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## **Since 2008**

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## AERIAL LIFT SAFETY

(For assistance, please contact EHS at (402) 472-4925, or visit our web site at <http://ehs.unl.edu/>)

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 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.

This SOP is not a substitute for appropriate training, as described above. Supervisors are encouraged to notify EHS if lifts are used by persons they supervise so EHS can assist in evaluating hazards and training workers.

### 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. Example checklists are provided in the Appendix to 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 lightning. 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.

## Operator's Checklist

### WORKSITE

- Minimum safe distance from overhead electrical lines and other conductors**  
(< 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)
- Floor and ground conditions are appropriate**  
(free of slippery conditions, uneven surfaces, obstructions, and significant slopes; sufficient load ratings of floor/surface)
- Overhead obstructions are outside of the working range of the lift, if possible. If not, the operator is aware of the overhead obstructions. Hard hat is used.**  
(e.g., cross members, trusses, sprinkler heads, water/utility lines, conduit, cranes)
- Lift is protected from pedestrian and vehicular traffic**  
(barricades or other effective means are used to delineate the work zones and divert both vehicular and pedestrian traffic)
- Weather conditions**  
(If operating outdoors, weather conditions are safe- no threat of inclement weather, including windy conditions)
- Atmospheric conditions**  
(work space is free of flammable/explosive vapors, dusts, and fibers; lifts with combustion engines not operated in an enclosed space)
- Machine load ratings and intended use are compatible with the specific machine to be used.**

### Lift

- Batteries (DC Operated Models)**  
(proper electrolyte level; cable connections should be tight; there should be no visual evidence of corrosion or other deterioration/damage; and the batteries should be of the size and weight specified by the manufacturer)
- Power cord (AC Operated Models)**  
The power cord for AC models should be securely attached and have no visible signs of damage (e.g., cut or cracked insulation, missing prongs, etc.)
- Fluid levels**  
(i.e., oil, hydraulic fluid, coolant, etc.)
- Frame**  
(look over the entire frame checking for loose or missing hardware, cracked welds, bent pins/sockets, etc.)

- Hydraulic and pneumatic systems**  
(look for signs of deterioration or leakage including reservoirs, hoses, cylinders, etc.)
- Platform raising system**  
(look for worn, nicked, frayed or rusted cables or chains, insufficiently lubricated moving parts, loose tension on chains or cables, bind in pulleys or sheaves, etc.)
- Tires, wheels, casters**  
(check tires, wheels, casters to ensure that they are free rolling and securely attached; if tires are pneumatic, ensure proper inflation level).
- Guardrail**  
(securely attached to the platform, there are no signs of damage (e.g., cracked welds, etc.), and the gate works properly)
- Fall arrest anchoring point**  
(good condition)
- Platform**  
(clean, securely attached to mast)
- Outriggers**  
(cables leading to controls are in good condition and control labels are present and legible)
- Controls**  
(cables leading to controls are in good condition and control labels are present and legible)
- Instructional and warning labels/decals**  
(present and legible)
- Operator's manual**  
(stowed in the designated weather-resistant compartment on the lift)
- Function tests**  
(all function tests recommended by manufacturer conducted with acceptable results)
- Additional items for specific models (as recommended by manufacturer)**