



ENVIRONMENTAL HEALTH & SAFETY

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The University of Alabama at Birmingham

# **General Safe Work Practices Program Manual**

## **2021**

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## **University of Alabama at Birmingham** **General Safe Work Practices Program Manual**

General and Occupational Safety at the University of Alabama at Birmingham (UAB) is governed by federal, state, and local standards, including University Policies and University Standard Operating Guidelines/Procedures. The office of Environmental Health and Safety (Campus Safety) is responsible for the day-to-day accident prevention, inspection, and program oversight. However, each and every individual, whether faculty, staff, student, or visitor on UAB's campus shares a role in overall occupational safety.

### **Program Requirements**

The basis for the General and Occupational Safety program at UAB is provided for by University Policies and Guidelines/Procedures.

### **Applicable Codes & Standards**

The University of Alabama at Birmingham is governed by the Occupational Safety and Health Administration standards. It is important to note that these codes are not all-inclusive, and that other codes and standards may also apply. Some of these include, but are not limited to:

- Occupational Safety and Health Administration (OSHA)
- Environmental Protection Agency (EPA)
- National Fire Protection Administration (NFPA)
- American National Standards Institute (ANSI)
- National Institute for Occupational Safety and Health (NIOSH)

### **General Safe Work Practices Program**

The General Safe Work Practices Program at UAB involves numerous activities, programs, and procedures to help ensure that our campus is a safe place to work, live, and play. These program areas include accident prevention, training, education, and risk assessment to properly mitigate hazards. The following information is provided as a general guideline for activities associated with general safety. Additional information may be obtained by contacting Environmental Health and Safety at 205-934-2487 or <https://www.uab.edu/ehs/>. Links are provided throughout this document.

## **Accident and Injury Reporting**

### **Procedures for Reporting**

- Employees should report on-the-job accidents as soon as possible to their immediate supervisor. This reporting should occur whether or not medical treatment is necessary.
- When an accident occurs, the employee's supervisor or lead employee should investigate the accident. The area where the accident occurred should be viewed and statements should be obtained from any witnesses. Questions regarding the accident/incident report should be directed to the Risk Management office.
- Environmental Health and Safety (EHS) shall review all Workers Compensation claims and shall investigate those where a hazard is present, where appropriate safety procedures were not followed or where personal protective equipment was not used or was defective.
- The Risk Management office may forward other claims (property loss, visitor accidents) and incident reports to Campus EHS for review and investigation.
- If the incident resulted in, or had the potential to result in, a serious injury or property loss, it should be reported to EHS.
- If any action is necessary resulting from the investigation conducted by EHS, the findings will be forward to the appropriate supervisor and/or department head.
- EHS shall investigate chemical spills/releases and fires.

Supplemental Forms: Incident reporting form Risk Management

<https://riskmgt.hs.uab.edu/forms.html>

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## **Aerial Lift Guidelines**

Work activities that are performed with an aerial lift must be in conformance with the manufacturer and General Industry standards.

### **Basic Requirements**

The basic requirements for operating an aerial lift include, but are not limited to:

- Initial training is required to operate aerial lifts. A certified trainer will be responsible for training employees in the correct use and safety precautions for the specific equipment (i.e., a certified employee or equipment supplier / manufacturer.)
- Articulated and extensible boom platforms must have both platform (operator controls) and lower controls (on the body of the lift.)
- The operator must test the controls each day to determine that the controls are in safe working condition.
- The operator must stand firmly on the floor of the basket and must not sit or climb on the railings or on the edge of the basket or use planks, ladders or other devices for a higher work position.
- Body harnesses must be worn with a lanyard attached to the boom. The point of attachment must be the designated loop on the aerial lift's boom or work platform. Personnel cannot attach lanyards to adjacent poles, structures or equipment while they are working from the aerial lift.
- An aerial lift may not be moved when the boom is elevated in a working position with the operator in the basket, except for equipment which is specifically designed for this type of operation.

Employees who use aerial lifts shall be knowledgeable of the following:

- The manufacturer's operating instructions
- Pre-start inspection of the aerial lift
- Inspection of the work area for dangerous conditions such as uneven surfaces, overhead obstructions, such as power lines, or other hazards
- Load capacities of the equipment, including the employee and all tools and materials
- How to safely move the equipment
- Training on how to prevent falls and use appropriate fall protection personal protective equipment
- Minimum safe approach distances to energized power lines

## **Confined Space Entry**

### **Purpose**

To protect employees from the hazards of entry into confined spaces at UAB

### **Scope**

To establish requirements, practices and procedures for confined space entry for all UAB employees and contractors

### **Responsibilities**

UAB employees and contractors will follow required confined space work procedures and use the appropriate personal protective equipment. Departmental supervisors have the responsibility for ensuring permits are properly issued and adhere to safe work practices. When assistance is needed or procedures need assessment, EHS (Campus Safety) should be consulted prior to beginning any work.

### **Definitions**

Authorized Entrant (Entrant):

- An employee who is authorized by the employer to enter a permit-required confined space
- Knows the hazards that may be faced during entry, including information of the signs or symptoms and consequences of the exposure
- Communicates with the attendant, as necessary, to enable the attendant to monitor entrant status and to alert entrants of the need to evacuate the space

Attendant:

- An individual stationed outside one or more permit-required confined spaces who monitors the authorized entrants and performs all assigned attendant's duties
- Knows the hazards that may be faced during entry, including information of the signs or symptoms and consequences of the exposure
- Continuously maintains an accurate count of entrants in the permit space
- Communicates with entrants, as necessary, to monitor entrant status and alert entrants of the need to evacuate the space if necessary
- Summons rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape the confined space hazards
- Warns the unauthorized persons that they must stay away from the permitted confined space

**Bump Test:** A method of verifying instrument accuracy. A bump test verifies calibration by exposing the instrument to a known concentration of test gas. The instrument reading is compared to the actual quantity of gas present (as indicated on the cylinder). If the instrument's response is within an acceptable tolerance range of the actual concentration, then its calibration is verified.

**Note:** It is recommended that users check with the detection equipment manufacturer for the acceptable tolerance ranges. Instruments should be "zeroed" before the bump test in order to give

a more accurate picture of the bump test results. When performing a bump test, the test gas concentration should be high enough to trigger the instrument alarm.

**Calibration:** A method designed to adjust of the instrument's reading to coincide with a known concentration (generally a certified standard) of test gas. In most cases, a full calibration is only necessary when an instrument fails a bump test or after it has been serviced. The full calibration and bump test should be conducted in a clean fresh air environment.

**Confined Space:**

- A space that is large enough and so configured that an employee can bodily enter and perform assigned work, yet has limited or restricted means for entry or exit
- A confined or enclosed space includes, but is not limited to tanks, vessels, storage bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, and tunnels.
- Such space is not designed for continuous employee occupancy.

**Entry Permit:** A form that authorizes entry to a permit-required confined space

**Entry Supervisor:**

- The person (such as the employer, supervisor) responsible for determining whether acceptable entry conditions are present at a permit space where entry is planned, as well as authorizing entry, overseeing entry operations, and terminating entry, as required
- Knows the hazards that may be faced during entry, including information of the signs or symptoms and consequences of the exposure
- Verifies (by checking that the appropriate entries have been made on the permit) that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place, before endorsing the permit and allowing entry to begin
- Terminates the entry and cancels the permit
- Verifies that rescue services are available and that the means for summoning them are operable
- Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations

**Hazardous Atmosphere:**

An atmosphere that may expose employees to the risks of death, incapacitation, impairment of ability to self-rescue, injury or acute illness from one or more of the following causes:

- Flammable gas, vapor or mist equal to or higher than 10 percent of its lower explosive limit (LEL) or lower flammable limit (LFL)
- Airborne combustible dust at a concentration that meets or exceeds its LEL/LFL
- Atmospheric oxygen concentration equal to or below 19.5 percent or above 23.5 percent
- Presence of toxic gases (for example, equal to or more than 10 ppm hydrogen sulfide (H<sub>2</sub>S) measured as an 8-hour time-weighted average.) If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit (PEL) is published in 29 CFR 1910 Subpart G or in Subpart Z, which could result in employee exposure in excess of its dose or PEL
- Any other atmospheric condition that is immediately dangerous to life or health (IDLH)

Immediately Dangerous to Life or Health (IDLH): Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a confined space

Lower Explosive Limit (LEL) or Lower Flammable Limit (LFL): The minimum vapor concentration of flammable liquid in air, below which flame propagation does not occur on contact with an ignition source

Permit-Required Confined Space (Permit Space) has one or more of the following characteristics:

- Contains or has potential to contain a hazardous atmosphere
- Contains a material that has the potential for engulfing an entrant
- 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
- Contains any additional recognized serious safety or health hazard

Retrieval System: The equipment (including a retrieval line, full -body harness, lifting device or anchor) used for non-entry rescue of persons from permit spaces

Testing: The process by which hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

### **Confined Space Entry Procedures**

Space Evaluation: All permit-required confined spaces are to be evaluated by an entry supervisor prior to authorizing an entry.

Permit Required Entry Procedures:

- As a minimum, an entry supervisor, entry attendant and entrant will be designated to participate in each permit-required confined space entry. Special Note: The entry supervisor may act as an entry attendant, as well.
- Acquire, inspect and setup all safety equipment required by the permit, including blowers, full body harness, rescue tripod, and rope or cables.
- The entry supervisor will establish appropriate rescue procedures specific to the space entry and will list these procedures on the Confined Space Entry Permit.
- All hazardous energy sources will be locked and tagged out. (Refer to the Lockout/Tagout Procedure.)
- The confined space atmosphere will be tested to determine whether dangerous air contamination exists and/or if oxygen levels are outside the required range. A direct reading



gas monitor will be used. Testing will be performed by the entry supervisor who has successfully completed the gas detector training for the monitor that will be used. The minimum parameters to be monitored are oxygen deficiency or excess, LEL/LFL, H<sub>2</sub>S and carbon monoxide (CO) concentrations. A written record of the pre-entry test results will be made and kept at the work site for the duration of the job. Affected employees will be able to review the testing results.

- The entry supervisor will complete and sign the Confined Space Entry Permit prior to space entry. The permit conditions, entry precautions, and rescue procedures will be reviewed with the attendant and entrant(s) prior to entry.
- Prior to entry, the attendant will verify that entry conditions are acceptable.
- The entrant must wear retrieval equipment during the entire entry operation.
- The attendant will continuously monitor the portable gas detector and record the readings every hour, at minimum.
- The entry supervisor and attendants must be in constant communication with the entrant at all times via radio and/or voice. This must be specified on the permit form.
- An immediate evacuation of the space will be ordered if the safety equipment fails or if the space becomes, or has the potential to become, immediately hazardous.
- Upon completion of the job, the Entry Supervisor will cancel the permit and ensure that the completed permit is retained in the department's records. EHS will periodically review the permits while auditing the Confined Space Program.

## **Hazard Control**

### **Monitoring Confined Space Air Quality:**

- Prepare the gas detector. A trained and authorized employee, prior to entering a confined space, will prepare the gas detector by ensuring the device is in good working order, and will follow the manufacturer instructions for calibration and maintenance requirements of the equipment.
- Conduct a bump test. Breathe into the gas detector probe and look for a decrease in oxygen concentration – the detector should alarm due to the lack of oxygen.
- Sample the air quality of the space. This is done by slightly moving the lid (horizontal entry) or by testing the space through a hole in the lid (if available) before completely opening the space (vertical entry.)
- Lower the probe slowly into the space, allowing time for the instrument to detect atmospheric changes at different vertical heights within the space (vertical entry.)
- Measure in the following order and record the results on the Confined Space Entry Permit:
  - Oxygen
  - LEL/LFL
  - H<sub>2</sub>S
  - CO
- Lock and tag out all hazardous energy sources. (Refer to the Lockout/Tagout Procedure.)
- Test the confined space atmosphere. The confined space atmosphere will be tested to determine whether dangerous air contamination and/or oxygen levels exists. A direct reading gas monitor will

be used. Testing will be performed by the entry supervisor who has successfully completed the gas detector training for the monitor to be used. The minimum parameters to be monitored are oxygen deficiency or excess, LEL/LFL, H<sub>2</sub>S and CO concentrations. A written record of the pre-entry test results will be made and kept at the work site for the duration of the job. Affected employees will be able to review the testing results.

- Complete and sign the Confined Space Entry Permit. This will be done by the entry supervisor prior to space entry. The permit conditions, entry precautions, and rescue procedures will be reviewed with the attendant and entrant(s) prior to entry.
- Verify that the entry conditions are acceptable. This will be done by the attendant.
- Wear retrieval equipment during the entire entry operation. This will be done by the entrant.
- Continuously monitor the portable gas detector and record the readings every hour (minimum). This will be done by the attendant.
- Ensure ongoing communication. The attendant must be in constant communication with the entrants at all times via radio and/or voice. This must be specified on the permit form.
- Order an immediate evacuation, if needed. An immediate evacuation of the space will be ordered if the safety equipment fails or if the space becomes, or has the potential to become, immediately hazardous.
- Cancel the permit. Upon completion of the job, the entry supervisor will cancel the permit and ensure that the completed permit is retained in the department's records.
- The gas detector will remain on during the entire entry operation and will be regularly inspected by the attendant. The attendant will also record the gas readings on the record sheet at a minimum of one-hour intervals or after breaks (e.g., lunch, etc.) before re-entering the space.
- Entry operations will cease, and entry personnel will be removed if the following concentrations are exceeded any time:
  - Oxygen readings less than 19.5% or greater than 23.5%
  - Combustible gas reading equal to or greater than 10% LEL/LFL
  - H<sub>2</sub>S reading equal to or greater than 10 ppm
  - CO reading greater than 50 ppm

### **Ventilating a Confined Space**

- Set up one or more blowers to provide adequate ventilation for the space. Ventilation must be forced draft discharge of clean air into the space (not exhaust of the space.)
- Ensure that ventilation air supply is from a clean source. Allow enough time for blowers to clear the space before entering.
- After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.
- Ensure that the blowers remain on during the entire entry operation. If the blower fails, the entrant must leave the space immediately.

### **Emergency Rescue from Permit Required Confined Spaces**

Only specifically designated rescuers may attempt to conduct a confined space rescue or retrieval. If at any time rescue or retrieval of the confined space entrant is necessary, the attendant or entry supervisor **MUST IMMEDIATELY CALL** the City of Birmingham Fire Department at 911 or UAB Police (205) 934-3535. A follow-up call must also be made to the UAB EHS office at (205) 934-2487.

Retrieval equipment is required for all permit required vertical entries.

- Retrieval equipment will include (but not limited to) the following:
  - Rescue harness
  - Rescue tripod
  - Rope or cable
- The entry supervisor will notify EHS department immediately in an emergency.
- All persons involved in the confined space entry must have received training.
- At least one member of the rescue team must be certified in first aid and CPR.

### **Training**

Prior to performing confined space work, all UAB employees who participate in confined space entries (including entry supervisor, entrants and attendants) must receive training. Refresher training will be provided annually.

## **Electrical Safety**

### **Purpose**

To ensure that UAB employees, students and visitors health and safety are protected during any electrical work activity or exposure

### **Scope**

These guidelines apply to all UAB personnel and projects involving electrical work activity or exposure.

### **Responsibilities**

#### **Supervisor**

- Maintain a safe work environment and to assist in verifying that electrical equipment is installed in accordance with applicable codes
- Ensure the safety of their employees and mitigate hazards within their area of responsibility
- Provide awareness training to all employees and to observe their work practices

#### **EHS**

- Assist in the coordination of the appropriate training for qualified and unqualified workers
- To provide electrical safety guidelines that is necessary for the practical safeguarding of employees in their workplaces
- Conduct periodic inspections of work sites to assure that electrical safety guidelines are being followed and provide assistance with corrective actions that may be necessary

#### **Employee Responsibility**

- Test electrical equipment when de-energized
- Understand and follow the Standard Operating Procedures (SOP), regulatory codes and standards prior to performing electrical work
- Be aware of potential electrical hazards
- Use non-conducting or insulated tools and the proper personal protective equipment (PPE) when working around electricity
- Stay at least 10 feet away from overhead power lines
- Never use damaged power tools/electrical cords
- Do not touch wet electric tools, equipment, or cords
- Have knowledge and understand the emergency procedures
- Immediately report any work-related injury/illness

#### **Definitions**

Arcing: A type of continuous electric discharge, giving intense light and heat, formed between two electrodes in a gas at low pressure or in open air

**Authorized Lockout/Tagout Employee:** A person who has completed the required hazardous energy control (LOTO) training and is authorized to lockout or tagout a specific machine or equipment to perform service or maintenance

**Confined space:** An enclosed space which has limited egress and access, and has an atmospheric hazard

**De-energized electrical work:** Electrical work that is performed on equipment that has been previously energized and is now free from any electrical connection

**Disconnecting/isolating switch:** A device designed to close and/or open an electric circuit

**Energized electrical work:** Repair, maintenance, troubleshooting, or testing on electrical circuits, components, or systems while energized/live

**Energy source:** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy

**Exposed electrical parts:** Energized parts that can be inadvertently touched or approached nearer than a safe distance by a person. Parts not suitably guarded, isolated, or insulated. (i.e., terminal contacts/ lugs, bare wiring, etc.)

**Ground Fault Circuit Interrupter (GFCI):** A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds a predetermined value that is less than that is required to operate the over-current protective device of the supply circuit

**Ground:** A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth

**Hazardous location:** An area in which an airborne flammable dust, vapor or gas may be present and would represent a hazard if a source of ignition were present (see National Fire Protection Association (NFPA) Class I & II and Division 1 & 2)

**High voltage:** Circuits with a nominal voltage more than 600 volts

**Interlock:** An electrical, mechanical, or key-locked device intended to prevent an undesired sequence of operations

**Isolating power system:** A system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors

**Life safety equipment:** Equipment that provides critical protection for safety, in the event of an emergency or other serious hazard

**Lockout:** The placement of a lock on an energy-isolating device according to procedure, ensuring

that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed

**Lockout/Tagout:** A standard that covers the servicing and maintenance of machines and equipment in which the unexpected re-energization of the equipment or release of stored energy could cause injury to employees. **Tagout** - The placement of a tagout device on an energy- isolating device according to procedure to indicate that the equipment may not be operated until the tagout device is removed

**Low voltage:** Circuits with a nominal voltage less than or equal to 600 volts

**Switching devices:** Devices designed to close and/or open one or more electric circuits. Included in this category are circuit breakers, cutouts, disconnecting (or isolating) switches, disconnecting means, interrupter switches, and oil (filled) cutouts

**Outlet:** A point of the wiring system at which current is taken to supply utilization equipment

**Over-current:** Any current in excess of the rated current of equipment of the capacity of a conductor. It may result from overload, short circuit, or ground fault

**Personal Protective Equipment (PPE):** Employees who work directly with electricity should use the PPE required for the jobs they perform. This equipment may include rubber insulating gloves, hoods, sleeves, matting, blankets, line hose, and industrial protective helmets designed to reduce electric shock hazard.

**Qualified person:** One who has received training in and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations and the hazards involved. **Note 1:** A worker can be considered qualified with regard to certain equipment in the workplace, but “unqualified” as to other equipment. **Note 2:** 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 a qualified person for the performance of those duties.

**Remote-Control Circuit:** Any electric circuit that controls any other circuit through a relay or an equivalent device

**Service:** The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served

**Service Equipment:** The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the entrance of supply conductors to the building and intended to constitute the main control and means of cutoff to the supply

**Voltage:** The difference of electrical potential between two points of an electrical or electronic circuit, expressed in volts. It is the measurement of the potential for an electric field to cause an

electric current in an electrical conductor.

Voltage, nominal: An approximate value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240 volts, 480/277 volts, 600 volts). The actual voltage at which a circuit operates can vary from the nominal with a range that permits satisfactory operation of equipment

## **General Requirements**

### **Grounding**

Grounding a tool or electrical system means intentionally creating a low-resistance path that connects to the earth. This prevents the buildup of voltages that could cause an electrical accident.

A service or system ground is designed primarily to protect machines, tools, and insulation against damage.

An equipment ground helps protect the equipment operator. It furnishes a second path for the current to pass through from the tool or machine to the ground. This additional ground safeguards the operator if a malfunction causes the tool's metal frame to become energized.

### **Guarding**

Guarding involves locating or enclosing electric equipment to make sure people do not accidentally come into contact with its live parts. Effective guarding requires equipment with exposed parts operating at 50 volts or more to be placed where it is accessible only to authorized people qualified to work in it.

Equipment of 50 volts or more shall be guarded against accidental contact by approved cabinets or other enclosure of or other means, such as:

- By location in a room
- By suitable permanent, substantial partition or screen
- By placement
- By elevation of 8 feet or greater
- Entrances with exposed parts, shall be marked: "Danger", "Warning" or "Caution" and "Electrical Equipment – Approved Entrant Only"

Equipment over 600 volts:

- Installation accessible to qualified persons only
- Working spaces must be according to their minimum clearances

### **Entrances Locked at All Times**

Entrances must have warning signs: "Danger", "Warning" or "Caution", and beneath that, appropriate, concise wording that alerts people to the hazard or gives an instruction, such as "Danger/High Voltage/Keep Out".

## **Circuit Protection Devices**

Circuit protection devices limit or stop the flow of current automatically in the event of a ground fault, overload, or short circuit in the wiring system. (i.e., fuses, circuit breakers, ground-fault circuit interrupters, and arc-fault circuit interrupters.)

Fuses and circuit breakers open or break the circuit automatically from too much current flow. Typically, a fuse then melts, and a circuit breaker trips the circuit open. Fuses and circuit breakers are designed to protect conductors and equipment. They prevent wires and other components from overheating and open the circuit when there is a risk of a ground fault.

## **Ground-fault Circuit Interrupters**

GFCIs, are used in wet locations, construction sites, and other high-risk areas. These devices interrupt the flow of electricity within as little as 1/40<sup>th</sup> of a second to prevent electrocution. GFCIs compare the amount of current going into electric equipment with the amount of current returning from it along the circuit conductors. If the difference exceeds 5 milliamperes, the device automatically shuts off the electric power.

## **Arc-fault Device**

Arc-fault devices provide protection from the effects of arc-faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc-fault is detected.

## **Protection**

### **Protection against Electrical Hazards**

Safe work practices are a protection, some include:

- De-energizing electric equipment before inspection or repair
- Keeping electric tools properly maintained
- Exercising caution when working near energized line
- Using appropriate protective equipment

### **Protection against metal parts that become energized**

A break in an electric tools or machine insulation can cause its metal parts to become hot or energized, meaning that they conduct electricity. Touching these energized parts can result in an electrical shock, burn, or electrocution. The protection when using electrical tools or machines is to establish a low resistant wire that directs unwanted current directly to the ground.

### **Protection against unexpected equipment startup**

Proper lockout/tagout procedures protect you from the dangers of the accidental/unexpected startup of electrical equipment. Securing tagging the switch or controls of the machine or equipment being locked out of service is an identification mark that the equipment or circuits are being inspected or repaired.

Note: One individual lock and key should be issued to each worker authorized to lock out and tag the equipment. All employees who repair a given piece of equipment should lock out its switch with an individual lock. Only authorized workers should be permitted to remove it.



(See UAB EHS – General Safety Lockout/Tagout Procedures)

### **Protection from overhead power lines**

Maintain a safe distance to the overhead power lines and for very high-voltage lines. Ground any equipment, such as cranes, that can become energized.

Employees unqualified to work with electricity, as well as mechanical equipment, should remain at least 10 feet away from the overhead power lines. If the voltage is more than 50,000 volts, the clearance increases by 4 inches for each additional 10,000 volts.

### **Tool Safety**

Tools must be maintained regularly to protect workers against electric hazards. Check each tool before using it. If you find a defect, immediately remove it from service and tag it so no one will use it until it has been repaired or replaced.

When using a tool to handle energized conductors, check to make sure it is designed and constructed to withstand the voltages and stresses to which it will be exposed.

### **Basic Electrical Safety Guide**

- Personal Protective Equipment (PPE) must be tested prior to its use. (i.e., glove must be tested to confirm no tears or pin holes.)
- Use protective shields, barriers, or insulating materials when working near exposed energized parts.
- Ensure all wiring and electrical equipment conforms to all the applicable codes, laws, regulations, and good practices.
- Unused openings in cabinets, boxes and fittings shall be effectively closed for systems over 600 volts.
- Covers for boxes shall be permanently marked “High Voltage”.
- Unless specifically permitted, flexible cords and cables may not be used for the following:
  - As a substitute for fixed wiring
  - Run through holes in wall, ceilings or floors
  - Run through doorway, window or similar areas
  - Attached to buildings surfaces
  - Concealed behind building walls, ceiling or floor
- Install electrical equipment in accordance with area restrictions based on real or potential hazards (for example, explosion-proof fixtures, hazardous location classifications, size, voltage, type, etc.)
- Ensure grounding of all electrical equipment, including powered hand tools. Equip all electrical equipment with a ground fault circuit interrupter (GFCI).
- Use extension cords only on a temporary basis where fixed wiring is not available. Ensure that they are free from defects, use only in dry areas. Note: Do not present a tripping hazard.
- Do not use extension cords to lift or pull equipment. Never tie extension cords or knot them

together as this increases the rated resistance and places undue stress upon the insulation and or insulators.

- Label electrical equipment.
  - All circuitry must be accurately and clearly labeled.
  - Mark all disconnecting means, circuitry and/or over-current devices to indicate their purpose.
  - Electrical panels, main switches, and transformers must be labeled as to their voltage, current, wattage or other ratings as necessary.
  - 600-volt equipment or greater must have controlled access for qualified personnel only.
- Guard and secure live electrical equipment.
- Guard live parts of electrical equipment operating at 50 volts or more against accidental contact by the use of approved cabinets or other methods of isolation to which only qualified persons have access.
- Do not work on live equipment unless a specific procedure is developed to ensure employee protection and a live work permit has been issued by EHS- Campus Safety
- Hazardous locations must be marked as such and clearly state that entry is restricted to qualified individuals.
- Maintain electrical equipment and systems.
- Inspect electrical equipment on a periodic basis.
- Repair or replace exposed wires, frayed cords, and deteriorated insulation.
- Keep junction boxes, outlets, switches, and fittings covered.
- Ensure cord and plug-connected equipment has grounded connections (for example, electrical appliances, vacuums, blowers, etc.)
- Ensure portable electric hand tools are either double insulated or grounded. Do not remove the third grounding prong or use adapters that do not connect.
- Only qualified workers can test instruments and equipment.

### Electrical Hazards

Inadequate wiring	Ungrounded electrical systems and tools	Wires with bad insulation
Exposed electrical parts	Overloaded circuits	Damaged power tools and equipment
Using the wrong PPE and tools	Overhead power lines	Working with electricity in wet/damp environments

## Protective Measures

Proper grounding	Using GFCIs
Use of fuses and circuit breakers	Guarding live parts
Proper use of flexible cords	Training

## Emergency Action

If a person is “frozen” to a live electrical contact, shut off the current immediately. If this is not possible, use boards, poles, or sticks made of wood or any other non-conducting materials and safely push or pull the person away from the contact. It is important to act quickly, while remembering to avoid electrocution or shock.

Note: Report all incidents to the immediate supervisor and the UAB Police Department (dial 911 or 205-934-3535.)

## Training and Communication

UAB employees involved with electrical work/activity of any sort are at risk and shall be trained in general electrical safety, work practices and procedures.

Qualified persons shall at a minimum be trained in and familiar with exposed live parts, have skills necessary to determine the nominal voltage of exposed live parts, and know the clearance distances and the corresponding voltages to which the qualified person will be exposed.

Employees in the following occupations are at risk and are required to be trained:

- Direct supervisors
- Electrical engineers
- Electrical equipment assemblers
- Electrical technicians
- Electricians
- Industrial machine operators
- Material handling equipment operators
- Mechanics and repairers
- Painters
- HVAC mechanics
- Welders
- Maintenance workers

## References

External - American National Standards Institute (ANSI) Standards Z89.1; Z87.1; Z41
External - American Standards for Testing of Materials (ASTM) for Electrical Protective Equipment
External - OSHA Regulations, Subpart S - 1910.301
External - National Fire Protection Association (NFPA) Article 70
Internal - UAB Lock Out/ Tag Out Procedure

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## **Fall Protection**

### **Purpose**

The purpose of this procedure is to specify practices and training for the safety of University of Alabama at Birmingham (UAB) employees while working on elevated surfaces and ladders to minimize/eliminate fall related injuries and fatalities.

### **Scope**

This procedure applies to all UAB employees that perform any duties on an elevated work surface where there is a fall hazard of 4 feet or more to a lower level.

### **Responsibilities**

#### **EHS**

The Campus Safety team is responsible for providing training, conducting evaluations of elevated work areas, and assisting in the selection of the proper equipment for the task.

#### **Supervisors**

Follow this procedure when they have employees that work at heights.

#### **Employees**

Employees who work at heights of four feet or greater are responsible for following the safety procedures regarding fall protection and use the personal protective equipment specified, and they are required to attend training on fall protection. Additionally, those employees working on aerial lifts, scissor lifts, or other elevated platform equipment must receive training on the use of such equipment.

#### **Definitions**

**Aerial lift device:** Equipment such as powered platforms, vehicle-mounted elevated and rotating work platforms, extendible boom platforms, aerial ladders, articulating boom platforms, vertical towers, and powered industrial truck platforms

**Anchor point:** A secure point of attachment for lifelines, lanyards or deceleration (grabbing) devices

**Body harness:** An interconnected set of straps that may be secured about a person in a manner that distributes the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with a means for attaching the harness to other components of a personal fall arrest system

**Deceleration device:** Any mechanism, such as a rope, grabbing device, rip stitch lanyard, specially woven lanyard or automatic self-retracting lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest

**Deceleration distance:** The additional vertical distance a falling person travels, excluding lifeline

elongation and free fall distance, before stopping, from the point at which a deceleration device begins to operate

Fixed ladder: A ladder, including an individual rung ladder, which is permanently attached to a structure, building, or equipment

Guardrail: A barrier at least 42 inches high erected to prevent personnel from falling from working levels more than 30 inches above the floor, ground, or other working areas of a building

Hole: A void or gap 2 inches or more in its least dimension in a floor, roof, or other walking/working surface

Ladder: A device typically used to gain access to a different elevation consisting of two or more structural members crossed by rungs, steps, or cleats

Lanyard: A flexible line of woven fabric or a strap that generally has a connector at each end for connecting the body harness to a deceleration device, lifeline or anchor point. Shock-absorbing lanyards are now required.

Lifeline: A component consisting of a flexible line for connection to an anchorage at one end to hang vertically or for connection to anchorages at both ends to stretch horizontally. This serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Lower levels: Those areas or surfaces to which an employee can fall. Such areas include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, tanks, water, equipment, structures, or portions thereof.

Floor opening: An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard through which persons may fall, such as a hatchway, stair or ladder opening, pit, or large manhole

Personal fall arrest system: A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, and body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Restraint line: A device, which is attached between the employee and an anchorage to prevent the employee from walking or falling off an elevated surface

Scaffold: Any temporary elevated or suspended platform, and its supporting structures, used for supporting employees and/or materials

Self-retracting lifeline/lanyard: A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted into, the drum under minimal tension during normal movement and which, after onset of a fall, automatically locks the drum and arrests the fall

Standard railing: A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls

Toe board: A vertical barrier at floor level erected along exposed edges of a floor openings, wall opening, platform runway, scaffold or ramp to prevent falls of materials

Tie-off: A procedure of connecting directly or indirectly to an anchorage point

Unprotected sides and edges: Any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 42 inches high

Walking/working surface: Any surface, whether horizontal or vertical, on which an employee walks or works including, but not limited to, floors, roofs, ramps, bridges and runways

Wall opening: A gap or void 30 inches or more high and 18 inches or more wide in a wall or partition, through which someone can fall to a lower level

Work area: That portion of a walking/working surface where job duties are being performed

## **Procedure**

The procedure for fall protection covers the following work situations:

- Ladders – fixed, free standing, temporary, or roll away type
- Elevating Personal Platforms – scaffolding, Baker scaffolds, aerial lifts, scissors lifts, etc.
- Elevated Surfaces – roofs (closer than 6 feet from a leading edge), catwalks, skylights, boilers, chillers, etc.
- Vertical Opening – ground level entry into excavations, trenches, holes, vaults, vessels and other confined spaces

Fall protection is required whenever work is performed in an area 4 feet above its surroundings and can generally be provided through the use of fall protection systems including:

- Covers - Covers are fastened over holes in the working surface to prevent falls.
- Guardrails - Standard guardrails consist of a top rail, located 42 inches above the floor, and a mid-rail. Screens and mesh may be used to replace the mid-rail, so long as they extend from the top rail to the floor.
- Personal Fall Arresting Systems - Components of a personal fall arresting system include a body harness, lanyard, lifeline, connector, and an anchorage point capable of supporting at least 5,000 pounds.
- Warning Line Systems - Warning line systems are made up of lines or ropes installed around a work area on a roof. These act as a barrier to prevent those working on the roof from approaching it edges.

## **Ladders**

Employees who work on ladders with a working height of 4 feet or more shall be knowledgeable of the following:

- How to inspect ladders for visible defects
- How to use ladders properly

The ladder safety inspection guide can be used as a referenced.

([https://www.osha.gov/sites/default/files/2018-11/FY06\\_46e0-ht10\\_stf\\_ladder\\_safety\\_checklist.pdf](https://www.osha.gov/sites/default/files/2018-11/FY06_46e0-ht10_stf_ladder_safety_checklist.pdf))

Employees who work on fixed ladders with a working height of 24 feet or above must have a fall arrest system attached.

## **Training**

Fall Protection training will be provided for all affected employees. Refresher training will be provided periodically to all employees who use a personal fall arrest system. Training must be documented, and records must be maintained, as required.

Employees who use personal fall arresting systems to control fall hazards in their work area shall be knowledgeable of the following:

- The application limits of the equipment
- The proper hook-up, anchoring and tie-off techniques including determination of elongation and deceleration distance
- Methods of use, inspection, and storage of equipment

## **Fall Arrest System Requirements**

Fall arrest equipment reduces the risk of injuries that can occur when a worker falls from one level to another. If engineering controls are not feasible to prevent the fall, fall arrest equipment becomes the last line of defense.

### **Critical Components of Fall Arrest Equipment include:**

- Body harness - The harness must comfortably, but snugly, fit the individual. Many body harnesses are designed for "universal fit" to accommodate several individuals. "Universal fit" has limitations; the mid-range "universal fit" may not adequately accommodate individuals that have smaller or larger frames.
- Shock absorbing lanyards - Shock absorbing lanyards are required. Static rope and nylon lanyards must be replaced with an appropriate length shock-absorbing lanyard. During fall arrest, the rip stitching of the shock-absorbing lanyard absorbs the shock of the fall, drastically reducing forces onto the body and preventing significant injury. Special attention must be given to the stopping distance required by the manufacturer of the lanyard.
- Locking snap hooks - Locking snap hooks are required. All connection hardware (e.g. -



snap hooks, carabineers) must have a locking mechanism to prevent roll out from the anchor and sized appropriately to fit with the anchor.

- Inspection of fall arrest equipment - The employee will perform a visual inspection of the equipment prior to each use. General Industry standards, UAB, and fall arrest equipment manufacturers require any defective equipment to be immediately removed from service and replaced. Defective equipment must be destroyed to prevent accidental use that could endanger someone's life.

### **Harness and Lanyard Inspection**

Defects include, but are not limited to, cuts, burns, abrasions, loose threads in stitching, tears, stretching, rust, and mold. Metal or plastic hardware may be damaged or missing. Following are steps to use when performing an inspection:

- Look for deterioration
- Exposure to molten metal or flame from hot work will fuse nylon fibers together. There may be hard shiny spots and the nylon appears shriveled and brown. The nylon will feel brittle.
- Exposure to harsh chemicals can cause a change in color, appearing as a brownish smear.
- Check nylon webbing for loss of elasticity.
- Stitching at connection points may become frayed or start to come unraveled.
- When inspecting hardware, look for cracks, pitting, and any distortion in all hardware components: buckles, D-rings, snap hooks and carabineers, rivets, and grommets. Belt buckle grommets get a lot of wear from opening and closing; buckles must function properly. Snap hooks must lock and close tightly.

### **Use of Fall Arrest Equipment**

- Always use a secure anchor point (must hold 5,000 lb. load.)
- Connect to an anchor point at shoulder level or above. Never connect below the D-ring of the body harness.
- Connection to anchor points must prevent a dangerous swing fall hazard or impact with any lower level in the event of a fall.
- Connection to an anchor point must limit the fall to no greater than 4 feet.
- Use chafing pads or anchor slings to prevent cutting connectors (lanyards and lifelines) on sharp edges.
- Do not use knots on connectors (lanyards and lifelines.)
- Vertical lifelines must be synthetic (nylon) fiber.
- Rope grab devices used on vertical lifelines must be secured 12 feet up from the terminal end of the vertical lifeline.
- Terminate the end of the vertical lifeline to prevent the rope grab device from slipping off.
- Only one person can tie off to a vertical lifeline.

### **Cleaning and Storage of Fall Arrest Equipment**

Follow the equipment manufacturers' cleaning instructions. Always dry equipment naturally. Use an approved lubricant (light oil or lubricant) to oil snap hooks when dry. Store clean and dry away from direct sunlight and excessive heat.

## **Forklift Safety**

### **Purpose**

The purpose of this guide is to inform operators and supervisors of operators of their obligation to follow OSHA, NFPA, and other federal, state and local regulations pertaining to the use of powered industrial trucks (PITs) and forklifts operated at UAB. It also outlines training and evaluation procedures. As a guide, it is not a substitute for the regulations themselves, but a summary of important considerations.

### **Roles and Responsibilities**

#### **Forklift Operators**

- Be trained and evaluated before operating a powered industrial truck/forklift
- Be reevaluated by a competent person every three years
- Operate and maintain PITs in a safe manner and according to the regulations and training provided.
- Report all vehicle problems to their supervisor.

#### **Supervisors**

Identify and designate employees responsible for operating powered industrial trucks/forklifts.

- Ensure that all employees under their direction, who operate a powered industrial truck/forklift are trained and evaluated.
- Maintain records of training and evaluation.
- Ensure that forklifts are repaired when malfunctioning and maintained or taken out of service until such repairs can be made.

#### **EHS**

- Shall provide program oversight
- Review and audit powered industrial truck/forklift safety training as necessary
- Provide forklift safety training upon request from the supervisor
- May audit a department or responsible unit and assign training as necessary

#### **Visitors**

- Ensure they have passed forklift training and evaluation before operating a powered industrial truck/forklift on campus
- Comply with all regulations and UAB's Powered Industrial Truck/Forklift safety guidance

### **Inspection, Fueling, Charging, and Maintenance Procedures**

The following section will review:

- Pre-Use Inspection
- Fuel-Handling and Storage
- Battery Handling and Storage
- Maintenance

## **Pre-Use Inspection**

### **Engine-off Inspection**

A pre-use inspection identifies potential hazards that may be encountered from a damaged forklift and must be performed at least daily by the operator before operation. If at any time a forklift is found to be in-need of repair, defective, or in any way unsafe, the forklift shall be removed from service until it has been restored to safe operating condition. Always refer to manufacturer-provided manuals for appropriate inspections guidance. A forklift does not need to be inspected on any day that it is not used.

The pre-use inspection can include the following, however, refer to the user's manual for the type of machine you are using:

- Verify that the data plate is present, legible, and represents the configuration in use.
- Verify that all safety and control stickers and labels are present and legible.
- Verify that all safety equipment is present.
- Inspect the mast for broken or cracked weld points and any other obvious damage.
- Ensure roller tracks are greased and that chains are free to travel.
- Forks should be equally spaced and free from cracks along the blade and at the heels.
- Check hydraulic fluid levels.
- Check each hydraulic line and fitting for excessive wear or crimping.
- Check hydraulic lines for breakage in the outer case or sheath.
- Check lift and tilt cylinders for damage or leaking fluid. Fluid leaks are not considered normal and must be repaired.
- Inspect mounting hardware on the cylinders.
- Check tires for excessive wear, splitting or missing tire material.
- Check pneumatic tires for proper pressure indicated on the tire.

## **Power Source Inspection**

### **Battery Power**

Batteries contain acid, so protective gloves, goggles, and long sleeves must be worn when working with batteries. Batteries systems should be inspected for:

- Cracks or holes
- Securely sealed cells
- Frayed cables
- Broken insulation. This can occur when a cord rubs against the forklift casing.
- Tight connections
- Clogged vent caps

### **Propane Power**

Before replacement, all LP-gas containers should be examined by the operator for the following defects or damage:

- Dents, scrapes, and gouges of the pressure vessel

- Damage to the various valves and liquid level gauge
- Debris in the relief valve
- Damage to or loss of the relief valve cap
- Indication of leakage at the valves or threaded connections

### **Engine-on Inspection**

Once the engine off inspection has been completed, mount the forklift safely, put on your seat belt and make any personal adjustments to the seat and wheel.

- Start the engine and verify that all controls operate as they should including lift, tilt, and shift controls, lights, horns, backup alarms, etc.
- The wheel should have appropriate free play.
- Move forward and brake, ensuring travelling and stopping operates as it should.
- Check the floor for evidence of fluid leaks. Again, fluid leaks are not normal and must be fixed.
- Once operational aspects are verified, you may begin work.

## **Gantry Cranes and Hoists**

### **Purpose**

Many types of cranes, hoists, and rigging devices are used at UAB for lifting and moving materials. UAB's program is to maintain a safe workplace for faculty, staff and students; therefore, it cannot be overemphasized that only qualified and licensed individuals shall operate these devices.

This program has been established to:

- Ensure the safe use of cranes, hoists and slings.
- Ensure that departments understand and comply with safety standards related to cranes and hoists.
- Assign responsibilities to personnel which are necessary for successful implementation of this program.

### **Scope and Applicability**

#### **Scope**

This program applies to all employees at UAB and covers cranes and hoists with the exception of mobile cranes, engine hoists or winches.

#### **Applicability**

This program applies to cranes and hoists that are attached to any building, research facility or equipment owned or operated by UAB and to all UAB faculty, staff, students, supplemental labor, and subcontractor personnel who use such devices.

#### **Definitions**

**Crane:** A machine for lifting or lowering a load, and moving it horizontally, in which the hoisting mechanism is an integral part of the machine. It may be driven manually or by power and may be a fixed or a mobile machine, but does not include stackers, hoist trolleys, lift trucks, power shovels, backhoes, or excavators.

**Hoist:** An apparatus for raising or lowering a load but does not include a car or platform riding in guides or horizontal motion.

**Qualified Person/Operator:** A person designated by the department who, by reason of training and/or experience, has demonstrated the ability to safely perform all assigned duties. Persons may be deemed "qualified" to operate all or only specific cranes and hoists within a department by their supervisor.

**Rigging:** Collectively referred to as "below the hook devices" are also called "lift gear". May be any device used to carry, position, and secure a load while it is being hoisted or craned.

## **Roles and Responsibilities**

### **Supervisors and Principal Investigators**

- Ensuring that employees and students, under their supervision, receive the required training and are certified and licensed to operate the cranes and hoists in their areas
- Providing training for prospective crane and hoist operators. This documented training must be conducted by a qualified, designated instructor who is a licensed crane and hoist operator.
- Ensuring that hoisting equipment is inspected and tested monthly by a responsible individual and that rigging equipment is inspected annually
- Ensuring employees are provided with and use appropriate protective equipment
- Taking prompt corrective action when unsafe conditions or practices are observed

### **Crane and Hoist Operators**

- Lockout/Tagout any equipment that is defective
- Operating hoisting equipment safely
- Conducting functional tests prior to using the equipment
- Ensuring the appropriate personal protective equipment is worn and following UAB's Crane and Hoist Program
- Selecting and using rigging equipment appropriately
- Having a valid operator's license on their person while operating cranes or hoists
- Participating in the medical certification program, as required
- Conducting periodic and special load tests of cranes and hoists
- Maintaining written records of inspections and tests and maintaining all manuals for cranes and hoists in a central file for reference
- Attending all required training
- Immediately reporting any unsafe conditions or concerns to their supervisor
- Inspecting and load testing cranes and hoists following modification or extensive repairs (e.g., a replaced cable or hook, or structural modification)
- Scheduling a non-destructive test and inspection for crane and hoist hooks at the time of the periodic load test, and testing and inspecting before use new replacement hooks and other hooks suspected of having been overloaded. The evaluation, inspection, and testing may include, but are not limited to visual, dye penetrant, and magnetic particle techniques referenced in ASME B30.10 (Hooks, Inspection and Testing)

### **EHS**

- Interpreting crane and hoist safety rules and standards
- Revising Crane and Hoist Program
- Assisting in the investigation of accidents related to cranes

## **Procedures**

### **General Requirements for Cranes, Hoists and Slings**

- Only trained employees shall operate a crane or hoist.
- Cranes and hoists shall go through pre-use, monthly and annual inspections.
- Any unsafe condition noted during an inspection shall be corrected before the equipment is used.
- Operators shall comply with the manufacturer's specifications and limitations applicable to the operation of the equipment.
- Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded.
- Operators shall follow safe work practices when operating a cranes, hoists and slings.

### **Crane and Hoist Operators**

To be qualified as a Crane and Hoist Operator, the candidate shall have received hands-on training from a licensed, qualified crane and hoist operator designated by the candidate's supervisor. Crane and Hoist Operators must renew their license every three years.

### **General Safety Rules**

Operators shall comply with the following rules while operating the cranes and hoists:

- Do not engage in any practice that will divert your attention while operating the crane.
- Respond to signals only from the person who is directing the lift, or any appointed signal person. Obey a stop signal at all times, no matter who gives it.
- Do not move a load over people. People shall not be placed in jeopardy by being under a suspended load. Also, do not work under a suspended load unless the load is supported by blocks, jacks, or a solid footing that will safely support the entire weight. Have a crane or hoist operator remain at the controls or lock open and tag the main electrical disconnect switch.
- Ensure that the rated load capacity of a crane's bridge, individual hoist, or any sling or fitting is not exceeded. Know the weight of the object being lifted or use a dynamometer or load cell to determine the weight.
- Check that all controls are in the OFF position before closing the main line disconnect switch.
- Avoid side pulls. These can cause the hoist rope to slip out of the drum groove, damaging the rope or destabilizing the crane or hoist.
- To prevent shock loading, avoid sudden stops or starts. Shock loading can occur when a suspended load is accelerated or decelerated and can overload the crane or hoist. When completing an upward or downward motion, ease the load slowly to a stop.

## **Operation**

### **Pre-operational Test**

At the start of each work shift, operators shall do the following steps before making lifts with any crane or hoist:

- Test the upper-limit switch. Slowly raise the unloaded hook block until the limit switch trips.
- Visually inspect the hook, load lines, trolley, and bridge as much as possible from the operator's station; in most instances, this will be the floor of the building.
- If provided, test the lower-limit switch.
- Test all direction and speed controls for both bridge and trolley travel.
- Test all bridge and trolley limit switches, where provided, if operation will bring the equipment in close proximity to the limit switches.
- Test the pendant emergency stop.
- Test the hoist brake to verify there is no drift without a load.
- If provided, test the bridge movement alarm.
- Lock out and tag for repair any crane or hoist that fails any of the above tests.

### **Moving a Load**

- Center the hook over the load to keep the cables from slipping out of the drum grooves and overlapping, and to prevent the load from swinging when it is lifted. Inspect the drum to verify that the cable is in the grooves.
- Use a tag line when loads must traverse long distances or must otherwise be controlled.
- Manila rope may be used for tag lines.
- Plan and check the travel path to avoid personnel and obstructions.
- Lift the load only high enough to clear the tallest obstruction in the travel path.
- Start and stop slowly.
- Land the load when the move is finished. Choose a safe landing.
- Never leave suspended loads unattended. In an emergency where the crane or hoist has become inoperative, if a load must be left suspended, barricade and post signs in the surrounding area, under the load, and on all four sides. Lock open and tag the crane or hoist's main electrical disconnect switch.

### **Parking a Crane or Hoist**

- Remove all slings and accessories from the hook. Return the rigging device to the designated storage racks.
- Raise the hook at least (7 feet) above the floor.
- Store the pendant away from aisles and work areas or raise it at least (7 feet) above the floor.
- Place the emergency stop switch (or push button) in the OFF position.



## **Rigging**

### **General Rigging Safety Requirements**

Only select rigging equipment that is in good condition. All rigging equipment shall be inspected annually; defective equipment is to be removed from service and destroyed to prevent inadvertent reuse. The load capacity limits shall be stamped or affixed to all rigging components. Damage to look for includes:

Nylon slings with:

- Abnormal wear
- Torn stitching
- Broken or cut fibers
- Discoloration or deterioration

Wire-rope slings with:

- Kinking, crushing, bird-caging, or other distortions
- Evidence of heat damage
- Cracks, deformation, or worn end attachments
- Six randomly broken wires in a single rope lay
- Three broken wires in one strand of rope
- Hooks opened more than 15% at the throat
- Hooks twisted sideways more than 10 degrees from the plane

Alloy steel chain slings with:

- Cracked, bent, or elongated links or components
- Cracked hooks
- Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

### **Rigging a Load**

Do the following when rigging a load:

- Determine the weight of the load. Do not guess.
- Determine the proper size for slings and components.
- Do not use manila rope for rigging.
- Make sure that shackle pins and shouldered eye bolts are installed in accordance with the manufacturer's recommendations.
- Make sure that ordinary (shoulder less) eye bolts are threaded in at least 1.5 times the bolt diameter.
- Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts wherever possible.
- Pad sharp edges to protect slings. Remember that machinery foundations or angle-iron edges may not feel sharp to the touch but could cut into rigging when under several tons of load. Wood, tire rubber, or other pliable materials may be suitable for padding.
- Do not use slings, eye bolts, shackles, or hooks that have been cut, welded, or brazed.
- Install wire-rope clips with the base only on the live end and the U-bolt only on the dead end. Follow the manufacturer's recommendations for the spacing for each specific wire size.

- Determine the center of gravity and balance the load before moving it.
- Initially lift the load only a few inches to test the rigging and balance.

### **Crane Overloading**

Cranes or hoists shall not be loaded beyond their rated capacity for normal operations. Any crane or hoist suspected of having been overloaded shall be removed from service by locking open and tagging the main disconnect switch. Additionally, overloaded cranes shall be inspected, repaired, load tested, and approved for use before being returned to service.

### **Hand Signals**

Signals to the operator shall be in accordance with the standard hand signals unless voice communications equipment (telephone, radio, or equivalent) is used. Signals shall be discernible or audible at all times. Some special operations may require addition to or modification of the basic signals. For all such cases, these special signals shall be agreed upon and thoroughly understood by both the person giving the signals and the operator and shall not be in conflict with the standard signals.

### **Inspection, Maintenance, and Testing**

All tests and inspections shall be conducted in accordance with the manufacturer's recommendations:

- If any unsafe conditions exist, the equipment shall be removed from service.
- In order to remove a crane or hoist from service it shall be locked out and tagged out to prevent use.
- A unit which has been idle for a period of one month or more shall be given a monthly inspection before placing in service.
- Prior to initial use, all new, altered, modified or repaired cranes and hoists shall have the following testing performed by the installation company or third party:
  - Hoisting and lowering
  - Trolley travel
  - Bridge travel
  - Limit switches, locking and safety devices
  - Load Tests shall not be more than 125% of the rated load unless otherwise recommended by the manufacturer.

### **Monthly Tests and Inspections**

All in-service cranes and hoists shall be inspected monthly and the results documented. Defective cranes and hoists shall be locked and tagged "out of service" until all defects are corrected.

### **Annual Inspections**

The Department shall schedule and supervise (or perform) annual preventive maintenance (PM) and annual inspections of all cranes and hoists. The annual PM and inspection shall be performed by a qualified third-party company, approved by the manufacturer.

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## **Lock Out / Tag Out**

### **Purpose**

To ensure that employees and contractors at UAB are protected from accidental or unexpected activation of mechanical & electrical equipment and/or pressurized power sources during inspection, maintenance or construction activities.

### **Scope**

The requirements of this procedure apply to all affected UAB employees.

### **Responsibilities**

#### **EHS**

- Ensuring overall effectiveness of the procedures and practices described in this procedure
- Ensuring that all UAB employees and contractors follow this procedure when performing lockout/tagout
- Providing the necessary support to enable effective implementation of this procedure and its related activities

#### **Definitions**

LOTO: Lockout/Tagout

Lockout: The use of appropriate lockout devices to safely prevent equipment from being reactivated while work is in progress

Tagout: The use of tags to identify equipment that cannot readily be locked out of service and to notify personnel that the equipment has been taken out of service and must not be reactivated while work is in progress

Energized: Connected to an energy source or containing residual or stored energy

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy

Authorized employees: Any properly trained person who has the authority and responsibility to perform the lockout/tagout assignments

#### **Lockout/Tagout System Procedure**

- Notify affected employees that a lockout/tagout system is going to be utilized and the reason it is necessary. The authorized employee shall know the type and magnitude of energy that the machine or equipment utilizes and shall understand the associated hazards.
- If the machine or equipment is operating, shut it down by the normal stopping procedure (press stop button, etc.)
- Operate the switch, valve, or other energy isolating device(s) so that the equipment is

isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.

- Lockout/Tagout the energy isolating devices with assigned individual lock(s) and tag(s).
- After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate. **CAUTION: Return operating control(s) to neutral or off position after the test.**
- The equipment is now in lockout/tagout.

### **Restoring Equipment to Normal Operation**

- After the servicing is complete and equipment is ready for normal operations, check the area around the equipment to ensure that no one is exposed.
- After all tools have been removed from the equipment, guards have been reinstalled and employees are in the clear, remove all lockout/tagout devices. Operate the energy isolating devices to restore energy to the equipment.

### **LOTO – Multiple Locks**

In the preceding steps, if more than one individual is required to lockout/tagout equipment, each shall place his/her own personal lockout/tagout device on the energy isolating device(s). When an energy isolating device cannot accept multiple locks or tags, a multiple lockout/tagout device (hasp) may be used. If lockout is used, a single lock may be used to lockout the machine or equipment with the key being placed in a lockout box or cabinet that allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lockout protection, that person will remove his/her lock from the box or cabinet.

### **Temporary Removal of LOTO Devices**

In situations where lockout/tagout devices must be temporarily removed from the energy isolating device and the energized equipment, to test or position the equipment, the following sequence of actions will be followed:

- Remove non-essential items and ensure that equipment components are operationally intact.
- Notify affected employees that lockout/tagout devices have been removed and ensure that all employees have been safely positioned or removed from the area.
- Have employees who applied the lockout/tagout devices remove the lockout/tagout devices.
- Energize and proceed with testing or positioning.
- De-energize all systems and reapply energy control measures in accordance with the lockout/tagout system procedure described above.

## **Maintenance of Equipment**

Where maintenance, repairing, cleaning, servicing, adjusting, or setting up operations cannot be accomplished with the energy source disconnected, such operations may only be performed under the following conditions:

- The operating station (e.g., external control panel) where the machine may be activated must at all times be under the control of a qualified operator.
- All participants must be in clear view of the operator or in positive communication with each other.
- All participants must be beyond the reach of machine elements that may move rapidly and present a hazard.
- Where machine configuration or size requires that the operator leave the control station to install tools, and where there are machine elements that may move rapidly, if activated, such elements must be separately locked out.
- During repair procedures when mechanical components are being adjusted or replaced, the machine shall be de-energized or disconnected from its power source.

## **Removal of LOTO**

A system shall be in place that addresses device removal if the authorized employee who applied the lockout/tagout device is unavailable to remove it. The employee's direct supervisor may only remove the authorized employee's lockout/tagout device(s), after necessity has been established.

The procedure shall include at least the following:

- The employee's direct supervisor shall investigate the situation and verify that the authorized employee who applied the device is not at the facility.
- All reasonable efforts shall be made to contact the authorized employee to inform him/her that his/her lockout/tagout device will be removed.
- The authorized employee's direct supervisor is certain that removal of the lockout/tagout device will not endanger employees.
- The authorized employee's direct supervisor will complete the Removal of LOTO Form.
- Prior to resuming work at the facility, the authorized employee shall be notified that his/her lockout/tagout device was removed in his/her absence.

## **LOTO Inspections**

An authorized employee must perform inspections of the energy control procedures annually.

The inspections must review lockout/tagout procedures and correct any issues.

## **Personal Protective Equipment**

### **Purpose**

To protect the health and welfare of UAB employees in areas where there may be a risk of injury or exposure to hazardous substances or conditions employees who work in areas where physical hazards or the potential for physical hazards exist.

### **Scope**

Personal Protective Equipment (PPE) include devices for head protection, eye and face protection, protective clothing, hand protection, foot protection, hearing and respiratory protection. Using PPE requires hazard awareness and training on the part of the user. PPE is not a substitute for good engineering or administrative controls or good work practices but should be used in conjunction with these controls.

The use of appropriate personal protective safety equipment applies to all employees, students, visitors and contractors performing tasks or entering areas that require specific PPE.

### **Definitions**

ASTM: American Society Testing Materials is an organization of inclusion offering global access to fully transparent standards development, resulting in the highest technical excellence in standardization.

ANSI: American National Standard Institute is an organization that works to establish national consensus standards regarding occupational safety and protection of the environment.

NIOSH: National Institute for Occupational Safety and Health is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

PPE: Personal protective equipment protects employees from hazards. It includes items such as head protection, eye protection, respiratory protection, protective clothing, protective footwear, barrier or protective lotions, etc.

Eye/Face Protection: Equipment designed to provide protection to the face and eyes during exposure to such hazards as flying particles, molten metal or sparks, liquid chemicals, acids or caustic liquids, or potentially injurious light radiation (i.e., lasers, welding, etc.)

Foot Protection: Equipment designed to provide protection to the feet and toes during exposure to situations with the potential for foot injuries such as falling or rolling objects, chemical or liquid exposures, piercing objects through the sole or uppers, and/or where the employee's feet are exposed to electrical hazards.

Hand Protection: Equipment designed to provide protection to the hands during exposures to potential hazards such as sharp objects, abrasive surfaces, temperature extremes and chemical contact. Hand protection is selected based upon the hazard and performance characteristics of

the gloves.

**Head Protection:** Equipment designed to provide protection to the head during exposure to potential hazards such as falling objects, striking against low hanging objects, or electrical hazards.

**Hearing Protection:** Equipment designed to provide protection to an individual's hearing during exposure to high noise levels.

**Personal Protective Equipment (PPE):** Includes all equipment designed to provide protection to the wearer from potential hazards to the eyes, face, hands, head, feet, ears, and extremities.

**Respiratory Protection:** Equipment designed to provide protection to the wearer from potential inhalation hazards such as vapors, mists, particulates, and gases.

## **Responsibilities**

### **Supervisor**

Supervisors have the primary responsibility for implementation of the PPE Program in their work area. This involves:

- Providing appropriate PPE and making it available to employees and ensuring they are wearing the equipment
- Identifying the hazards prior to the start of any work and seeking assistance from EHS to evaluate and control the hazards
- If hazards may not be eliminated, then guards and protective equipment should be utilized to ensure the safety of employees.
- Supervising their employees to ensure that the PPE Program elements are followed and that employees properly use and care for PPE
- Notifying EHS when new hazards are introduced or when processes are added or changed

### **Employees, Students, Visitors, Contractors**

The PPE user is responsible for following the requirements of the PPE Program. This involves:

- Wearing PPE as required
- Attending required training
- Caring for, cleaning, storing and maintaining PPE, as required
- Informing the supervisor of the need to repair or replace PPE

### **EHS**

The Office of Environmental Health and Safety is responsible for the development, implementation, and administration of the UAB PPE Program. This involves:

- Determining the type of PPE necessary based on the hazards involved in the job
- Providing safety training and technical assistance to supervisors on the proper use, care and cleaning of approved PPE
- Reviewing, updating and evaluating the overall effectiveness of the PPE Program

- Conducting periodic Job Safety Analysis and Risk Assessments to determine PPE required or other controls necessary to protect the employee

### **Program Components**

All personal protective clothing and equipment will be of safe design and construction for the work to be performed and shall be maintained in a sanitary and reliable condition. Only those items of protective clothing and equipment that meet NIOSH, ANSI or ASTM standards will be procured or accepted for use.

The ANSI standards contain useful reference information regarding the selection and use of PPE. Some of these standards are:

- Eye and Face Protection ANSI Z87.1
- Head Protection ANSI Z89.1
- Foot Protection ANSI Z41.1 and ASTM F-2413-2005
- Hand Protection – the selection must be based on the performance characteristics of the glove in relation to the tasks to be performed.

### **Identifying the Hazards and Selecting the Proper PPE**

In order to be able to choose the proper PPE, the individual must be aware of what hazards exist. This involves obtaining information on the types of hazards present, the toxicity of the materials involved, and what other options are available to control exposure. General information about chemicals may be found in Safety Data Sheets (SDS). The chronic and acute effect of chemicals should also be assessed. The next step would be to implement the control measures necessary to prevent exposure into the operational procedures.

#### **Head Protection**

Head injuries are commonly caused by impact from falling or flying objects and falling or walking into hard objects. PPE devices such as hard hats may protect you from objects falling on your head and, in a limited way, from electrical shock or burns. Hard hats should be worn in areas where there is potential for head injuries.

#### **Eye and Face Protection**

Eye protection should always be worn where there is potential for injury to the eyes or face from small particles, toxic chemicals, acids or caustic liquids, gases or vapors, bioaerosols, flying objects or particles, large objects, thermal or radiation hazards, and lasers. According to the types of and extent of hazards, different PPE should be worn. PPE for the face and eyes includes devices such as safety glasses, goggles, and face shields. These must always remain clean and free of contaminants. Safety glasses or goggles must always be worn in laboratory areas.

This includes employees, researchers, visitors, contractors and students. To provide protection, supervisors of such areas shall procure a sufficient quantity of goggles or safety glasses which provide the maximum amount of protection possible. If employees wear personal glasses, they shall be provided with a suitable eye protector to wear over them.



**Emergency Eyewash Facilities**

Emergency eyewash facilities meeting the requirements of ANSI Z358.1 will be provided in all areas where the eyes of any employee may be exposed to hazards. All such emergency stations will be located where they are easily accessible and not blocked in the event of an emergency.

**Body Protection**

Protective clothing, such as lab coats, should be worn when handling hazardous materials. Tyvek suits and sleeves are also available to prevent the contamination of skin and clothing.

**Hand Protection**

Selecting the proper gloves is very important since it is our hands that are often used to handle hazardous materials. These materials usually consist of caustic or toxic chemicals, biological substances, electrical sources, or extremely cold or hot objects that may irritate or burn your hands. In addition, traumatic injuries such as cuts, sprains and punctures may also occur. With the wide range of hazards, there also exists a wide range of gloves that may be used as PPE. The first consideration in the selection of gloves for use against chemicals is to determine, if possible, the exact nature of the substance to be encountered. Read instructions and warnings on chemical container labels and SDS before working with any chemical. Recommended glove types are often listed in the section for personal protective equipment.

**Foot Protection**

Injuries that may occur when the proper footwear is not worn are chemical and heat burns from spills and splashes of acids and caustics, compression injuries, electrical shocks, and slipping. Wearing the proper footwear is, therefore, very important when working in areas where physical and chemical hazards are present. Close-toed shoes must always be worn in laboratory areas where chemicals are present.

**Hearing Protection**

Earplugs are should be made available in areas where the noise exposure to high levels may result in hearing loss. PPE should be worn when the noise level is 85 decibels or greater averaged over an 8-hour period of time.

**Respiratory Protection**

Respirators are used to prevent the exposure to air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. All respirator usage, which includes disposable respirators, air purifying respirators, and air supplied respirators, require annual fit testing and training prior to use.

## **Scaffolding Guidelines**

UAB employees must follow General Industry standards when working with scaffolds. All scaffolds must be inspected daily by a qualified person before any work begins.

### **Fixed Scaffolds (Work Platforms)**

- The footing 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, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.
- Scaffolds and their components shall be capable of supporting, without failure, at least four times the maximum intended load.
- Scaffolds shall be maintained in safe condition. Scaffolds shall not be altered or moved horizontally while they are in use or occupied.
- Any scaffold damaged or weakened from any cause shall be immediately repaired and shall not be used until repairs have been completed.
- Scaffolds shall not be loaded in excess of the working load for which they are intended.
- Guardrails not less than 2x4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1x4-inch lumber or equivalent, and toe-boards shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toe-boards shall be a minimum of 4 inches in height.

### **Mobile Work Platforms**

- All scaffold work levels 10 feet or higher above the ground or floor shall have a standard (4-inch nominal) toe board.
- All work levels 10 feet or higher above the ground or floor shall have a guardrail of 2x4-inch nominal or the equivalent installed no less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1x4-inch nominal lumber or equivalent.
- A climbing ladder or stairway shall be provided for proper access and egress and shall be affixed or built into the scaffold and so located that its use will not tend to tip the scaffold. A landing platform shall be provided at intervals not to exceed 12 feet. Never climb a ladder with tools or materials; instead attach to the body in an appropriate support or pull up with a rope.
- Employees shall not work on scaffolds during storms or high winds.
- Employees shall not work on scaffolds which are covered with ice or snow, unless all ice or snow is removed, and planking sanded to prevent slipping.
- Tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.

## **Slips, Trips, and Falls**

To reduce injuries caused by slips, trips, and falls, it is important to minimize the hazards that cause them.

- Immediately clean up and place warning signs in wet floor areas.
- Eliminate uneven floors, chords across walkways, and clutter in walking areas.
- Avoid undue speed and maintain an unobstructed view while carrying a bulky load.
- Use handrails when going up or down the stairs.
- Use ladders correctly by following ladder safety measures such as using only on even surfaces and using the 3-point rule while ascending and descending.
- Assure good lighting provided in all hallways and stairwells and report to maintenance if you see a problem.
- Use caution on icy walkways and loading docks. Contact maintenance to apply de-icing solutions.
- Report all incidents to you supervisor immediately.

## **Ergonomics**

Preventing injuries through ergonomics is an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely.

### **Office Setting Injury Prevention:**

- Avoid a bent neck, shoulders raised or bent, and awkward postures.
- Keyboard should be placed directly in front of the monitor.
- Computer monitor should be 18-20 inches away from you and at eye level.
- Take frequent breaks and avoid prolong repetitive postures and motions.
- Elbows should be positioned so hands are at a 90-degree angle to the desktop.

### **General Ergonomics Injury Prevention:**

- Do not text and walk.
- Never obstruct your vision while working or walking.
- Select proper footwear for the job.
- Do not jerk to lift or move a load.
- Use equipment or ask for help when moving heavy or awkward loads.
- Avoid prolonged awkward postures and handholds.
- Use the correct tools for the job.