

AERIAL LIFT SAFETY

Aerial lift operators must complete training and demonstrate proficiency in the recognition and mitigation of hazards associated with the operation of aerial lifts. To achieve proficiency, operators are advised to:

1. Complete the EHS web-based Mobile Aerial Lift Safety training module (<http://ehs.unl.edu/onlinetraining/>), or equivalent instructor-led training.
2. Read the manufacturer's operator's manual for each model of lift that will be operated.
3. Complete hands-on training with a competent and experienced individual (designated by the responsible supervisor) and demonstrate proper operation under expected operating conditions before independently operating any lift. The form at the end of this document can be used to document operator hands-on training but are not mandatory. An equivalent form of the department's choosing can be used.

The Nebraska Safety Council offers the following training: "Aerial Lift Safety: Train-the-Trainer". Local equipment distributors often offer training as well. These resources are not mandatory, but may be useful.

Scope

This SOP and the complementary EHS web-based training are specific to mobile aerial lifts that are used to position personnel so that they can conduct work at elevated heights. Common activities include changing or adjusting theater or other lighting, painting, and other maintenance-like operations. Models commonly used at UNL include manually and self-propelled units; vertical masts, scissor lifts, articulating booms, telescoping booms, and van mounted articulating booms. Examples of each of these are shown below.



Regulatory Basis

Several OSHA regulations and ANSI standards apply to aerial lifts and include provisions for design, operator training, and safe operating practices, these include:

- 29 CFR 1910.67 (Vehicle Mounted Elevating and Rotating Work Platforms)
- 29 CFR 1926.453 (Aerial Lifts)
- 29 CFR 1926.451 & .452 (Scaffolds)
- 29 CFR 1926.20 (General Safety and Health Provisions)
- 29 CFR 1926.21 (Safety Training and Education)
- Section 5 of the OSHA Act, commonly referred to as the “General Duty Clause.”
- American National Standards Institute (ANSI), A92.3, Manually Propelled Elevating Aerial Platforms
- ANSI, A92.6, Self-Propelled Elevating Work Platforms
- ANSI, A92.2, Vehicle Mounted Elevating and Rotating Aerial Devices
- ANSI, A92.5, Boom-Supported Elevating Work Platforms

General Operational Safety Precautions

- All newly-acquired aerial lifts should meet the design and construction requirements of the relevant American National Standards Institute and OSHA standards. Every effort should be made to replace equipment that does not meet current standards.
- Modifications to lifts are not allowed without express written approval from the manufacturer (maintain file documentation).
- Most lifts are designed for operation on relatively flat surfaces with minimal slope (< 5%). Do not operate on surfaces that exceed the manufacturer’s maximum rated slope.
- Lifts are to be used strictly for the purposes for which they were designed and in accordance with manufacturer’s specifications and instructions.
- Service and repair are to be conducted only by qualified mechanics and replacement parts must meet the original equipment manufacturer’s specifications.
- Prior to each day’s operation, each operator must conduct a worksite and machine inspection, including applicable function tests of controls and safety devices. The purpose of these checks is to detect and abate hazard. An example checklist is provided at the end of this SOP. Additional guidance is provided in the EHS aerial lift training module and the manufacturer’s operator’s manual.

Hazards

- **Electrocution**
Nationally, one of the most common and deadly hazards associated with aerial lifts is electrocution from contact with electrical wires and conductors. ANSI and OSHA standards specify minimum safe distances that are to be maintained while working in an aerial lift, as indicated in the table below. If these distances cannot be achieved, do NOT use the equipment.

| Voltage | Minimum distance |
|---------------|------------------|
| < 50 KV | 10 feet |
| 50 - <199 KV | 15 feet |
| 200 – 349 KV | 20 feet |
| 350 – 499 KV | 25 feet |
| 500 – 749 KV | 35 feet |
| 750 – 1000 KV | 45 feet |

Other precautions to avoid an electrocution hazard include:

- If welding while on an aerial lift, do NOT use the platform or any part of the machine for grounding. Adhere to hot work permit requirements. See EHS SOP, *Hot Work Operations*.
- If using electrified tools while on an aerial lift, use only tools that are double insulated or have a grounding plug.
- If using an electromechanical model lift, ensure that the proper gauge of extension cord wire is used and that it is in good condition and equipped with a grounding plug.
- Do not operate the machine outdoors if there is threat of lightening. In fact, do not operate during any type of inclement weather, including windy conditions, since fall and tip-over hazards are exaggerated in these conditions.
- Personnel on the ground are prohibited from operating the ground controls when an aerial lift is in contact with a live electrical source until such time as the electrical source is de-energized.

• **Tip-over and Collapse**

Tip-over and collapse are also serious hazards associated with aerial lifts, being the second leading cause of injury associated with aerial lifts. Reduce this hazard by observing the following precautions:

- Never exceed the manufacturer’s specified maximum load (which includes the weight of the person and all tools/supplies/equipment, etc. that will be on the platform).
- Do not operate on surfaces that exceed the manufacturer’s maximum slope (typically 5% or less). Always use wheel chocks and brakes when operating on any slope.
- Set up on a firm surface, well away from drop-offs.
- When navigating a lift that is designed to move with the platform extended, avoid debris, bumps, depressions, or potholes. Do not drive over floor grates or covers. Never exceed the manufacturer’s maximum speed recommendations.
- Know the type and proper usage of stabilizing mechanisms used on the lifts that you operate. Do not attempt to move or adjust stabilizing mechanisms while the platform is raised.

- Never position or tie off the lift or platform against a wall, structure, or other surface.
 - Maintain the intended center of gravity by evenly dispersing loads on the platform. Never attempt to increase the surface area of the platform with planks, boards, or other devices. Do not let materials extend over the edge of the platform. Do not hang tools or equipment off the sides or rails of the platform.
 - Exercise care when raising and lowering the platform to avoid entangling ropes, cords, etc. in the machine.
 - Most aerial lifts are intended for a single person. Do not allow more than one person on a lift unless it is specifically designed for that purpose.
 - Avoid horizontal forces from work tasks that could cause the platform to sway and become unstable. This includes pushing off or pulling toward any surface, structure, or object outside of the platform.
 - Do not operate an aerial lift outdoors during windy conditions or other inclement weather.
 - Never climb on the mast or use ladders or scaffolds on any part of the machine.
 - Enter and exit the platform only through the intended access point/gate.
- **Falls**

Falling from a lift is another hazard that must be recognized and steps taken to mitigate the risk.

 - Guardrails typically provide adequate protection for scissor like and vertical mast lifts that are stationary, not capable of motive power while the platform is extended, and the platform raises straight up from its base, so long as work activities and practices do not defeat the protection afforded by the guardrail. A full-body harness personal fall arrest systems must be used when operating all boom type lifts. See EHS SOP, *Fall Arrest Systems* for specific requirements.
 - Restrict materials and equipment on the platform to that which can be safely handled by one person.
 - Keep both feet firmly on the floor of the platform. Do not attempt to gain additional reach by standing on boxes, planks, or other objects.
 - Do not lean on or over the rails. Do not sit, stand, or climb on the guardrails.
 - Keep your shoes clean and ensure that they have a good, anti-slip tread.
 - Keep the platform clean and free of debris. Position equipment so that the weight is evenly distributed and in a manner that does not create a trip hazard.
 - Enter and exit the platform only when it is fully lowered.
 - If a platform or elevating assembly becomes caught, snagged, or otherwise prevented from normal motion by adjacent structures or other obstacles such that control reversal does not free the platform, all personnel must be removed from the platform before attempts are made to free the platform using ground controls.
- **Collision**

Collision hazards can exist both overhead and on the ground. To avoid collision hazards:

 - Lockout overhead cranes that are located within the working distance of the lift.

- Look below before lowering a platform to verify that persons or objects are not present. Give warning of your intent to descend (audible alarm, voice commands, etc.). If working as a team, verbally verify clearance of your teammate(s) on the ground before lowering.
 - Avoid setting-up in high traffic areas. If absolutely necessary, attempt to conduct work at low-traffic times or work with appropriate personnel to temporarily interrupt traffic during the time that the lift is in use. Regardless of the traffic level, place warning barricades at a safe perimeter around the lift to detour both pedestrian and vehicular traffic.
 - Be aware of the swing range. Set-up in a manner that avoids objects within the range of motion of the machine.
 - When moving a lift, use extreme caution and slow and deliberate motions, particularly when space is limited, traffic is high, surface conditions are potentially hazardous (slippery, pot-holes, etc.), or the route contains corners, blind spots, and other visual obstructions.
 - For drivable boom lifts, use the boom controls (not the drive controls) for final positioning of the platform close to objects.
- **Entanglement**

Obviously, any lift has many moving parts, which create pinch and/or shear points. To avoid injury from pinch/shear points:

 - Keep hands, arms, and other body parts within the confines of the platform and guard rail while working on the platform. Keep hands and fingers away from moving parts while on the ground.
 - Avoid loose clothing that could become caught in chains, pulleys, lifts, etc. Keep long hair confined.
 - Always ensure that the machine is de-energized before conducting maintenance and repairs.
- **Improper Use**

It is relatively simple to mitigate the risk of injury resulting from improper use.

 - Remove the key or otherwise secure a lift while it is being stored so that it is not available to unauthorized persons.
 - Do not allow anyone to operate a lift until they have completed instructional and hands-on training and they have demonstrated competency in the operation of the specific lift they are expected to use.
 - Refrain from horseplay.
 - Use an aerial lift only for the purposes and in the manner specified by the manufacturer. Never use an aerial lift as a crane.
- **Hazardous Atmosphere**

There are a couple of things that must be considered with respect to potentially hazardous atmospheres. The first is the workplace atmosphere irrespective of the aerial lift. Aerial lifts are not intrinsically safe, meaning that they can create sparks that could ignite flammable vapors, fibers, or dusts that may be in the atmosphere. Under

no circumstances should a lift be operated in a hazardous location (contains, or has the potential to contain, an explosive or flammable atmosphere). While UNL does not have work sites that ordinarily would contain flammable vapors/dusts/fibers, it is important to recognize that an anomalous condition could present such a hazard (e.g., leak/ruptured drum or tank for gasoline or other solvent, etc.) and this would negate the use of an aerial lift.

The other atmospheric hazard to be aware of may arise from operation of certain lifts in unsuitable locations. For example, gasoline, propane, and diesel engines generate exhaust fumes (carbon monoxide and other pollutants) that can be hazardous to the operator and others. This is especially problematic when operating a combustion engine lift in areas that have insufficient ventilation. To avoid creating a hazardous atmosphere:

- Use electric powered units in confined areas.
 - Install carbon monoxide detectors in use areas.
 - Adhere to maintenance schedules to ensure efficient fuel combustion
 - Remove a lift from service that does not appear to be operating normally (e.g., excessive smoke)
 - Clean up spills and leaks of fluids
 - Know the symptoms of exposure to carbon monoxide. Carbon monoxide is colorless and odorless- you can't easily detect overexposure through your ordinary senses. Rather, you are likely to suffer symptoms such as shortness of breath, nausea, headache, or light-headedness at low to moderate concentrations. Prolonged or high exposures can lead to death. If you suspect an overexposure, seek fresh air. As needed, seek medical attention.
- **Defective Machine**

Before an aerial lift can be used safely it must be in safe condition. That is the purpose of a pre-use inspection: to detect defects or damage that could impair the functioning of the machine or the operator's familiarity with the controls. If a defect is detected during the pre-use inspection, the machine must be clearly tagged out of service until it is repaired. Report all such circumstances to your supervisor in a timely manner. More information on conducting a proper pre-use machine inspection is provided in the EHS training module and the operator's manual for the particular model to be used.



Aerial Lift Daily Inspection Checklist

| Equipment Evaluation | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Inspection Item | Problems | Comments |
| Equipment and attachments are appropriate for the space, surface and compatible with the load limits | <input type="checkbox"/> Yes; <input type="checkbox"/> No | |
| AC-Operated Power cord is securely attached and no visible damage | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| DC-Operated, Batteries: Battery water and electrolyte levels and charge. The batteries are in place and properly connected. Original battery (or acceptable replacement of the same lbs.) is in place. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Accelerator and direction controls function smoothly | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Brakes work smoothly | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Steering/positioning controls work smoothly | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Drive, hoist, and attachment controls work smoothly | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Tires, Wheels, Casters- condition, pressure, and appropriate type for use location | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Hydraulic and pneumatic power unit, reservoir, hoses, chains, cables and stops- condition | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Electrical components, wiring and electrical cables. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Platform-raising system components, chains, cables, pulleys, moving parts. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Boom components and wear pads, if applicable. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Outriggers, leveling jacks and foot pads. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| All structural and other critical components are present and all | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |



| | | |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------|
| associated fasteners and pins are in place and properly tightened. | | |
| No visible cracks in welds or structural components. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| No dents or damage to the machine. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Operator's safety and responsibilities manual(s) are complete, legible and present on the lift. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Product Information/Name plate attached | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Safety warnings attached per manufacturer specifications | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Beacons and alarms, if equipped. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Safety interlocks and guards are present and function as intended | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Fall Protection | | |
| Fall restraint equipment is proper for the task being performed | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Fall restraint systems are in good condition | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Function Tests | | |
| | Problems? | Comments |
| Set-Up | | |
| Set the outriggers and adjust to level the machine and raise the wheels slightly off the ground. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Check the interlock display lights to confirm that all outriggers are in the proper position. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Check the leveling device to make sure the machine is level. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| At The Ground Controls | | |
| Test power on/off. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test the emergency stop. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test the emergency descent/aux. power. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |



| | | |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
| Test directional/positioning functions. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test the outrigger interlock. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test the tilt sensor. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| At the Platform Controls | | |
| Test emergency stop. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test the function-enabling switch. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Test directional/positioning functions. | <input type="checkbox"/> Yes; <input type="checkbox"/> No <input type="checkbox"/> NA | |
| Workplace Inspection at the site | | |
| Drop offs or holes | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Bumps, floor obstructions or debris? | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Slopes that can exceed the machine's leveling capability. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Unstable or slippery surfaces. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| The lift is not moved with the platform extended? | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Center of gravity of the machine is maintained? | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Overhead obstructions or electrical conductors | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Inadequate surface support to withstand all load forces imposed by the machine. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| No horizontal forces applied from the platform? | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Wind and weather conditions. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| The presence of unauthorized personnel. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |
| Other possible unsafe conditions. | <input type="checkbox"/> Y; <input type="checkbox"/> N; If no, explain: | |



Aerial Lift Training Documentation and Operator Evaluation Checklist

| | | | |
|------------------|--|--------------|--|
| Evaluator's Name | | Today's date | |
| Operator Name | | NU ID | |
| Lift Make/ Model | | | |
| Department | | Supervisor | |
| Location | | | |

| | S | U | NA |
|------------------------------------------------------------------------------------------------------------|---|---|----|
| Has completed the proper training: | | | |
| ▪ Completed EHS web-based Aerial Lift Safety training (list date) OR | | | |
| ▪ Completed equivalent instructor-led training (list date, instructor's name and location) | | | |
| ▪ Has read the operator's manual for the above-named aerial lift | | | |
| ▪ Has completed full protection training, if applicable (list date) | | | |
| Properly completes a pre-use inspection of the lift: | | | |
| Demonstrates a proper workplace inspection of the site before the lift is set up: | | | |
| Demonstrates proper lift set-up: | | | |
| ▪ Sets the outriggers and adjusts to level the machine while raising the wheels slightly off the ground. | | | |
| ▪ Check the interlock display lights to confirm that all outriggers are in the proper position. | | | |
| ▪ Check the leveling device to make sure the machine is level. | | | |
| ▪ Sets up warning barricades, cones, barrier tape or other method to alert vehicle and pedestrian traffic. | | | |
| ▪ Knows how/when/who to report deficiencies in the lift. | | | |
| Demonstrates proper use of the ground controls: | | | |
| ▪ Tests the power on/off. | | | |
| ▪ Tests the emergency stop. | | | |
| ▪ Knows how to operate the emergency descent/aux. power. | | | |
| ▪ Knows how to use the directional/positioning functions. | | | |
| ▪ Tests the outrigger interlock. | | | |
| ▪ Tests the tilt sensor. | | | |
| Demonstrates proper use of the platform controls: | | | |
| ▪ Tests the emergency stop. | | | |
| ▪ Knows how to operate the function-enabling switch. | | | |
| ▪ Knows how to use the directional/positioning functions. | | | |
| ▪ Raises and lowers the platform smoothly. | | | |
| Demonstrates competency in use of Fall Protection equipment: | | | |
| ▪ Inspects the equipment before use. | | | |
| ▪ Correctly dons, doffs and adjusts full body harness and lanyard | | | |
| ▪ Correctly attaches the lanyard to the mfg. approved tie-off point. | | | |
| Demonstrates competency in moving the lift to and from the work site: | | | |
| Follows proper procedures for an "unattended" lift: | | | |
| Demonstrates competency in re-fueling/re-charging (to the extent of assigned responsibilities) | | | |
| ▪ Designated location | | | |
| ▪ PPE | | | |
| ▪ Proper and safe procedures | | | |