and jewelry.
3. Hair nets or caps shall be worn over long hair to keep it away from moving parts. Beards shall be kept trimmed close to the face.
4. Safety shoes shall be worn when handling heavy material or when there is potential for foot injury.

NOTE: See section "PERSONAL PROTECTIVE EQUIPMENT" for more information.

### **Table Saw**

1. Feed with body to side of stock.
2. Adjust blade to appropriate height.
3. Use guard with splitter and anti-kickback fingers.
4. Keep stock firm against fence.
5. When crosscutting, remove ripfence.
6. Make sure blade is guarded by approved guard.

### **Circular Saw**

1. Make sure blade is guarded by approved guard.
2. Make sure stock does not bind.
3. Use correct type blade. See [Circular Saw Blade](#) chart this section.
4. Keep blade tight in arbor.
5. Make sure work is firmly supported.
6. Make sure there are not obstructions to work.
7. Use manufacturer feet recommended speed for materials being cut.

### **Radial Arm Saw**

1. Rip sawing in direction of (cut) feed and anti-kick fingers.
2. Use blade guards.
3. Pull for cross cuts except 3 inches - 4 inches thickness.
4. Make sure end plates on track-arm are tight.
5. Clamp handles tight.
6. Make sure material is tight to fence.
7. Return cutter to rear of track.

### **Band Saw**

1. Feed with body to side of stock.
2. Guard height shall allow 2 inch clearance of material.
3. A band saw should have a tension control device to indicate proper blade tension.
4. Release cuts before long curves.
5. Stop machine to remove scrap or pull out incomplete cut.

### **Jointer/Planer**

1. Make sure knife projection which extends beyond the body of the head is not more than 1/3 inch.
2. Use long length stock.
3. Use sharp cutters.
4. Do not pass hands over cutters.
5. Use push stick for small stock.
6. Guard should adjust itself to the moving stock (swinging guard).

### **Wood Sharpener**

1. The stock should be clamped securely in place.

2. Use correct guard.
3. Feed into knives—do not back off.
4. No feeding between fence and cutter.
5. Collar and starting pin work for irregular work—stock of sufficient weight.
6. Make sure fence opening is only enough to clear cutters.
7. Use stock as guard by shaping the underside of stock.
8. Make sure spindle nut is tight.
9. Shape only pieces 10 inches or longer.

#### **Sander**

1. Keep hand from abrasive surface.
2. Adequate exhaust system available.
3. Belt or disk in good condition.
4. Sand on downward side of disk.

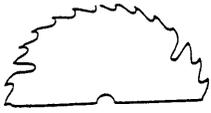
#### **Lathe**

1. Stock without defects; glued joints dry. (When using V-Belt, power should be off when changing speeds.)
2. Make sure tool rest is close to stock.
3. Hold tools firmly in both hands.
4. Remove tool rest when sanding or polishing.

### **CIRCULAR SAW BLADES FOR CUTTING WOOD**



**HOLLOW GROUND PLANER BLADES** are for pre-cision cross-cutting, mitering, and rip-ping on all woods, plywood, and laminates where the smoothest of cuts are desired.



**MASTER COMBINATION BLADES** are used for use on all woods, plywood, and wood base material, such as fiberboard and chip-board. This type blade is better for cross-cut and mitering than for ripping in solid woods. The teeth are set, and deep gullets are provided for cool and free sawing.



**RIP BLADES** are primarily intended for rip cuts in solid woods. The teeth are set and deep gullets are provided for cool and free cutting.



**PLYWOOD BLADES** are fine-tooth cross cut type blades intended for cross cutting of all woods, plywood, veneers, and chip-board. It is especially recommended for cutting plywood where minimum of splintering is desired. The teeth are set and sharpened to give a smooth but free-cutting blade.



**CHISEL-TOOTH COMBINATION BLADES** are all-purpose blades for fast cutting of all wood where the best of finish is not required. Ideal for use in cutting of heavy rough timbers, in framing of buildings, etc. It cross cuts, rips, and miters equally well.

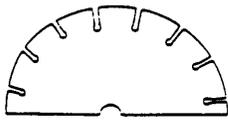


**CABINET COMBINATION BLADES** are for general cabinet and trim work in solid wood. It will cross cut, rip, and miter hard and soft wood to give good accurate cuts for moldings, trim, cabinet work.

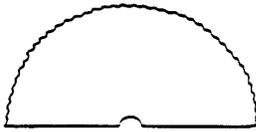


**STANDARD COMBINATION BLADES** are used for all hard and soft wood for cross cut, rip, or miter cut. It is especially recommended for use on power miter boxes and for accurate molding and framing work.

## **METAL-CUTTING BLADES**



NONFERROUS METAL CUTTING BLADES are for cutting brass, aluminum, copper, zinc, lead, bronze, etc. Blades are taper-ground and need no set. Use wax or lubricant on the blades for best results.



STEEL SLICER BLADES are for cutting thin steel and sheet iron up to 3/32-inch (2.4 mm) thickness. Not for use on nonferrous metals, wood, or plastic. This blade will give off sparks when cutting steel because it cuts by friction. Always keep sawdust chips free of machine to prevent fires.



FLOORING BLADES are tungsten carbide-tipped blades especially designed for rough cutting where occasional nails, metal lathe, etc. will be cut. It is especially recommended for the professional carpenter or installer of air conditioning or heating ducts where it is necessary to cut through old walls and floors. Always wear safety goggles when cutting metal.

I

### Inspection and Repair of Saw Blades

1. Periodic inspections, essential to the maintenance of power tools, shall be performed.
2. Employees shall be instructed and trained to inspect tools and recognize and report defects.
3. All defective equipment shall be taken out of service and tagged or locked out until repairs or maintenance is completed.
4. Employees shall not be allowed to make make-shift repairs.

Power tools shall be cleaned with a recommended non-flammable and non-toxic cleaner.

### MACHINE SAFEGUARDING REQUIREMENTS FOR HAND AND POWER TOOLS

#### Flywheels

1. All parts of flywheels which are 7 feet or less above the floor or working platform shall be guarded.
2. Screens shall be placed in front of all flywheel spokes to protect against accidental contact by pipe, bars, rods, and similar materials.
3. Flywheel pits shall be surrounded with a standard railing and a toeboard not less than 6 inches high with standard railing, toeboard, and spoke guard showing.

## **Machine Guards**

1. Where guard or enclosure is within 2 inches of moving parts, openings through the guard shall not be > 3/8 inch.
2. If guards are > 4 inches and < 15 inches from moving parts, then the largest opening shall not be > 2 inches. Where slatted guards are used, the opening shall not be > 1 inches.
3. Inclined belt guards shall be installed so that the vertical clearance between the lower run of the belt and the floor shall not be < 7 feet at any point outside of the guard.
4. Any panel in a guard exceeding 6 ft<sup>2</sup> or 42 inches in either dimension shall be supported by an additional frame member.
5. A standard railing placed not < 15 inches nor > 20 inches from a flywheel, is acceptable; but a railing shall not be used where other types of guards are specifically required such as guards for gears, sprockets, and V-belts.
6. When frequent oiling must be done inside the guard, openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil fed tubes or grease gun connections outside the guard if lubricant is to be added while machinery is in motion.
7. Self-lubricating bearings are recommended.

## **Gears, Sprockets, Friction Drives**

1. All gears or sprockets shall be completely enclosed or shall be guarded with side flanges extending inward beyond the roots of the teeth.
2. All spokes on open web gears, sprockets, or friction drives shall be guarded to prevent accidental contact.
3. The contact points of all friction drives must be enclosed.

## **Belt, Chain or Rope Drives**

1. Single or multiple V-belts, located 7 feet or less from the floor or working platform shall be completely enclosed.
2. Belt, chain, or rope drives 7 feet or less above the floor or platform shall be guarded. The guard shall extend to at least 15 inches above the belt or to a height of 7 feet; however, where both runs of a horizontal belt are 42" or less from the floor, the belt shall be fully enclosed.

3. Overhead horizontal drives with a lower run of 7 feet or less from the floor or platform shall be guarded on the bottom and sides to a height of not < 7 feet, or 15 inches above the lower run.
4. Horizontal flat belts and chain or rope drives, regardless of height above the floor or platform, shall be guarded for the entire length if located over passageways or workplaces. The guards shall follow the line of the pulley to the ceiling or to the nearest wall, thus enclosing the belt effectively. Where this is impractical, the guard shall enclose the top and bottom runs of the belt and the faces of the pulleys. The guards shall be of sufficient strength to restrain broken belts or drives.

### **Shafting**

1. All horizontal shafting 7 feet or less from the floor, working platforms, or runways shall be guarded.
2. All vertical or inclined shafting 7 feet or less from the floor, working platforms, or runways shall be guarded.
3. Shafting under benches or tables shall (a) be completely enclosed, (b) be guarded by a trough which shall extend at least 2 inches above or below the shafting; open space is not to exceed 6 inches below the table or above the floor, or (c) be protected with a rigid guard from the underside of the bench to 2 inches below the bottom line of shafting.
4. Projecting shaft ends lower than 7 feet from the ceiling or story base shall either be cut off smooth within one-half the diameter of the shaft or shall be guarded by a non-rotating guard.
5. Unused keyways shall be filled, covered, or guarded.

### **Belt Conveyors**

1. Means for stopping the motor or engine shall be provided at the operator feet station and also at the motor or engine.
2. Conveyor systems shall be equipped with an audible warning system to be sounded immediately before starting up the conveyor.
3. Emergency stop switches shall be arranged so that the conveyor cannot be started again until the actuating loop switch has been reset to running or "ON" position.
4. Conveyors passing over occupied locations shall be guarded to prevent material from falling.
5. All belt conveyor head, tail, tension, and dip take-up pulleys shall be guarded to cover the entire sides of the pulleys and along the run of the belt a sufficient distance so that a person cannot reach behind the guard and become caught in the nip point between the belt and pulley.

**Tilting table saw guard-** Circular saws should be provided with a hood that covers the saw at all times to the depth of the teeth. Hood should adjust itself automatically to thickness of, and remain in contact with, material being cut. A spreader and anti-kickback device should be provided. The exposed part of the saw underneath the table should be guarded.

**Radial saw-** In addition to hood enclosing the blade, an adjustable stop should be provided to limit forward travel and head should automatically return to starting position. When used for ripping, a spreader and anti-kickback device should be provided.

**Swing saw-** In addition to the hood enclosing the blade, the swing should be provided with a limit chain or other device to limit forward travel and a device to automatically return the head to starting position. Hood should enclose saw.

**Edger-** The saws of the edger should be enclosed and there should be pressure rolls on both the feed and take-off sides. Non-kickback teeth should be provided on at least the feed side of the saws. All belts, pulleys, and gears should be enclosed.

**Self Feed Rip Saw-** Saw and feed rolls should be completely enclosed.

**Jointer Guards-** Jointer guards should automatically adjust themselves to cover all sections of the head on the working side of the fence or gage and should remain in contact with the material at all times. The section of the cutting head back of the fence or gage should also be guarded.

**Milling Machine-** Mesh guard over cutter to protect against contact and flying particles.

**Bandsaw-** Band or band resaw wheels should be completely enclosed and all portions of the blade should be guarded, except that portion between the guide rolls and the table.

**Electric Saws-** Electric saws shall be equipped with guards above and below the face plate. The lower guard shall be checked frequently to be sure it operates freely and encloses the teeth completely when not cutting. Circular saws shall not be crowded into the work. The motor shall be started and stopped outside the work. At the beginning and end of the stroke or when the teeth are exposed., the operator shall use extra care to keep the body out of the line-of-cut. Saws shall be equipped with a dead man@ controls or a trigger switch that shuts off the power when pressure is released.

**Portable Abrasive Wheel Grinder-** Grinding wheels shall be guarded as completely as possible. They shall never be used at greater than their rated speed. To do so may result in the wheel breaking apart due to excessive centrifugal force. Guards shall be adjustable so the operator will be inclined to make the adjustments rather than remove the guard. However, the guard shall be easily removable to facilitate replacement of the wheel. In addition to mechanical guarding, the operator shall wear safety glasses at all times. Guard should be strong enough to withstand the shock of a bursting wheel and be adjustable to the wear of the wheel. Tempered or laminated glass with protective glass on the underside should be used. Portable abrasive wheel should also be guarded by as complete an enclosure as practical. Care shall be exercised to protect the grinder from damage.

Since part of the wheel is exposed, it is important that the employee hold the wheel so it does not touch his clothes or body.

**Air Hoses-** Workers shall be warned against disconnecting the air hose from the tool and using it to clean machines or remove dust from clothing. Air used for cleaning shall not exceed 30 psi and workers shall wear safety glasses at all times when using air hoses. Brushing or vacuuming equipment is recommended for removing dust from clothing.

## ELECTRICAL SAFETY

### **Electrical Codes**

The National Electric Code, NFPA 70-1984, and ANSI C1-1971 are the nationally adopted requirements for safeguarding of any persons and buildings and their contents from hazards arising from the use of electricity. The code contains basic minimum provisions considered necessary for safety. All electricians shall be familiar with these requirements.

### **Use of Electrically Powered Equipment and Tools**

All electrically powered equipment or hand tools, except double insulated hand tools, shall be grounded.

1. Portable hand tools and electrically powered equipment shall be used with a ground fault circuit interrupter (GFCI) or an assured equipment grounding program (AEGP) (see “Ground Fault Circuit Protection” this section) shall be in effect.
2. Electrical equipment shall be disconnected or the current otherwise interrupted while it is being adjusted or repaired.
3. Permanent wiring shall be put in conduits.
4. All breakers, motors, and appliance disconnects shall be labeled.
5. Framing of electrical motors shall be grounded.
6. Outlets, switching, junction boxes, etc., shall be covered.
7. Exposed noncurrent-carrying metal parts of fixed equipment that may become energized under abnormal conditions shall be grounded when in wet or damp locations, in electrical contact with metal, if operated in excess of 150 volts to ground, or in a hazardous location.

NOTE: Consider all exposed wires “hot” until verified otherwise.

### **Ground Fault Circuit Protection**

When using extension cords, portable electrically powered hand tools, appliances, or other electrically powered equipment outdoors or in an area under construction, they shall be of the 3-wire type (except double insulated tools) and shall be connected to a GFCI or an AEGP shall be in effect.

The GFCE does not have to be used if the receptacles being used are part of a building feet permanent wiring. The GFCI trips a circuit when current outleakage occurs.

The AEFP requires regular inspections of all tools, cords, and electric devices. Appropriate documentation shall be maintained. An AEGP are shown below.

1. A written description of the program including specific procedures.
2. Qualified employees shall be appointed to run the program. More than one person shall be appointed.
3. All equipment, cords, etc., to be used shall be inspected for external defects each day. All defective equipment shall be tagged out until repairs are made. All defects, repairs, inspections, etc., shall be documented.

### **Extension Cords**

1. Cords shall not be hung over nails, bolts, or sharp edges.
2. Cords shall not be laid in aisles unless protected from damage; they shall be so placed so as to not create a tripping hazard.
3. Cords shall not be used as a substitute for fixed wiring.
4. Cords shall not be run through holes in walls, ceilings, floors, doors, windows, or hung from light fixtures or attached to building surfaces.

### **Hazardous Locations**

Standard electrical apparatus cannot be used in locations where flammable gases, vapors, dusts, and other easily ignitable materials are present.

Before electrical equipment and its associated wiring is selected for a hazardous location, the exact nature of the flammable materials present should be determined.

The National Electric Code, NFPA-70, Articles 500-503, shall be consulted before any use or installation of electrical equipment and associated wiring is selected. Listed below is a guideline for classifying hazardous locations. This guidelines shall not be used as a substitute for NFPA-70, Article 5000-503.

### **Wet Locations**

A switch or circuit breaker in a wet location or outside of a building shall be enclosed in a weatherproof enclosure. In damp or wet locations, cabinets and cutout boxes of the surface type shall be weatherproof, be so placed or so equipped so as to prevent moisture or water from entering and accumulating within the cabinet or cutout box, and shall be mounted so there is at least 1/4" space between the enclosure and the wall or other supporting surface. It is recommended that boxes of nonconductive material be used with nonmetallic-sheathed cable.

In locations where walls are frequently washed or where there are surfaces of adsorbent materials such as damp paper or wood, the entire wiring system, including all boxes, fittings, conduits, and cables used, shall be mounted so that there is at least 1/4 inch air space between it and the wall or supporting surface.

**Lock Out/Tag Out Procedures**

Refer to "Equipment Lockout Procedures" in this section.

This procedure shall be used whenever the need for de-energizing electrical or mechanical equipment (to include fume hoods and other scientific equipment) arises.

**Transportation or Movement of Equipment or Materials**

Vehicles, equipment, or materials shall not be placed closer to any high-voltage lines than the minimum clearances specified below.

<b>RECOMMENDED CLEARANCES FROM ENERGIZED HIGH VOLTAGE CONDUCTORS (WHILE IN TRANSIT)</b>	
<b>VOLTAGE (PHASE TO PHASE)</b>	<b>MINIMUM CLEARANCE (FEET)</b>
750 - 50,000	6
50,000 - 345,000	10
345,000 - 750,000	16
750,000 - 1,000,000	20

**HANDLING, USING, AND STORING OF COMPRESSED GAS CYLINDERS**

Compressed gas in cylinders, are used in several shops in the Physical Plant, Engineering, Physics, Chemistry, Art, Biology and Agricultural Sciences. These rules apply to the handling and storage of compressed gases.

### **Handling Cylinders**

1. Only cylinders approved for use in interstate commerce for transportation of compressed gases shall be accepted.
2. Numbers or marks stamped on cylinders shall not be removed or changed.
3. Because of their shape, smooth surface, and weight, cylinders are difficult to carry by hand. Cylinders may be rolled on their bottom edge but never dragged. Cylinders weighing more than 40 pounds (18.2 kg total) shall be transported on a hand motorized truck and suitably secured to keep them from falling.
4. Cylinders shall be protected from cuts and scratches.
5. Compressed gas cylinders shall not be lifted with an electro-magnet. Where cylinders must be handled by a crane or derrick as on construction jobs, they shall be carried in a cradle or suitable platform and extreme care shall be taken to see that they are not dropped or bumped. Slings shall not be used.
6. Cylinders shall not be dropped or be allowed to strike each other violently.
7. Cylinders shall not be used for rollers, supports, or any purpose other than to contain gas.
8. Safety devices in valves or on cylinders shall not be tampered with.
9. When in doubt about the proper handling of a compressed gas cylinder or its contents, the supplier of the gas shall be consulted
10. When empty cylinders are to be returned to vendor, they shall be marked EMPTY or MT with chalk. Close the valves and replace the valve protection caps.
11. Cylinders to be transported shall be loaded to allow as little movement as possible. Secure them to prevent violent contact or upsetting.
12. Cylinders shall always be considered full and shall be handled carefully. Accidents have resulted when containers under partial pressure were thought to be empty.
13. The fusible safety plugs on acetylene cylinders melt at about the boiling point of water. If an outlet becomes frozen or clogged with ice, it shall be thawed with warm (not boiling) water applied to the valve only. A flame shall never be used.

### **Using Cylinders**

1. Cylinders, particularly those containing liquified gases and acetylene, shall be used in a secured upright position to prevent them from being accidentally knocked over.
2. Unless the cylinder valve is protected by a recess in the head, the metal cap shall be kept in place to protect the valve when the cylinder is not connected for use. A blow on an unprotected valve might cause high pressure gas to escape.
3. The threads on a regulator or union shall correspond to those on the cylinder valve outlet. Connections that do not fit shall not be forced.
4. Cylinder valves shall be opened slowly. Cylinders without hand wheel valves shall be opened with a spindle key, special wrench, or other tool provided or approved by the gas supplier.
5. Cylinders of compressed gas shall not be used without a pressure-reducing regulator attached to the cylinder valve except where cylinders are attached to a manifold in which case the regulator shall be attached to the manifold header.
6. Before making connection to a cylinder valve outlet, the valve shall be cracked for an instant to clear the opening of particles of dust or dirt. The valve and opening should always be pointed away from the body and not toward anyone else. Fuel gas cylinder valves shall not be cracked near other welding work, sparks, open flames, or other possible sources of ignition.
7. Regulators and pressure gauges shall be used only with gases for which they are designed and intended. Make no attempt to repair or alter cylinders, valves, or attachments. This shall be done by the manufacturer.
8. Unless the cylinder valve has first been closed tightly, no attempt shall be made to stop a leak between the cylinder and the regulator by tightening the union nut.
9. Fuel gas cylinders in which leaks occur shall be taken out of use immediately and handled as follows:
  - a) The valve shall be closed and the cylinder taken outdoors well away from any ignition source. The cylinder shall be properly tagged and the supplier notified. A regulator attached to the valve may be used temporarily to stop a leak through the valve seat.
  - b) If the leak occurs at a fuse plug or other safety device, the cylinder shall be taken outdoors well away from any ignition source, the cylinder valve opened slightly, and the fuel gas permitted to escape slowly. The cylinder shall be plainly tagged. NO SMOKING or IGNITION SOURCE signs shall be posted. A responsible person shall stay in the area until the cylinder is depressurized to make sure that no fire occurs. The supplier shall be promptly notified and his instructions for returning the cylinder shall be followed.
10. Sparks, molten metal, electric currents, excessive heat, or flames shall not be permitted to come in contact with the cylinder or attachments.

11. Oil or grease shall never be used as a lubricant on valves or attachments of oxygen cylinders. Oxygen cylinders and fittings shall be kept away from oil and grease. Such cylinders or apparatus shall not be handled with oily hands, gloves, or clothing.
12. Never use oxygen as a substitute for compressed air in pneumatic tools, in oil pre-heating burners, to start internal combustion engines, or to dust clothing. It shall be used only for the purpose for which it is intended.
13. Cylinders shall not be filled except with the consent of the owner and then only in accordance with DOT (or other applicable) regulations. No attempt to mix gases in a compressed gas cylinder or to use it for purposes other than those intended by the supplier shall be made.
14. Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.

### **Storing Cylinders**

1. Cylinders shall be stored in a safe, dry, well-ventilated place reserved for this purpose.
2. Cylinders shall not be stored near elevators, gangways, stairwells, or other places where they can be knocked down or damaged.
3. Oxygen cylinders shall not be stored within 20 feet (6 m) of gas cylinders or highly combustible materials.
4. If closer, cylinders shall be separated by a fire-resistive partition at least 5 feet (1.6 m) having a fire resistive rating of at least 2 hours.
5. Acetylene and liquified fuel gas cylinders shall be stored with the valve end up. If storage areas are within 100 feet (30.5 m) distance of each other and not protected by automatic sprinklers, the total capacity of acetylene cylinders stored and used inside the building shall be limited to 2000 ft<sup>3</sup> (57 m<sup>3</sup>) of gas, exclusive of cylinders in use or connected for use. Quantities exceeding this total shall be stored in a special room built in accordance with the specifications of NFPA 51, "Oxygen-Fuel Gas Systems for Welding and Cutting," either in a separate building or outdoors.
6. Acetylene storage rooms and buildings shall be well ventilated. Open flames shall be prohibited. Storage rooms shall have no other occupancy.
7. Cylinders shall be stored on a level, fire-resistive floor.
8. To prevent rusting, cylinders stored in the open shall be protected from contact with the continuous direct rays of the sun in the summer.

9. Cylinders are not designed for temperatures in excess of 130°F (54° C). Accordingly, they shall not be stored near sources of heat such as radiators or furnaces, or near highly flammable substances like gasoline, oil or volatile liquids.
10. Cylinder storage shall be planned so that cylinders will be used in the order in which they are received from the supplier.
11. Empty and full cylinders shall be stored separately with empty cylinders plainly identified as such so as to avoid confusion. Cylinders having held the same contents shall be grouped together.
12. A flame or electric arc shall never be permitted to contact any part of a compressed gas cylinder.
13. Storage rooms for cylinders containing flammable gases shall be well ventilated to prevent the accumulation of explosive concentrations of gas; no source of ignition shall be in conduit; electric lights shall be in fixed position, enclosed in glass or other transparent material to prevent gas from contacting lighted sockets or lamps, and they equipped with guards to prevent breakage; electric switches shall be located outside the room.

## RE-USING STEEL DRUMS AND CONTAINERS

A steel drum and/or container shall not be re-used until it has been rinsed three to four times with water unless it will be refilled with a compatible substance. A steel drum and/or container having contained a water-reactive substance shall not be rinsed out with water under any circumstances. The Environmental Health and Safety Department shall be contacted if a suitable rinse cannot be found.

Under no circumstances shall the top, bottom, or side of a steel drum and/or container having contained a flammable or toxic substance be removed with a cutting torch.

## TASK-SPECIFIC POLICIES- PLUMBING OPERATIONS

Plumbers are subjected to many safety hazards; especially when working in the University environment.

Plumbing involves facing those exposures to which most trades are subjected, plus the additional dangers associated with the removal/repair of science laboratory equipment, tasks involving drains that may contain a variety of chemical, biological, or physical hazards, and working in confined spaces.. Before dismantling such equipment as lab sinks, drains, pipes, fume hoods, glove boxes, etc., the plumber shall exercise great care and wear the appropriate PPEs (ex: puncture resistant gloves, safety goggles). **Because of the potential of being exposed to human blood or body fluids in drains, plumbers are classified as being of “high-risk” for exposure to blood borne pathogens (BBP) and other pathogens and must attend annual “high risk” BBP training offered by the Office of Environmental Health and Safety.** When dismantling the plumbing in equipment, a check with the Budget Unit Head in charge of the equipment shall be made to try to ascertain what the equipment has generally been used for.

Example: If a fume hood which has been used mostly for work involving perchloric acid is to be repaired or removed, a complete wash down, inside and outside, is crucial to doing the job safely. A copious amount of water is the best practical prevention available to combat perchloric acid.

Sinks and pipes might contain residual acids which need neutralizing; again, a check with the appropriate Budget Unit Head in charge is vital to safely completing the job.

Through circumstances beyond his/her control, a plumber is sometimes required to perform a task without benefit of information relative to safety. In the event this happens, the Environmental Health and Safety Department shall be contacted.

Additionally, plumbers shall consult the following items in the manual for other safety rules that could offer protection:

SAFE USE OF HAND AND PORTABLE POWER TOOLS

ELECTRICAL SAFETY

EQUIPMENT LOCKOUT PROCEDURES

SAFETY IN WELDING AND CUTTING OPERATIONS

PROPER USE OF LADDERS

ASBESTOS

MATERIALS HANDLING

PERSONAL PROTECTION PROGRAM

CONFINED SPACES

BLOOD BORNE PATHOGENS

## **TASK-SPECIFIC POLICIES- WELDING AND CUTTING OPERATIONS**

### **General**

Welding and cutting operations are conducted by personnel in the Physical Plant, Engineering, Art, and Agricultural Sciences. The following rules and those that apply that apply to "Compressed Gases" must be followed when welding and cutting.

### **Protective Clothing and Equipment**

1. Protective clothing and equipment shall be suitable for the type work to be performed, kept in good repair, and kept free of oil and grease.
2. Sleeves shall be kept buttoned at the wrist.
3. Collars shall be kept buttoned.
4. Fire resistant gauntlet gloves, aprons of leather or asbestos, and leggings shall be used as protection against radiated heat or sparks.
5. Front pockets on overalls and aprons and cuffs on pants shall be eliminated.

6. Capes or shoulder covers made of leather or other flame and heat-resistant material shall be worn during overhead welding or cutting operations. Leather skull caps worn under helmet provide protection against head burns. When working in a confined space or an overhead location, ear plugs shall be worn or the ears covered with wire screen protections
7. Hard hats or other types of head protectors shall be used where there is exposure to falling objects.
8. Low cut shoes shall not be worn unless the ankles are covered with protective leggings.
9. Employees required to wear respirators shall keep them clean and sterilized. When not in use, such equipment shall be stored in closed containers.
10. The air line to supplied-air respirators shall be provided with a filter which will remove pipe scale, water, oil, mist, and noxious vapors. It shall also be equipped with a pressure reducing valve to prevent the supplied-air pressure from exceeding 25 psi.
11. Shock from electric arc welding can and does kill. Insulating mats of sufficient size shall be used when sitting on the same metal which is being welded. Rubber gloves shall be worn under welding gloves when welding in wet or damp locations, or when the operator is perspiring excessively.
12. After a welding job is completed, the material shall be chalk marked ΔHOT,Ⓢ or a warning sign shall be posted to caution other employees.

### **Eye Protection**

1. Goggles, helmets, hand shields, or other suitable eye protection having the proper lens shade for the work being done shall be worn during all welding or cutting operations.
2. Goggles, helmets, and hand shields shall be checked frequently. Equipment with light leaks shall not be worn, as radiation burns will result. Cracked, broken, or loose filter plates must be replaced immediately.
3. Protective colored flash goggles with side shields shall be worn under a hood for protection against harmful rays, flying chips, and sparks when an arc is struck prematurely before the helmet is lowered. The lenses shall be No. 1 or No. 3 shade. Inert gas metal-arc welding by nearby welders requires goggles under the helmet with lens shade as per table. NOTE: Momentary observation of an arc without protective lenses can cause a retinal burn, which, in turn, may result in a permanent dark area in the field of vision.
4. When arc welding operations are performed in an area that is not enclosed or isolated, workers or other persons near the welding area (generally within 75 feet of the arc) shall wear appropriate goggles.
5. Flash shields shall be carried on portable welding carts as standard equipment and shall be used when necessary.

## **Welding in Confined Spaces**

1. All confined spaces such as tanks, boilers, and compartments shall be ventilated when welding operations are being performed within. When impracticable to provide such ventilation, supplied-air respirators shall be used.
2. When welding, cutting, or burning is performed in confined spaces, the cylinders shall be left outside. When welding operations are interrupted for coffee breaks, lunch, or at the end of the day, the cylinder valves shall be closed to prevent gas leaks into the confined space as this may cause oxygen depletion or an explosion hazard. Before re-entry, the tank atmosphere shall be checked for signs that oxygen depletion, flammable gases, or toxic vapors are not present.
3. In confined spaces where the means of exit is a manhole or other small opening, a means for quickly removing workers in an emergency should be provided, such as a life belt and life line. An attendant shall be stationed outside the exit at all times while work is in progress. See Item, Work in Confined Spaces.

## **Ventilation**

1. Mechanical ventilation shall be used as a precaution against breathing welding fumes and dust. When this is not provided, a metal frame respirator or supplied air respirator shall be used.
2. When welding on brass, bronze, galvanized iron, or cadmium plated metals, adequate ventilation shall be provided to carry off vapors. Metals containing or coated with lead, cadmium, zinc, mercury, beryllium, and similar materials produce toxic fumes when welded or cut; the latter evolving into deadly phosgene gas. Chlorinated solvent vapors <200 feet from inert gas metal-arc welding shall be shielded from the arc.
3. For local exhaust suction devices to be effective, the exhaust hood entrance shall be within 9 inches of the weld or cut.

## **Fire Prevention**

1. When practicable, the object to be welded shall be moved to a safe location designated for welding. If the object to be welded cannot be moved to a safe location, all movable fire hazards in the vicinity shall be taken to a safe place.
2. Welding and cutting operations shall not be performed in rooms, compartments, or confined places containing flammable vapors or dusts, nor on containers that have held flammable liquids or gases until all fire and explosion hazards have been eliminated. This is in accordance with recommendations of the American Welding Society, Standard A6.0-Welding and Cutting Containers Which Have Held Combustibles. For petroleum storage tanks, the recommendations of the American Petroleum Institute contained in their Manual No. RP2015, Cleaning Petroleum Storage Tanks, shall be followed. Also see Section, Recycling of Used Steel Drums and Containers.
3. Welding and cutting operations shall be performed only in areas that have been freed of fire hazards.

4. Welding shall not be performed on the outside or inside of tanks that contain flammable liquids until all explosion or fire hazards have been removed.
5. Before starting welding or cutting operations on tanks or similar surfaces, an inspection shall be made to see that no combustible material is present on either side of the surface.
6. Approved fire extinguishing equipment in good operating condition shall be kept close to all welding or cutting operations.
7. Sheet metal guards, or other similar protection shall be used to prevent sparks (which can travel up to 35 feet) from falling on wooden floors, partitions, or on flammable materials that cannot be moved. A fire watcher with fire extinguishing equipment shall be in attendance where combustible materials may be ignited by welding sparks. After the job is complete careful inspection of these areas shall be made to ascertain that no sparks remain in flammable materials. The watcher shall be assigned to inspect the area for at least a half hour after work has been completed.
8. To prevent explosions, welding or other burning torches shall not be taken into confined spaces until pressures have been regulated and unless they are to be used immediately. Remove torches as soon as the work is finished.
9. When required, welding permits shall be made available for review by interested parties.

### **Gas Welding and Cutting**

#### Storage, Handling, and Use of Cylinders:

1. Special care shall be used in the identification and selection of cylinders to ensure that the proper type of gas is used. Identification shall be made from the cylinder tag instead of depending on the cylinder color code.
2. Cylinders shall be handled carefully. They shall not be dropped or jarred.
3. The loading and storage platform shall be used for outdoor storage of cylinders so that they can be transferred between delivery trucks and the platform without being dropped or jarred. Full and empty cylinders of each type of gas shall be stored separately. Cylinders shall be stored so that they will not be knocked over or damaged by falling objects, passing vehicles, or persons.
4. Cylinders shall not be stored near radiators, stoves, or any other sources of heat.
5. O<sub>2</sub> cylinders shall be stored 20 feet away from fuel gas cylinders and combustible materials, or if closer, separated by a non-combustible barrier (at least 5 feet high) with a fire resistance rating of one-half hour.
6. All cylinder storage rooms shall be well ventilated.
7. Unless other suitable provisions have been made to prevent cylinders from upsetting during use, they shall be securely tied to a substantial stationary object.

8. Cylinder valves shall be closed and valve protection caps replaced before cylinders are moved or placed into storage.
9. Special cylinder carts shall be used for moving cylinders.
10. All cylinders shall be placed in an upright position whether in use or in storage. This prevents fuel gas liquids in LP-Gas or MAPP Gas (Methylacetylene-Propadiene) cylinders or acetone liquid in acetylene cylinders from being discharged through the regulator.
11. Cylinders shall be used in the order they are received from the supplier. When empty, their valves shall be closed, caps replaced, and the cylinders marked  $\Delta$ MT Storage to indicate that they are empty. Also see Section, Handling, Using, and Storage of Compressed Gas Cylinders.
12. Cylinders shall not be permitted to come in contact with electrical wires.
13. Cylinders shall be placed in locations where they will not come in contact with sparks or flames from welding or cutting work.
14. When cylinders are to be hoisted or lowered by derrick, they shall be securely placed on a suitably designed carrier or platform and attached to the derrick hook by means of a choker sling. Cylinders shall not be lifted by their valve or caps. Electric magnets shall never be used.
15. Oxygen or acetylene cylinders shall be used only when equipped with proper regulators or reducing valves.
16. Regulators or automatic reducing valves shall be used only with the gas for which they are intended and at pressures for which they are intended.
17. While acetylene cylinders are in use, the valve key wrench shall be kept in place. It shall be removed after closing the valve.
18. The fusible safety plug on acetylene cylinders shall not be tampered with.
19. Warm water - never a flame or boiling water - shall be used to remove ice from around the outlet valve of an acetylene cylinder.
20. Leaking acetylene cylinders shall not be placed in service. When uncontrollable leaks are present, the cylinder shall be moved to a well-ventilated open area, and the valve shall be opened slightly to permit the acetylene to escape slowly. Warning signs shall be displayed to keep persons with cigarettes or other sources of ignition at a safe distance.
21. The tops of acetylene cylinders shall be kept free of tools or other objects.
22. Fuel gas and acetylene cylinders shall be stored and used valve end up.
23. Fuel gas cylinders shall not be used as a substitute for compressed air, as a source of pressure, nor for ventilation or dusting operations.

24. Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease, or near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire, or in an acetylene generator compartment.
25. Acetylene shall not be used at a pressure >15 psi.

### **Hose Lines and Connections**

1. Only hoses in good condition shall be used. At regular intervals, examine pressurized hose while it is immersed in water to detect leaks.
2. Only hoses designated to be used with a specific gas shall be used. In general, hoses can be identified by their color: red=fuel gas, green=oxygen, and black=inert gas.
3. Hose shall be protected from damage by trucks, falling objects, sharp edges, sparks, slag, and open flame.
4. Hose shall be placed so that it will not create a tripping hazard. Excess hose shall be coiled to prevent kinks and tangles.
5. Standard oxygen hose or regulator outlet connections have right-hand threads; fuel gas connections have left-hand threads with a grooved hex on the nut or shank. Connections shall never be forced.
6. Oil or grease shall not be used in making up connections.
7. Tape shall not be used to repair hose. Hose may be spliced using standard brass fittings (not copper tubing) and ferrules or hose clamps designed for this purpose.
8. Welders shall not stand in front of the gauges on the regulators when opening the discharge valve of the tank. Sudden pressure may destroy the gauge, blowing out the glass and parts.

### **Torches**

1. Torches shall not be lighted by spark lighters, pilot lights, or matches. Torches shall not be re lighted from hot work, especially when operating in a small confined space. If gases do not light instantly, ignition could be violent.
2. Purge oxygen and fuel gas lines individually to remove air and other contaminants before using each day. Do not purge in a confined space.
3. When torches are changed or welding is discontinued for longer than five minutes, all cylinder valves shall be closed.
4. A clear, unobstructed space shall be maintained between the work and the cylinders so that pressure reducing regulators can be reached quickly in an emergency.
5. If a flashback occurs because of combustible gas mixtures burning inside the tip, torch, or hose, faulty equipment or misuse is generally the cause. In an oxy-fuel torch, when hissing or squealing is

heard, flame has passed the mixer and the torch and cylinder valves shall be shut off and the area vacated for about five minutes. If the torch, regulator, and cylinder are cool, inspect the torch and regulator for inner damage. Discard the hose unless it will pass a pressure test—the greater of either 300 psi or twice the operating pressure.

## **Electric Arc Welding**

### Equipment and Cables:

1. Before starting operations, all electrical connections shall be checked to determine that they are securely made and firmly attached to the work.
2. Work leads shall be kept as short as possible.
3. Equipment shall be examined frequently to determine that all electrical connections and insulations on holders and cables are in good condition. Loose cable connections may overheat or arc and cause a fire.
4. Be careful not to connect the equipment ground lead of single phase units to the 3<sup>rd</sup> wire (hot) of a 3-phase power source.
5. Line cords with 3-prong plugs shall be connected to a grounded switch box or a grounded mating receptacle respectively. Three-prong plugs with a broken ground prong shall not be used.
6. Safety devices such as circuit breakers and interlocks shall not be shunted out or disconnected. Power sources or line fuses shall be locked out or removed when equipment is being installed, inspected, or serviced.
7. Report any missing enclosures or defects in the motor or generator to your supervisor.
8. Terminals of the welding generator shall not contact the frame of the welder. This produces an electrical ground.
9. Only electrode holders designed to safely handle the maximum rated current required shall be used.
10. Electrode holders that are not fully insulated shall be replaced. Holders with protruding screws shall not be used.
11. Electrodes shall be removed from the holder when not in use.
12. An arc shall not be stricken on a gas cylinder or any pressure vessel as it may seriously weaken the vessel.
13. Only welding cables that are completely insulated, flexible, and of proper size for the maximum current requirements of the work shall be used. Cables shall be regularly inspected for cracks, wear, or damage, and repaired or replaced if necessary.
14. Lengths of cable shall be connected by fully insulated lock-type connectors having a capacity equal to that of the cable.

15. Cable lugs shall be soldered to the cable and shall be securely fastened to give full electrical contact.
16. The exposed metal parts of lugs shall be completely covered with rubber tape and protected with friction tape. Exposed parts of electrical units shall have insulating covers in place before the power is turned on.
17. Proper electrical contact shall exist at all joints when a building structure or pipeline is used temporarily as a ground-return circuit.
18. When a structure or pipe is continuously used as a ground for the machine, all joints shall be electrically bonded to establish a good ground.
19. Pipe containing gases, flammable liquids, or conduits carrying electrical conductors shall not be used as a ground-return circuit.
20. Welders shall make every effort to keep welding cables dry, grease and oil free, and protected from sparks or hot metal.
21. Cables shall be supported from overhead when practical.
22. Cables laid on the floor or ground shall be protected so they will not be damaged or cause a tripping hazard.
23. Welding cables shall not be located close to other power supply cables or other high-tension leads.
24. When discontinuing work, the power supply switch in the equipment shall be opened and the unit disconnected from the source of power.
25. Welding rods shall be stored in the container on the welding machine; not thrown on floors or staging.
26. Welding shall never take place in damp areas without insulation to protect workers against electrical shock. Dry duckboard or a mat shall be used if necessary.
27. Gas or diesel electric generators shall have the exhaust gases vented to the outside to avoid the toxic effects of carbon monoxide and other gaseous byproducts.  
NOTE: The hazards connected with atomic hydrogen and heli-arc welding are essentially the same as described herein for arc welding.

#### Spot Welding

The use of this type of welding presents certain hazards inherent to the nature of spot welding equipment.

1. Prior to spot welding, the material is usually cleaned in a caustic or slightly acid bath. Employees performing these wash operations shall be protected from splashing liquid.
2. Under no circumstances shall the operator of a spot welding machine adjust the contractors. This shall be done by a trained electrician.

3. In hand spot welding installations, eye protection shall be required to protect the operator from the spattering metal.
4. Operators shall exercise extreme care when cleaning the tips of the contractors to prevent having their fingers crushed between tops.
5. Welding of materials such as stainless and high carbon steels causes excessive spattering of metal. Operators shall be cautioned to protect against the possible penetration of the metal into the tips of the fingers.

## TASK-SPECIFIC POLICIES- PAINTING

Paint is used by personnel and/or students in the Physical Plant, Art, Agricultural Sciences, Architecture, Athletics, and other areas on campus. Persons using paint may be subjected to many safety hazards and exposures including fire, poisoning, falls, eye injury, strains, respiratory distress, and dermatitis.

### **Fire Prevention**

After use, cans of paint, thinners, or lacquers shall be closed. This is particularly important when working inside a building or other enclosed area where a heat source or sparks could be present or when moving paints, thinners, or lacquers in a truck or van.

All rags or towels soaked with paint, thinners, or lacquers shall be disposed of in approved containers after each shift. All paints, thinners, or lacquers shall be returned to the shop. Stock shall be kept in appropriate cabinets or bins. The shop shall be kept clean and as free as possible of flammable materials. The shop shall be equipped with at least one 2 C Class B or ABC fire extinguisher. NO SMOKING signs shall be posted in the shop.

### **Falls**

See Item, "LADDERS AND SCAFFOLDS." (THIS SECTION)

NOTE: It is permissible for painters to use metal ladders, provided the work does not involve removing electrical appliances and/or working around energized equipment or lines.)

### **Strains**

Moving ladders can and has caused back and muscle strains to many painters. Ladders are heavy and odd-shaped; they present quite a challenge to move, lift, or position. Large ladders shall be handled by two persons to prevent possible strain.

### **Poisoning**

Employees using a spray painter shall be protected from harmful mists as a result of overspray. Protection shall meet at least NIOSH/MSHA approved dual cartridge respirator requirements. There are a number of disposable face masks meeting the above requirements. Such protection is vital due to the possible effects of oil and/or lead based or other harmful mists from paints, thinners, and lacquers that

could damage the respiratory system. It is also important that a spray paint booth maintain sufficient air velocity to carry overspray and fumes away from the operator's face. Good maintenance and housekeeping of the system is a must for proper operation. (Air ducts shall be kept open, fan belts tight, and paint accumulations removed.)

### **Eye Injury**

When introduced into the eye, paints, thinners, lacquers, or other solvents could produce painful and dangerous results. Painters painting overhead shall wear appropriate eye protection to prevent paint or other materials from dropping into the eyes. When surfaces are prepared for painting by wire brushing, sanding, or scraping, eye protection shall be used.

### **Dermatitis**

Some individuals are susceptible to dermatitis, and inflammation of the skin (usually the hands, arms, or neck) caused by paints, thinners, or lacquers. To help prevent dermatitis, employees shall wear long sleeves, gloves, and keep the top button of their shirt buttoned while painting. Painters should consider wearing a hat when working.

## **TASK-SPECIFIC POLICIES- GROUNDS MAINTENANCE/FARM OPERATION**

Prevention of accidents and injuries from tools and machines used in grounds maintenance and farming requires that equipment be chosen for a specific purpose and that it be used and maintained properly. Fuel and chemicals shall be stored and used properly. Workers shall be thoroughly trained and shall wear proper clothing and use protective equipment as required.

It is important that maintenance workers be able to recognize poisonous vines, shrubs, fruits, and insects. (See "Poison Ivy and Oak," this section) They shall avoid contact with poison oak and ivy and permanently destroy all poisonous growths. They shall guard working outdoors. All cuts and scratches received outdoors shall be treated with proper antiseptic covering. All foreign matter such as glass, metal, and wire shall be removed from the grounds to be maintained. Gloves, sturdy shoes, and appropriate garments for protection shall be worn at all times.

### **Hand Tools**

See "Safety Use of Hand and Portable Power Tools" in this section.

### **Gasoline Powered Equipment:**

The following points shall be followed when handling gasoline:

1. Gasoline shall never be used for cleaning floors, tools, clothes, or hands. Gasoline is to be used in engines as a source of fuel only.
2. Gasoline shall only be stored in approved closed containers. Never use an open container, glass, or other breakable container.
3. Pouring gasoline from one container to another may generate a charge of static electricity. A metal-to-metal contact shall be maintained.

4. Gasoline spills shall be cleaned up immediately to prevent accumulation of vapors. Do not allow electrical switches to be turned on until the gasoline vapors have dispersed. Electrical devices that start automatically such as cold water fountains may have to be shut off at the main switch if the main switch can be pulled safely.
5. If gasoline is spilled on a person, the saturated clothing shall be removed immediately and the person kept away from sources of ignition. The affected area of the skin shall be washed with soap and water to avoid a skin rash or irritation. If the eyes are involved, they shall be flushed with water. Get the person to a doctor.
6. Gasoline tanks or equipment parts that are likely to contain gasoline shall be drained or dismantled only out-of-doors or in a well-ventilated area free from sources of ignition.
7. Smoking shall be allowed in approved areas only. Smoking shall not be allowed in fueling areas, fuel system servicing areas, maintenance areas, bulk fuel delivery areas, etc
8. Gasoline shall not be dispensed into a fuel tank while the engine is running or the motor is hot.
9. Equipment with fuel in the tank shall not be stored inside a building where vapors could reach an open flame or spark. Allow the engine to cool before storing in any enclosure.
10. Never run an engine indoors.

### **Lawn Trimmers**

Edgers and trimmers shall be treated with the same caution as mowers because they, too, have a heavy metal cutting blade that can throw debris or cut a finger.

Guards shall be kept in place and in working order. Keep the blades sharp. Do not put hands near the working area unless the machine is turned off and unplugged.

Nylon-cord weed trimmers cannot hurt as seriously as metal-blade trimmers-edgers, but getting hit by the line can sting. The operator shall disconnect the power cord when adjusting the cutter cord length or changing the reel, applying the same precautions as with any electrical appliance. Care shall be taken in wet areas and the cord checked periodically for cracks or breaks in the insulation. Gasoline-powered mowers and tractors shall meet the American National Standard B71.1, "Safety Specifications for Power Lawn Mowers, Lawn and Garden Tractors."

### **Power Lawn Mowers**

Supervisors shall make sure the operator is well-trained in using the mower. If it is the first time the mower will be used that season, the operator shall review the instruction manual. Before starting to mow, the operator shall pick up rocks, glass, tree branches and twigs, and any other objects that could become lethal missiles if thrown out by the mower blade and observe the location of fixed objects such as pipes, lawn sprinkler heads, and curbs that could damage the mower or break off and become missiles. Any wheel height adjustment shall be made prior to starting the mower; disconnect the spark plug wire when cleaning, repairing, or inspecting the mower. Unauthorized persons shall not be allowed to be in the mowing area. The operator shall make a quick inspection for loose nuts and bolts, check the engine oil

level (if the mower has a separate oil reservoir), and fill the fuel tank before starting, using a vented can with a flex spout. The operator shall wear work shoes and safety glasses. A brimmed hat, long pants and a long-sleeved shirt will protect against sunburn.

The operator shall be instructed to mow in daylight or good artificial light and to push the mower forward as much as possible because feet can be injured when pulling a mower backward. When mowing on a slope or terrace, a series of horizontal passes along the incline shall be used. If the operator pushes up the incline, he/she runs the risk of having the mower drift back onto his/her foot. If he pushes down, he/she could lose his footing and fall into the mower.

The mower shall not be used when the grass is wet and slippery. If the grass is damp or high, cut a slower speed, if possible, and set the cutting height higher than for dry grass; otherwise, the discharge chute may clog up.

Rotary blades can also pick up stones, pieces of wire, nails, or other objects hiding in the grass, and throw them out of the discharge chute at high speeds. Guards shall be in place every time the catcher is not used.

The operator shall shut off the engine and make certain that the blade has stopped completely before taking off the grass catcher to empty it, attempting to free obstructions from the discharge chute, adjusting the cutting height or performing any operation requiring him/her to put his/her hands or feet near the blade.

### **Riding Mowers**

Suggested safe practices for riding mowers include the following:

1. The operator shall be fully instructed in handling riding mowers. He/she shall know the controls, know how to stop the machine quickly, and shall read the owner's manual especially at the beginning of each mowing season.
2. The work area shall be cleared of objects that might be picked up and thrown. Fixed objects that might damage the mower shall be identified. All areas cannot be reached by a riding mower; some corners or sharp slopes will have to be mowed by a power mower. When planning landscaping, leave enough space around new plantings for easy mower access and allow for future growth.
3. Disengage all attachment clutches and shift into neutral before attempting to start the engine (motor). Disengage power to attachments and stop the engine before making any repairs or adjustments. Disengage the power to attachments when transporting them or when they are not in use. All possible precautions shall be taken when leaving the vehicle unattended such as disengaging the power takeoff, lowering the attachments, shifting into neutral, setting the parking brake, stopping the engine, and removing the ignition key.
4. When mowing, the operator shall stay alert for holes in the terrain and for other hidden hazards. Do not start or stop suddenly when going uphill or downhill. Mow up and down the face of steep slopes; never mow across because the wheelbase is longer than the tread so the unit is more stable that way. Reduce speed on slopes and on sharp turns to prevent tipping or loss of control. Extreme caution shall be used when changing direction, especially on slopes. Do not back up without looking to make certain it is safe to do so. Watch for traffic when crossing or near roadways. When using attachments, direct discharge of materials away from anything that could be hurt or damaged by it.

5. Maintain vehicle and attachments in good operating condition and keep safety devices in place. Keep all nuts, bolts, and screws tight, and make sure the equipment is in safe working condition; check especially blade mounting bolts. If the vehicle or its attachments strike a solid object, stop and inspect for damage; the damage shall be repaired before restarting and operating the equipment. The engine governor settings shall not be changed; the engine shall not be over speeded; discharge guards shall always be in the down position.

### **Garden Tractors**

1. Garden tractors shall have safeguards for all moving parts to reduce the hazard of contacting belts, chains, pulleys, and gears.
2. Garden tractors shall have a throttle, gears, and brakes that are accessible and can be operated smoothly with minimum effort.
3. Safety instructions shall be provided with the garden tractor. There shall be warning labels on the machine itself.
4. The operator shall read the owner feets manual and shall reread its recommendations before each use of the garden tractor.
5. Never allow children or unauthorized persons to operate the tractor and keep them away from these areas during operation.
6. The operator shall wear sturdy, rough-soled work shoes, and close-fitting slacks and shirts to avoid entanglement in the moving parts. He/she shall never operate a garden tractor in bare feet, sandals, or sneakers.
7. The machine shall be turned off and the spark plug wire disconnected when the machine is to be adjusted.
8. For greater stability, the operator shall always drive up and down the slopes, rather than across, when using a garden tractor on a hill for greater stability. (This instruction is different than that for power lawn-mowers.)
9. Garden tractors shall be started outdoors, not in a garage where carbon monoxide gas can collect.
10. No smoking shall be allowed near the garden tractor or gasoline storage can.
11. Unauthorized persons shall be kept away from the machines and the fuel.
12. All loose or broken parts, especially blades shall be tightened or replaced
13. Get expert servicing regularly; it may prevent serious injuries.
14. Bypass starting of tractors shall not be allowed.

**NOTE: TRACTORS ARE OFTEN USED WITH ACCESSORIES. OPEATORS SHOULD CONSULT THE OPERATOR'S MANUAL FOR INSTRUCTIONS ON THE PROPER AND SAFE USE OF THESE ACCESSORIES.**

**GOLF CARTS AND OTHER NON-REGISTERED/NON-LICENSED MOTOR VEHICLES ( EX: JOHN DEERE GATOR) SAFETY POLICY-**

**Scope**

Golf carts and non-registered/non-licensed motor vehicles (UTV) have grown in popularity because their light weight and oversized, low pressure tires allow them to maneuver in difficult terrain where larger vehicles cannot. **These vehicles are used at Louisiana Tech University solely for University business in the areas of security, law enforcement, grounds and building maintenance, athletics, and farming operations.** They are to be operated in accordance with the requirements of Louisiana General Laws, manufacturer's specifications and other Louisiana Tech policies and procedures (Ex: Driver Safety Policy).

The "Golf Cart and Non-registered/Non-licensed Motor Vehicle Operator Training Program" has been developed for operators of these vehicles. This Program is posted in The Driver Safety section of the Louisiana Tech University Office of Environmental Safety web site and on the Louisiana Tech University Police web site.

The most commonly used UTVs at Louisiana Tech are John Deere Gators. This **Gator (UTV) Safety Program** may be used as a guide when training operators of these and other types of UTVs.

**Louisiana Tech University John Deer (UTV) Safety Program**

**1. Initial Operator Training and Updates-** The Louisiana State Office of Risk Management requires that Supervisors **MUST** follow the "Golf Cart and Non-registered/Non-licensed Motor Vehicle Operator Training Program" to train all their operators of these vehicles. This training includes a review the manufacturer's Operator's Manual and all safety issues associated with the use of golf carts and the John Deere Gator or other types of UTVs. All Supervisor must verify, in writing, that all their operators are competent to operate this equipment, safely. Such training must be documented on a "**Louisiana Tech University Non-licensed Vehicle Operator Training Acknowledgement Form**". **Supervisors in the Physical Plant must also document this training in the "JOB SAFETY ANALYSIS" MANUAL IN THE LOUISIANA TECH UNIVERSITY PHYSICAL PLANT. Training and documentation must be done PRIOR TO the employee operating the UTV.**

The operator's manual, specific to the John Deere Gators and other UTVs must be available to the Supervisor for ease of reference. Should the manual be lost or otherwise misplaced, it shall be the responsibility of the Supervisor to replace it as soon as possible. **Maintaining a legible copy of the owner's manual on the vehicle is also a requirement of the Occupational Safety and Health Administration (OSHA).**

**2. General Rules of Operation-** The Gator and all other UTVs are not intended for public road or highway use, as it may be a hazard to the faster moving traffic. As such;

- a. These vehicles may not be driven along sidewalks that are adjacent to non-College property.

b. Operators and passengers should be seated separately, and shall not under any circumstances be allowed to ride on the vehicle, unless they are seated in the center of the seat with both feet inside the vehicle.

c. These vehicles are permitted to cross streets on campus from one Tech property to another, provided appropriate care is used with regard to pedestrians and traffic.

d. These vehicles must come to a complete stop before crossing a road or driveway. The crossing of public ways is never permissible during the hours of darkness.

**e. When approaching another motor vehicle or any pedestrian, they always have the right-of-way. Operators of the UTV must come to a complete stop and allow them to pass. NO EXCEPTION!!!!**

**3. Smoking-** In accordance with the Louisiana Tech Smoking Policy, smoking is not permitted in or around any vehicle, including the UTVs or Golf Carts. Some persons, including passengers, find smoking and second hand smoke offensive and a potential health risk.

**4. Keys-** Louisiana Tech Vehicle Policies prohibit leaving of keys in the ignition of UTVs or golf carts for reasons of liability and safety. A stolen vehicle, in which an injury or property damage occurs, shall be the responsibility of the operator.

**5. Riding in Trailer-** Riding in trailers pulled by a UTV is strictly prohibited.

**6. Driving- During the operation, the driver shall:**

a. Know the location of all controls, both inside and outside the vehicle.

b. Not operate the vehicle with the cargo box raised.

c. Not leave the vehicle running and unattended because the vehicle may be inappropriately used by unauthorized persons or accidentally shift gears and move, causing injury or property damage, and place the University in situations of undesired liability.

d. Avoid sudden starts, stops and turns.

e. Use directional signals to indicate path of travel.

f. Turn the vehicle only on level ground.

g. Not wear headphones designed to play music or other distracting noises. Earplugs or muffs may be used to lower decibel levels which are generated by the UTV, during normal operation.

h. Only use the UTV when adequate lighting is present.

i. Not permit horseplay or any other activity that will place passengers, cargo or the vehicle at risk.

j. Keep front wheels straight at crest of hill or when going over bumps or depressions.

**This Daily Checklist should be followed before operating these vehicles**

Inspect the vehicle for:

- Fuel and oil leaks.
- Warning decals and labels in good condition.
- Lighting abnormalities or failures, if applicable.
- Horns and other warning signals, if applicable.
- Properly inflated tires.
- Guards and shields for personnel safety.
- Broken or missing parts.
- Proper security of loads.
- Properly operating brakes, including parking brakes.

**7. Starting the vehicle**

- a. Operators must be sitting in appropriate seat.
- b. Vehicle brake should be engaged.
- c. Start vehicle in neutral with choke engaged (during cold weather).
- d. If engine does not start within 5 seconds, turn key off and wait 10 seconds before next attempt.
- e. Never attempt starting the engine more than 3 times within a 5 minute period. The starter must have time to cool to prevent damage.

**8. Braking-**

- a. The parking brake system shall be engaged whenever the vehicle is unoccupied.
- b. Brakes shall be tested before and during operation for reasons of safety.
- c. Braking shall be used when descending steep slopes to prevent the UTV from freewheeling.

**9. Parking- When parking, the UTV shall:**

- a. Be stopped and parked on a level surface.
- b. Be locked and the keys removed.
- c. Engine shall be stopped, and have the key removed to prevent unauthorized use.

10. **Loading and unloading the cargo box-** Loads in the cargo bed or box of the UTV shall be:

- a. Evenly distributed (Refer to Operator's Manual for correct load distribution)
- b. Securely anchored to prevent shifting or loss of load.
- c. Lighten if being transported on uneven or hilly terrain.
- d. Secured in the cargo box by closing the tailgate.
- e. Shall be flagged (orange or red) if it exceeds the length of the bed by 3'.

The UTV must be on a level and stable surface with the vehicle brake set before unloading the load. A cargo box can be very heavy. Never dump while moving. Cargo boxes that are not equipped with a power lift were not meant to be raised by hand. Back injury may result. The center of gravity changes as a loaded cargo box is raised. Do not allow rear wheels to hang over the edge of a loading dock or trench when unloading.

### 11. Operating in Special Situations

a. **ROUGH TERRAIN- When using an UTV on rough terrain the following precautions shall be used:**

Use existing trails; Avoid swails, dangerous slopes or depressions, bumps, holes, ruts and other obstacles; because of lower roof clearance, the manufacturer recommends the use of head protection; Keep wheels straight at crest of hill or over bumps; reduce speed to lower risk of rollover; brake frequently when descending slopes; do not permit the UTV to "freewheel"; if vehicle stops or loses power, lock brake to hold vehicle in place.

b. **WATER HAZARDS- When a water hazard is encountered, the operator shall:**

Not cross the hazard if the operator is not fully aware of the actual depth; not attempt to cross if water level is 6" or greater in depth; proceed slowly and carefully if the water level is less than 6".

c. **TOWING OF GATOR- Towing shall be performed in accordance with manufacturer specifications. It shall be used when appropriate by the university mechanics.**

### 11. Safety Decals

UTVs and golf carts have safety decals and labels that warn of the appropriate hazards and risks. Safety alerts range in hazards from a lower risk "Notice" to a much more significant "Danger". ALL EMPLOYEES MUST BE AWARE OF THESE DECALS AND LABELS AND FOLLOW THE RULES SPECIFIED ON EACH.

A **DANGER** label indicates a hazardous situation with high probability of death or sever injury.

A **WARNING** label indicates hazardous situation which have some probability of death or severe injury

A **CAUTION** label indicates a hazardous situation which may result in minor or moderate injury

A **NOTICE** label indicates important information, but not a hazard directly to personnel safety or protection of property.

Decals and labels specific to the Gator include:

**DANGER LABELS:**

**SHIELD EYES**

1. Explosive gases can cause blindness or injury. Flames, smoking and sparks will create explosion hazard.



**WARNING LABELS**

**RIDERS CAN FALL AND BE KILLED.**

1. Maximum of one person per seat.
2. Riders are not permitted in the cargo area.



**YOUNG DRIVERS INCREASES THE CHANCE OF DEATH**



**ROLLOVER OR FALLING OFF MAY CAUSE DEATH.**



## **12. Maintenance and Fueling**

**Before performing any work on the Gator or other UTVs , the operator and mechanic should understand the appropriate service procedures indicated in the manufacturer specifications. These include:**

- Never adjust, lubricate or service the vehicle when the machine is moving. .All safety devices must be in place and properly working.
- Under no circumstances shall a safety device be altered or defeated. Modifications not specified by the manufacturer could cause serious injury or death.
- Keep hands, feet, clothing, jewelry and long hair away from any moving, unguarded parts, to prevent entanglement or serious injury.
- The engine must be kept clean, free of leaves, grass, weeds, and/or excessive oil or grease, to prevent fire.
- Before service, the authorized repair person should disengage all power and stop the engine, which shall include:
  - Locking the brake and removing key.
  - Allowing machine to cool before service.
  - Disconnecting battery (negative) cable before making electrical adjustments or welding.
- All parts shall be maintained in good condition and properly installed. Modifications to the John Deere Gator are prohibited, unless specifically permitted by the manufacturer, in writing.
- Alterations such as the installation of additional seating or equipment could result in loss of warranty, cause serious injury or death, and place the College at considerable risk from liability.
- Modifications could cause the vehicle to become unstable and increase the possibility of rollover.
- Tires shall not be mounted without the proper equipment. Tires should be checked and maintained for adequate pressure.
- Do not over inflate the tires above recommended pressure.
- When inflating tires, the person should use a clip-on chuck and extension hose.
- Check all tire wheel bolts to insure that they remain tight.
- Because each individual Gator records its hourly use on the dashboard, it is the responsibility of the operator (at that time) to report the 100 hour reading to the mechanic.
- Wheel bolts should be checked every 100 hours.

### **Fueling- FUEL FUMES CAN CAUSE ILLNESS, SERIOUS INJURY OR DEATH.**

- When filling fuel tank, both doors and front windshield should be in the full open position.
- CELL PHONES AND PORTABLE RADIOS SHALL BE TURNED OFF WHILE TANK IS BEING FILLED.
- ENGINE SHOULD BE ALLOWED TO COOL PRIOR TO FILLING THE FUEL TANK.
- PREVENT FIRE AND EXPLOSION CAUSED BY STATIC ELECTRICITY.

- Use only non-metal portable fuel containers, approved by either Factory Mutual (FM) or Underwritten Laboratory (UL).
- Never fill portable containers in vehicle or cargo area. Place container on ground and maintain contact between nozzle and container.
- Do not fill tank in an enclosed area.
- Clean up any fuel spillage with hot water and soap.
- Do not operate or occupy vehicle if any fumes are present.
- Do not cover or obstruct any vent slots at floor area.
- Close fuel cap tightly.

## **Batteries**

**Batteries shall be maintained in accordance with manufacturer specifications.**

- Batteries being charged can generate explosive hydrogen gas.
- The battery may be different in size and voltage than that for passenger vehicles.
  - a. Persons unfamiliar with the charging or electrical system of the John Deere Gator should be referred to their supervisor.

## **Hazardous Chemicals and Waste-**

**Hazardous materials used in the Gators and other UTVs, include, but are not limited to, antifreeze, brake fluid, batteries, gasoline and oil can adversely affect the environment and the university if not handled properly.**

- It is the responsibility of the university mechanic to properly handle and dispose of all hazardous waste generated from the UTVs.
  - a. Hazardous materials and waste shall be labeled in accordance with the requirements of the Office of Risk Management and the Louisiana Department of Environmental Quality.
  - b. All waste generated will be properly capped or covered, except when actively being filled or discharged, and shall be placed when full into the Hazardous Material Storage Building, Office of Environmental Safety.

## Pesticides

Insecticides, herbicides, fungicides, disinfectants, rodenticides, and animal repellents are all pesticides. The safe use of pesticides is everyone's responsibility. The user, however, has the major responsibility which begins the day a pesticide is selected and purchased and continues until the empty container has been disposed of properly. All labels shall include a list of what the product will control, directions on how to apply the pesticide, a warning of potential hazards, and safety measures to follow.

**NOTE: THE PURCHASE AND USE OF HERBICIDES AND PESTICIDES ARE UNDER THE CONTROL OF THE LOUISIANA TECH UNIVERSITY BIOSAFETY AND RADIONUCLIDE INSTITUTIONAL REVIEW COMMITTEE. UNDER NO CIRCUMSTANCES SHALL THESE AGENTS BE USED BY ANY UNIVERSITY EMPLOYEE WITHOUT APPROVAL OF THIS COMMITTEE!!**

Before using any pesticide poison, read the label carefully. The label states that hazards involved, antidotes, and first aid instructions. Those poisons that have DANGER-POISON on the label are highly toxic. If inhaled, eaten, or allowed to frequently remain on skin, they could kill. Poisons that have WARNING on the label are moderately toxic and can be quite hazardous. Poisons that have CAUTION on the label have low toxicity, but could cause harm if the poison is eaten or grossly misused. Label instructions for mixing, handling, and applying shall be followed. BE SURE; DO NOT GUESS.

1. Application: **Any restricted-use pesticide used around a plant shall be applied by a certified handler according to law (Public Law 92.516).** The least toxic pesticide shall be used for the job in order to reduce hazards. Only enough pesticide to last one season shall be purchased. This cuts down on storage and disposal problems. The following precautions shall be observed:
  - a) Use pesticide poisons only for the purposes stated on the label.
  - b) Keep pesticide poisons in the original labeled container. Check for leaks or container damage.
  - c) Mix pesticide poisons carefully (outdoors if possible), keep off skin, and avoid breathing dust or vapors. Use protective clothing and equipment including respirators for toxic chemical. See [Personal Protective Equipment](#).
  - d) Set aside a special set of mixing tools (measuring spoons and a graduated measuring cup) for use with sprays and dusts only. Keep them with the chemicals.
  - e) Avoid spilling. Set aside a level shelf or bench in a well-ventilated area, preferably outside, for mixing chemicals. A level, uncluttered surface helps avoid spills. If chemicals do spill, wash hands at once with soap and water. Then hose down the mixing area and contact the Environmental Health and Safety Department.
  - f) Never smoke or eat while spraying or dusting.
  - g) Someone shall always be [in attendance](#) when pesticides are being used.
  - h) During application, stay out of the spray drift. Avoid outside application on a windy day.
  - i) If pesticide poison gets on skin or clothing, immediately remove clothing and take an all-over bath or shower; be sure to shampoo and use plenty of soap and water. Wash clothing before rescue and contact Environmental Health and Safety Department.
  - j) When finished, wash immediately with soap and water. Do not smoke, eat, or drink without washing first.
  - k) Never allow unauthorized personnel around treated areas or pesticide poison mixing, storage, and disposal area.
2. Safe Storage
  - a) Pesticide poisons shall be stored in a well-ventilated, locked area or building. Packages that are likely to be damaged by dampness shall be kept off the floor.

- b) Poisons shall be kept in tightly closed, original containers. The label gives information needed in case of accidents. Do not store pesticides in other containers.
  - c) Do not store clothing, respirators, lunches, cigarettes, or drinks with pesticide poisons. They may pick up poisonous vapors or dusts or soak up spilled poisons..
  - d) Keep soap and plenty of water handy. Seconds count when washing poisons from the skin.
3. Disposal: Dispose of pesticides through the Louisiana Tech University Hazardous Waste Program only. See [Hazardous Waste Program](#).

## **Emergency Information**

If an emergency occurs, additional advice and information on antidotes for specific pesticides may be obtained from the Student Health Center or a local hospital. Telephone numbers shall be conspicuously posted.

## **Poison Ivy and Poison Oak**

All maintenance workers shall be trained to recognize poison ivy and poison oak.

1. Poison ivy grows as a vine up to 50 feet long or as a small plant. The leaves of this plant always grow in groups of three. The leaves of poison ivy are green in late spring and early summer; reddish in the early spring, late summer, and fall.
2. Poison oak is most commonly a bush, although it sometimes grows as a vine up to 30 feet long. The leaves always grow in groups of three and are green in late spring and early summer; reddish in early spring, late summer, and fall.

Exposure to poison ivy or oak can be acute (short-term) or chronic (long-term). Acute exposure is received by touching the plant, swallowing parts of the plant, or inhaling smoke of the burning plant. Local signs and symptoms begin 12 hours to 7 days after exposure. Chronic exposure (repeated exposure) increases the severity of the symptoms which could lead to severe poisoning.

Symptoms include itching, swelling, blister formation, oozing, and crusting. Generalized signs and symptom include fluid accumulation, weakness, malaise, and fever.

### **Prevention**

1. Employees shall be able to recognize these poisonous plants and know how to avoid them.
2. If exposure is possible, heavy clothes and leather gloves shall be used.
3. Upon exposure, the employee shall wash thoroughly with soap and water, and remove all contaminated clothing for washing.

NOTE: Ingesting of poisonous plants does not help achieve immunity.

Treatment: Upon exposure, the employee shall wash thoroughly with soap and water.

## **TASK-SPECIFIC POLICIES-FOOD PREPARATION, DINING AREAS, AND STORAGE**

### **Sanitation**

Levels of sanitation shall conform to all state and local health codes.

### **Lifting**

1. Place heavy stock on lower shelves.
2. Use handcarts for heavy objects.
3. Use proper lifting procedures when lifting. See [Material Handling](#).
4. Do not overload garbage cans.
5. Do not overload handtrucks. Keep load balanced. Allow for clear view when moving loaded handtrucks. Keep load trimmed so it will pass through aisles and doorways easily.
6. For forklift use, see [Fork Trucks](#).

### **Handtools**

1. When using knives, cut downward and away from hand. Knives shall be returned to storage after use.
2. Do not catch falling knives, sharp tools, or glass objects
3. When cleaning blades, wipe away from sharp edges. Use patience and proper care.
4. Use proper tools for opening merchandise.
5. All knives and cutting tools shall be kept sharp.
6. Knives and cutting tools shall be stored with blades protected and placed so that they do not protrude into walkways, working areas, and aisles.
7. Obey all warning tags and signs.
8. See [Safe Use of hand and Portable Power Tools](#).

### **Electrically Operated Food Processing Equipment**

1. Machine guards shall be kept in place at all times. Avoid using hands.
2. Pay attention at all times.
3. Turn machine off after each job or when not in use.
4. When cleaning, repairing, or moving machines, lock out the machines. See [Trades Safety, Equipment Lock Out Procedure](#).
5. All warning tags and signs shall be obeyed.
6. See [Trades Safety, Safety Rules for Control of Hand and Portable Power Tools](#).

### **Slips and Spills**

1. Prevent slips by cleaning up spills immediately.
2. Do not overload carts, trays, counters, or yourself.
3. Extra care shall be taken when serving.
4. Use cautions on and around wet floors; take shorter steps ,and do not hurry.
5. Slip resistant shoes shall be worn at all times.
6. Cover full food trays when moving from location to location.
7. Areas which are constantly wet shall have a non-slick surface.

8. Broken, worn, and defective mats are to be replaced or repaired immediately.

### **Fire Protection**

1. Clean grease screens, filters, and greasy areas regularly.
2. Obey all fire prevention signs and posters.
3. Maintain automatic extinguishment systems on a regular basis.
4. All fire extinguishers shall be inspected regularly.
5. All fire extinguishers shall be field-tested and ready for operation.
6. Learn location of fire extinguishers.
7. Keep aisles and areas around fire extinguishers and other fire protection equipment clear at all times.

### **Housekeeping**

1. Keep cooking and working areas clear and clean.
2. Never let pot handles overhang stove or counters.
3. Place food carts close to walls and away from corridors, corners, or doorways.
4. Detergents and insecticides shall be properly marked and stored away from food.
5. Aisles and stairways shall be kept clean and unobstructed.
6. Broken, worn, and defective mats are to be replaced or repaired immediately.

### **Hot Areas and Pots**

1. Use potholders when moving hot pots or suspected hot pots.
2. Shield face and arms when lifting pot lids or reaching near steam tables.
3. When moving large, hot loads, get help; use potholders or gloves, clear space for load, and warn others.
4. Avoid placing hands or arms into the oven baking chamber.
5. Before emptying hot grease, be sure container to receive grease is absolutely dry (free of water).

### **Electrical**

1. Report any defective electrical and/or mechanical equipment to your supervisor.
2. All electrical equipment shall conform with the National Electric Code.
3. See Trades Safety, Electrical Safety.

### **Clothing and Personal Protection**

1. Do not wear loose clothing or accessories (neckties, loose or open sleeves, cuffed pants, open jackets, broken shoe soles, high heels, jewelry, etc.) that can get caught in moving machinery.
2. Long hair shall be kept in hair nets.
3. Eye protection shall be worn when there is a possibility of injury from caustic cleaning materials, flying particles, hot grease, spatters, chips, etc.
4. Appropriate hearing protection shall be worn when exposed to noise levels in excess of 90 dB.
5. When handling caustic cleaning materials, employees shall wear gloves which are impervious to such materials. The gloves shall be long enough to protect the forearms.

6. Non-skid shoes shall be worn in all areas of restaurants and bars where floors may become wet or greasy.
7. Leather hand gloves shall be used when loading or unloading supplies having sharp or rough surfaces. See "Personal Protection Equipment."

### **Oil and Gas Fire Ovens**

1. Before lighting an oven, check the following:
  - a) If oven is cold, see that it is thoroughly ventilated to remove any accumulation of gas.
  - b) Be sure pilot light shows a strong blue flame before turning on any of the main valves.
  - c) See that all flues are open.
  - d) Follow manufacturer's instructions carefully.
2. All gas pipes shall be identified

### **Gas Cylinders**

See "Handling, Using, and Storage of Compressed Gas Cylinders."

### **Cooling Fans**

All fans less than 7 feet from the floor shall be protected by guards with openings no larger than 2".

### **General Rules**

1. All warning tags and signs shall be obeyed.
2. All injuries shall be reported to your supervisor.
3. Always work at a safe speed.
4. No practical jokes or horseplay shall be tolerated.
5. A first aid kit shall be made available.
6. All steam, gas, and water pipes shall be identified

### **TASK-SPECIFIC POLICIES-CUSTODIALSAFETY-**

**NOTE: TASK-SPECIFIC PROTOCOLS AND SAFETY RULES HAVE BEEN DEVELOPED AND ARE USED BY CUSTODIAL PERSONNEL. THESE ARE TO BE FOLLOWED WHEN ATTEMPTING THE SPECIFIC TASKS ASSIGNED TO THESE PERSONNEL.**

### **General Rules**

1. Use fresh cleaning supplies or sanitary disposal supplies. Wash hands often.
2. Obey all hazard warning signs. If there are any questions, ask the supervisor first.
3. Never reach into or pack down trash with bare hands.
4. Don't let trash pile up. Empty it regularly.
5. Keep storage places neat and equipment clean.
6. Any equipment showing signs of electrical trouble shall be removed from use, then reported immediately to the supervisor.
7. Keep machine guards in place. When work requires, wear protective equipment.

8. Don't feet risk it. If repairing Bunplug, use lock-out tag-out procedures. See "Equipment Lock Out Procedures."
9. To unplug: grip at plug (do not yank on cord), dry hands before handling electrical equipment.
10. Prevent falls. Keep cords and vacuum hoses out of the way.
11. Report Abooby traps@ (ripped carpets, loose, missing, or broken tiles) in flooring.
12. Move equipment slowly. Park equipment away from doorways or corners.
13. Don not block aisles, stairs, and exits.

## **Cleaning**

1. Alkaline cleaners shall not be used on terrazzo.
2. Mild alkaline cleaners may be used on asphalt tile.
3. Oils are unsuitable for rubber tile. When applied to wood floors, the fire hazard increases.
4. To keep floor clean, safe, and sanitary, the recommendations of the flooring manufacturer shall be follow. Procedures shall be standardized and detailed.
5. In general, the routine maintenance procedure for linoleum, marble, terrazzo, asphalt tile, and other types of flooring is to clean the floors with a soft floor brush or vacuum cleaner. When necessary, damp-mop with clean, cold water.
6. Floor shall be cleaned one section at a time. If traffic in the area is heavy, that section shall be roped off. When soap is used, any soapy film shall be removed by thorough rinsing to avoid a slippery condition.
7. Ordinary wash for polishing wood, tile, and similar floor surfaces is unsuitable because of its inherently slippery nature.
8. Soft floors such as asphalt, vinyl, and linoleum shall be cleaned four times a year. Hard floors such as concrete and terrazzo shall be cleaned and sealed once a year.
9. Slippery materials spilled on floors shall be cleaned promptly. Clean all spills as soon as possible.
10. To remove grease and oils, the area can be covered with slaked lime to a depth of 1/4" (5mm). After two or three hours, the lime is then removed with a scraper or stiff brush. Various sand commercial cleaners can also be used.
11. Protection shall be used when handling strong chemicals. Wear gloves if using steel wool.
12. Ventilate area if painting, spraying insecticide, or using toxic cleaners. Do not mix ammonia and chlorine products.
13. Avoid leaving floor too wet, using too much wax, and not buffing enough.

