Occupational Safety Program

Aerial Platform Program

Manual

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Purpose

The purpose of the program is to maintain a safe and healthful environment for aerial platform operators, other vehicle operators, and pedestrians on campus. The program is intended to outline the safe operating procedures of aerial platforms or a combination of such devices when used to elevate associates to worksites or for the purpose of maintenance activities above ground and to prevent serious accidents from occurring while they operate these devices. All employees who utilize aerial lifts at Towson University must adhere to this program.

Scope

This scope of the program relates to the maintenance and use of aerial platforms. The program applies to all employees that operate these vehicles, regardless of the frequency in their use. Such employees will be trained and authorized to use said vehicles prior to use. Non-operators should be aware of their surroundings with respect to aerial platform use at all times.

The devices are commonly called the following: a) boom lifts, b) scissor lifts, c) push-around lifts, d) trailer-mounted boom lifts, e) aerial ladders, f) vertical towers, or g) a combination of any of these devices. Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis. This program applies to the above devices owned or leased by Towson University, which are operated by TU employees.

It does not apply to firefighting equipment or the vehicles on which aerial devices are mounted, except for the requirement that the vehicle provide stable support.

Definitions

Aerial device: Any vehicle—mounted device, telescoping or articulating, or both, which is used to position personnel.

Aerial ladder: An aerial device consisting of a single- or multiple-section extensible ladder.

Aerial Platform: A mobile or manually propelled device or vehicle-mounted device that has an adjustable position platform, supported from ground level by a structure or vehicle.

Anchorage (anchor point): A secure point of attachment for equipment such as lifelines, lanyards, or deceleration devices.

Articulating boom platform: An aerial device with two or more hinged boom sections.

Authorized Personnel: Individuals certified to operate an aerial platform and assigned to perform a specific type of duty or duties at a specific location or locations at a work site.

Base: The relevant contact points of the aerial platform that form the stability fulcrum (e.g., wheels, casters, outriggers, stabilizers, etc.)

Belt terminal: An end attachment of a window cleaner's positioning system used for securing the belt or harness to a window cleaner's belt anchor.

Body belt (safety belt): A strap with means both for securing about the waist and for attaching to other components such as a lanyard used with positioning systems, travel restraint systems, or ladder safety systems. **Note: Body belts are prohibited at Towson University.**

Body harness (full-body harness): Straps that secure about the employee in a manner to distribute 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 protection system.

Carabiner: A connector generally comprised of a trapezoidal or oval shaped body with a closed gate or similar arrangement that may be opened to attach another object and, when released, automatically closes to retain the object.

Center of gravity: The point on an object at which all of the object's weight is concentrated. For symmetrical loads, the center of gravity is at the middle of the load.

Chassis: The integral part of the aerial platform that provides mobility and support for the elevating assembly.

Competent person: An individual who, because of training and experience, is capable of identifying hazardous or dangerous conditions in powered platform installations and of training associates to identify such conditions. A person who is capable of identifying existing and predictable hazards in any personal fall protection system or any component of it, as well as in their application and uses with related equipment, and who has authorization to take prompt, corrective action to eliminate the identified hazards.

Configuration: All positions in which an aerial platform or any part thereof can be placed within its intended operating limits.

Connector: A device used to couple (connect) parts of the fall protection system together.

Counterweight: The weight that is built into the truck's basic structure and is used to offset the load's weight and to maximize the vehicle's resistance to tipping over.

D-ring: A connector used: (i) In a harness as an integral attachment element or fall arrest attachment; (ii) In a lanyard, energy absorber, lifeline, or anchorage connector as an integral connector; or (iii) In a positioning or travel restraint system as an attachment element.

Deceleration device: Any mechanism that serves to dissipate energy during a fall.

Deceleration distance: The vertical distance a falling employee travels from the point at which the deceleration device begins to operate, excluding lifeline elongation and free fall distance, until stopping. It is measured as the distance between the location of an employee's body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Elevating Assembly: The mechanisms used to position the platform relative to the aerial platform chassis.

Equivalent: Alternative designs, equipment, materials, or methods that the employer can demonstrate will provide an equal or greater degree of safety for employees compared to the designs, equipment, materials, or methods specified in the standard.

Extensible boom platform: An aerial device (except ladders) with a telescopic or extensible boom. Telescopic derricks with personnel platform attachments shall be considered to be extensible boom platforms when used with a personnel platform.

Familiarization: Providing information regarding the control functions and safety devices for the aerial platform(s) to a qualified person or operator who controls the movement of the aerial platform(s) being delivered.

Free fall: The act of falling before the personal fall arrest system begins to apply force to arrest the fall.

Free fall distance: The vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline, and lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before the devices operate and fall arrest forces occur.

Fulcrum: The truck's axis of rotation when it tips over.

General Training: Instruction to enable the trainee to become a qualified person regarding the task to be performed, including knowledge regarding potential hazards.

Grade: The slope of a surface, which is usually measured as the number of feet of rise or fall over a hundred-foot horizontal distance (the slope is expressed as a percent).

Guardrail System: A vertical barrier intended to prevent associates from falling to lower levels.

Hazardous Location: Any location that contains, or has the potential to contain, an explosive or flammable atmosphere as defined in ANSI/NFPA 505.

Instability: The quality or state of being unstable, likely to tip over.

Insulated aerial device: An aerial device designed for work on energized lines and apparatus.

Insulated Platform: A platform designed and tested to meet the specific electrical insulation ratings consistent with the manufacturer's identification plate.

Interlock: A control or mechanism that, under specific conditions, automatically allows or prevents the operation of another control or mechanism.

Lanyard: A flexible line of rope, wire rope, or strap that generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

Lateral stability: Truck's resistance to overturning sideways.

Lifeline: A component of a personal fall protection system consisting of a flexible line for connection to an anchorage at one end so as to hang vertically (vertical lifeline), or for connection to anchorages at both ends so as to stretch horizontally (horizontal lifeline) and serves as a means for connecting other components of the system to the anchorage.

Line of action: An imaginary vertical line through an object's center of gravity.

Load center is the horizontal distance from the load's edge (or the fork's or other attachment's vertical face) to the line of action through the load's center of gravity.

Longitudinal stability: The truck's resistance to overturning forward or rearward.

Mobile unit: A combination of an aerial device, its vehicle, and related equipment.

Modification/Modified: To make a change(s), temporary or permanent, to an aerial platform that affects the operation, stability, safety factors, rated load or safety of the aerial platform in any way.

Moment: The product of the object's weight times the distance from a fixed point (usually the fulcrum). In the case of a powered industrial truck, the distance is measured from the point at which the truck will tip over to the object's line of action. The distance is always measured perpendicular to the line of action.

Operator: A qualified person who controls the movement of the aerial platform.

Outriggers: Devices that increase the stability of the aerial platform and that are capable of lifting and leveling the aerial platform.

Personal fall arrest system: A system used to arrest an employee in a fall from a walking-working surface. It consists of a body harness, anchorage, and connector. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these.

Personal fall protection system: A system (including all components) an employer uses to provide protection from falling or to safely arrest an employee's fall if one occurs. Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.

Platform: Any personnel-carrying device (basket or bucket) which is a component of an aerial device. The portion of the aerial platform intended to be occupied by individuals with their necessary tools and materials.

Platform Height: The vertical distance measured from the floor of the platform to the surface upon which the machine is supported.

Positioning system (work-positioning system): A system of equipment and connectors that, when used with a body harness or body belt, allows an employee to be supported on an elevated vertical surface, such as a wall or window sill, and work with both hands free. Positioning systems also are called "positioning system devices" and "work-positioning equipment."

Qualified Person: A person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems relating to the subject matter, the work, or the project. An individual who by reason of knowledge, experience, and training is certified and familiar with the operation to be performed and the hazards involved.

Rated Work Load: The designed carrying capacity of the aerial platform as specified by the manufacturer.

Rope grab: A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.

Safety factor: The ratio of the design load and the ultimate strength of the material.

Self-retracting lifeline/lanyard: A deceleration device containing a drum-wound line that can be slowly extracted from, or retracted onto, the drum under slight tension during normal movement by the employee. At the onset of a fall, the device automatically locks the drum and arrests the fall.

Snaphook: A connector comprised of a hook-shaped body with a normally closed gate, or similar arrangement that may be manually opened to permit the hook to receive an object. When released, the snaphook automatically closes to retain the object. Opening a snaphook requires two separate actions. Snaphooks are generally one of two types: (i) Automatic-locking type (permitted) with a self-closing and self-locking gate that remains closed and locked until intentionally unlocked and opened for connection or disconnection; and (ii) Non-locking type (prohibited) with a self-closing gate that remains closed, but not locked, until intentionally opened for connection or disconnection.

Stability: The quality, state of being stable, firmly anchored, not likely to tip over.

Stabilizers: Devices that increase the stability of the aerial platform but are not capable of lifting or leveling the aerial platform.

Track: The distance between the wheels on the same axle of the truck.

Travel restraint (tether) line: A rope or wire rope used to transfer forces from a body support to an anchorage or anchorage connector in a travel restraint system.

Travel restraint system: A combination of an anchorage, anchorage connector, lanyard (or other means of connection), and body support that an employer uses to eliminate the possibility of an employee going over the edge of a walking-working surface.

Vehicle: Any carrier that is not manually propelled.

Vertical tower: An aerial device designed to elevate a platform in a substantially vertical axis.

Wheelbase: The distance between the centerline of the vehicle's front and rear wheels.

Responsibilities

A. Environmental Health & Safety (EHS)

1. EHS will ensure training and certify employee competency in aerial platform operation through classroom and hands-on training.
2. EHS will maintain safe workplace conditions through random inspections.
3. EHS will make scheduling arrangements and notify departments of scheduled training.
4. EHS will monitor employee re-training.
5. EHS will conduct periodic re-monitoring of identified at-risk employees.

B. Departments

1. Each TU Department that owns/operates an aerial platform shall ensure that the necessary training is acquired by all individuals performing maintenance or

inspections on, working on or operating aerial platforms/lifts or any combination of such devices, and provide an inventory of their equipment to EHS.

2. Each TU Department that owns/operates an aerial platform shall appoint a Supervisor(s) to serve as a Competent/Qualified Person(s), to ensure training for this/these position(s), and to ensure that pre-start, frequent and annual inspections are performed. The name(s) of the Supervisor(s) shall be forwarded to EHS.
3. Each department will work with Supervisors in their area to develop communication plans and rescue plans for their work operations. These plans shall be forwarded to EHS.

C. Supervisors

1. Supervisors will assist EHS in identifying new aerial platforms, new employees, and in scheduling safety training.
2. Supervisors will know the hazards in their areas and maintain safe workplace conditions.
3. Supervisors will complete aerial platform inspections before use, every 3 months or 150 hours of use (known as frequent inspection), and annually.
4. Supervisors will maintain aerial platforms and all required inspection records.
5. Supervisors will ensure that employees wear personal fall protection and other required PPE and operate in a safe manner.
6. Supervisors will notify EHS of accidents, illnesses, injuries, and/or near misses related to aerial platform use.
7. Supervisors will prohibit and prevent aerial platform use by non-authorized individuals (untrained employees, individuals under the age of 18, and contractors).
8. Supervisors will ensure that employees follow all safety training requirements.
9. Supervisors shall ensure that all individuals who operate aerial platforms/lifts are provided general training on the class of equipment to be used and certified to perform the duties assigned. A copy of the training certificate provided by the trainer will be maintained as verification of training.
10. Supervisors shall document that the employee receives familiarization instruction on the specific manufacturer and model lift for which the employee will operate. The supervisor shall use the familiarization training record attached as Appendix I of this program as verification of instruction.
11. All training records shall be forwarded to EHS for retention.

D. Employees

1. Employees will ensure aerial platform inspections have been completed prior to use.
2. Employees shall not operate any aerial platform/lift without having been properly trained on the details of this procedure and the operating manual of the specific model of aerial platform/lift.
3. Employees will contact their Supervisor and/or EHS for any hazards observed which cannot be corrected by the employee.
4. Employees will maintain aerial platforms in accordance with manufacturer recommendations.

5. Employees will notify their Supervisor, Facilities Management, and EHS, if an aerial platform accident occurs involving personnel or other individuals, the building structure, or equipment.
6. Employees will operate the aerial platform in a safe manner, in accordance with TU Policy, EHS training, and manufacturer instructions.
7. Employees will place an aerial platform out of service immediately, if it fails pre-operational inspection or becomes inoperable or unsafe during use.
8. Employees will request clarification from their Supervisor or EHS about any health or safety issue(s) related to aerial platform use.
9. Employees will schedule and complete initial and refresher training and re-certify every 3 years thereafter.
10. Employees will wear appropriate personal fall protection and other required PPE.

Introduction

An aerial lift is a vehicle-mounted device used to elevate personnel and perform work. Such equipment includes the following:

- aerial ladders
- articulating (jointed) boom platforms
- extendable boom platforms
- vertical towers, or
- any combination of the above.

Aerial lifts have replaced ladders and scaffolding on many job sites due to their mobility and flexibility. They may be made of metal, fiberglass-reinforced plastic, or other materials. They may be powered or manually operated, and they are considered to be aerial lifts whether or not they can rotate around a primarily vertical axis.

Synonyms and Classification for Aerial Lifts

Aerial lifts as described above are known by different names based on history, region, industry jargon, and equipment designs. Some of the earliest designs included the cherry picker, which was an aerial lift used in agricultural orchards to harvest this produce. Depending on the industry, the terms “aerial platforms”, aerial work platforms (AWPs), bucket truck, boom lift, elevating work platform, individual work platform (IWP), man lift, or scissor lift. In industrial standards (including from ANSI), and globally by manufacturers and safety groups, aerial lifts have come to be known as mobile elevated work platforms (MEWPs), which include scissor lifts. OSHA classifies scissor lifts as a mobile scaffold and is separated from the “true” aerial lift by standard. Under modern standards, and for the purposes of training, however, scissor lifts are grouped with other aerial platforms.

Per ANSI, MEWPs are classified by groups determined by the platform’s ability to extend beyond the machine’s tipping line (i.e. beyond its wheelbase or outriggers) and types determined by whether the machine can travel while the platform is elevated, and where the travel controls are located. The groups are defined as Group A and Group B, where Group A has platforms that move only vertically and remain inside the tipping lines of the chassis (or base),

at any height, and Group B has a platform that extends beyond the tipping line of the chassis or outriggers. Examples of Group A include scissor lifts and vertical mast lifts, while Group B includes boom lifts (articulating or telescopic) and bridge inspection equipment. The types are defined as Type 1, Type 2, and Type 3. Type 1 describes MEWP that can only be moved when the platform is in its stowed (or fully lowered) position, and it cannot be driven or repositioned while elevated; an example of Type 1 is the push-around vertical lift. The Type 2 MEWP can be moved while the platform is elevated, but the travel controls are located on the chassis, which means that its travel is controlled from the ground. An example of Type 2 is a truck-mounted aerial lift. Type 3 MEWPs can be moved while the platform is elevated, and the travel controls are on the platform, with examples including both scissor lifts and boom lifts. The full classification of any MEWP is a combination of its Group and Type (for example, "Group A, Type 1").

Capacity and Stability

Capacity and stability are each important to the handling and movement of the aerial lift. The center of gravity is the average location of the weight of an object, which has vertical (top-to-bottom), longitudinal (back-to-front), and lateral (side-to-side) components. Unlike forklifts, which use a standard fork-based load center, which is used to calculate load capacity, aerial lifts operate based on maximum platform capacity or rated workload. The maximum platform capacity is the total weight allowed on the platform of the aerial lift as deemed by the manufacturer and includes the combined weight of personnel, their tools, supplies, any other equipment in or attached to the platform, including integrated attachments.

Extending the platform for an aerial lift in any direction will change the location of its center of gravity. To maintain aerial lift stability, the center of gravity of the equipment must remain within the perimeter of its base footprint including its outriggers. Depending on the type of lift, particularly boom lifts (articulating and telescopic), the platform may move outside of this base perimeter. The turntable of a boom lift may rotate 360 degrees, and its boom is intended to extend beyond the limits of the base. Scissor lifts and vertical mast lifts are designed for vertical movement of the platform, which will avoid the hazard of horizontal extension beyond its base footprint. Extension of either type upwards will decrease their stability, with sway and the risk of tipping over, including wind speed if used outdoors, and increase stress on mechanical and hydraulic parts. Capacity for the platform will decrease as it moves further away from the base, horizontally and vertically, creating an imbalance and less stable environment to do work. Factors such as increased slope or unstable, soft ground decrease the capacity and stability of this equipment vastly and should be avoided.

Hazards, Accidents, and Injury Information

According to the Bureau of Labor Statistics, between 2011 and 2014, aerial lift operations led to 1,380 worker injuries. Of these injuries, 360 were due to falls to a lower level. Boom-supported lifts including bucket trucks account for 70% of all aerial lift fatalities with scissor lifts and related platforms accounting for the rest. The most affected trades include electricians, construction laborers, electrical power installers and repairers, painters, and carpenters.
The following are the major causes of fatalities with aerial lifts:

- Collapses and tip-overs involving mechanical failures including broken boom cables, and structural failures such as unlevel or unstable platforms or grounds;
- Collisions or contact of body, crush-by, and pinned-by (pinch point) incidents involving falling objects or being caught between the lift and a fixed object or building
- Electrocutions involving direct or indirect contact with overhead power lines
- Falls from the elevated platform or ejections triggered by collision of lift, tip-over, or uneven, jerky movements.

One of the primary hazards of using an aerial platform is the ejection risk. Moving while in the platform of the equipment, particularly a boom-supported platform, creates sudden movements (tilt, turn, stop, start) or momentum may easily cause an occupant to be ejected or fall outside of the guardrails. Bumpy or unlevel terrain may also lead to this result.
Other hazards include shock/electrocution from internal components or contact with energized equipment other than power lines; entanglement; contact with ceilings or overhead/protruding objects; burns from hot hydraulic oil; injection hazard from high pressure lines due to hydraulic or pneumatic leaks in the aerial platform unit; chemical burns due to corrosive battery acid; explosion or fire due to flammable fuels such as gasoline, diesel, or LPG/propane, cryogen (frostbite/extreme cold burn) hazard due to LPG/propane leak; toxicity/asphyxia from exhaust of combusted fuel; weather for equipment used outdoors, with high winds, rain, snow/ice, hail, and lightning contributing to hazards leading to equipment movement, falling object and injury, slips, damage, or shocks.

Injuries and deaths may result from misuse and unsafe use of the aerial lift. Permanent injuries such as dismemberment or crushed limbs leading to medically necessary amputation may occur if caution is not taken. The force and pressure of the vehicle or its loads can cause other damage such as broken bones, muscle and nerve damage, or other maladies. The common causes of such incidents are as follows:

- Improper maintenance;
- Inadequate training;
- Improper/lack of fall protection;
- Lack of monitoring workplace environment/weather, including equipment/facility clearances particularly from overhead power lines;
- Load stability, including unstable, improper loads or overloads; and
- Surface stability.

Each of these types of injuries and accidents are avoidable by following standard operating procedures for use and maintenance of the aerial lift.

Hazard Controls

There are several hazards associated with aerial platforms that must be addressed prior to doing work. Equipment involves heavy machinery, working at heights, mechanical and hydraulic energy, electricity, and variable environments with physical structures that have low clearances and protrusions, surfaces with varying degrees of roughness and obstruction, and changing weather conditions outdoors. Dynamics introduced from changes in capacity and stability as

equipment reaches or moves are also a source of hazard. There are different solutions for how to mitigate such hazards.

Workers may eliminate hazards from use of aerial platforms by avoiding work at heights through redesign of tasks, so that they can be done safely from the ground. Examples include assembling materials/equipment on ground level, lowering components to ground-level repairs, using extension tools, relocating equipment that requires frequent maintenance to ground level, and use of drones for inspections. A worker may substitute a hazard by use of an aerial platform rather than unsecured ladder or climbing structure, reducing a fall hazard. Within the aerial platform itself, hazards from emissions may be substituted by using a battery-powered lift instead of gas/diesel-powered lifts.
Engineering controls are used to mitigate hazards through use of equipment or equipment mechanisms, blocking or isolating the hazard. For aerial platforms, this is done through use of outriggers, tilt sensors, and interlocks to avoid tipover, use of guardrails and entry gates to protect from falls, and use of emergency stop buttons and key mode selector to switch equipment control from the platform to the ground or chassis/base in emergencies.
Administrative controls moderate behavior of the worker with equipment rather than engineering out hazards.

Often, these controls are policies and procedures for how to act and respond to equipment use and the surrounding workplace. Examples of such controls include having authorization and training to use aerial platforms prior to work; inspect equipment and work area prior to use, periodically, and annually; providing regular maintenance; practicing proper housekeeping of the work area; monitoring/avoiding poor weather conditions, obstructions, and clearances; reading, understanding, and possessing manufacturer operator manual, standard operating procedure, communication plan, rescue plan and maintaining these documents on aerial platform; using alarms on the vehicle to avoid errors leading to tipover and sounding horn to avoid pedestrians nearby; and reading and understanding hazard labels and decals on the aerial platform and related equipment. Other administrative controls include reduction of time in the area by taking breaks, making schedule adjustments, and rotation of work areas, to avoid prolonged exposures and fatigue; and turning off the vehicle when not in use and use of ventilation in the workplace to reduce exhaust exposure.

Lastly, personal protective equipment (PPE) is used to protect a worker as a last protective measure. The worker should inspect and wear general PPE such as a protective helmet, eye protection, hearing protection, high visibility safety vest, work gloves, long pants, and foot protection while using an aerial platform to avoid occupational hazards such as noise, minor impacts to eyes and feet. In addition, the worker should inspect and wear fall restraint PPE (e.g. lanyard and harness). A worker may only use fall arrest PPE if the manufacturer specifications specify that the anchor point is rated for fall arrest PPE use; avoid tie-off to guardrails or handrails themselves. Occupants must wear a full-body harness and must properly anchor (or tie off) to designated anchor points inside the platform to restrict movement and prevent falls or ejections.

If there are specific hazards from specialized work being done, workers should inspect and wear any other work-specific protective gear (e.g. electrical safety gloves, mats). Eye protection may consist of safety glasses and a face shield are used for refueling with LPG or propane cylinders, as well as leather or neoprene gloves. On a related note, long sleeves and long pants are also a requirement for this type of refueling.

Fall Protection PPE for Workers
Scissor lifts do not require additional fall protection as this equipment requires proper guardrails, so workers are not required to wear a personal fall arrest system (lanyard and harness) if the guardrails are intact. For true aerial lifts, workers are required to wear a body harness and lanyard always attached to an approved anchor point. On such lifts, fall restraint may be used or if the anchor point is so rated for it, fall arrest equipment may be used.

Fall Restraint vs. Fall Arrest
A fall restraint system is designed to stop a worker from ever reaching the edge of a fall hazard. A fall arrest system, by contrast, is designed to catch a worker after a fall has already started, using an energy-absorbing lanyard that lets out several feet of slack to soften the stop. Standard six-foot shock-absorbing lanyards are generally not appropriate for boom lifts unless specifically permitted by the lift manufacturer. If a worker is thrown or ejected from the platform, that lanyard can deploy its full length before it engages, potentially pulling the worker completely clear of the basket and applying enough force to tip the entire lift. A short, fixed-length restraint lanyard keeps the worker inside the platform at all times instead.

The main benefits of fall restraint are to prevent falling from an edge due to the fixed length lanyard, which may also be shorter than fall arrest lanyard; avoidance of a sudden violent jerk that occurs with arresting forces due to catching a fall or possible trauma from striking the exterior or undercarriage of the platform; not calculating ground clearance (distance to ground) as with fall arrest; no shock absorption mechanism required; and no need for the required obligation of an immediate post-fall rescue plan, as there are risks of trauma to the body due to extended time in suspension. The main benefits of fall arrest are having greater mobility and working reach within the platform, including over open edges; catches and decelerates a worker if a slip or fall over an edge happens, stopping the fall in progress; built-in shock absorption which has an integrated tear-away energy absorber or webbing that limits the maximum arrest force exerted on the body; useful for tasks where fall restraint cannot be used, such as working on steep roofs or scaffolding edges, where it requires a worker to approach an unprotected edge, in cases of transfer from aerial platform to another platform (double lanyard or 100% tie-off required in this case).

New MEWP Design Requirements
ANSI A92.20, which affects MEWP design, imposed new design and safety feature requirements on manufacturers. These apply to new MEWPs, which is equipment made after the standards took effect. Existing machines in the field do not need to be retrofitted, but any new models must incorporate the following changes:

- Active platform load sensing, which is used to monitor platform weight and trigger an alarm for excess weight, and restricts height and load capacity due to wind or raised platform;
- Chassis angle sensing (tilt sensing), which is used to reduce tip-over risk when the equipment is on a slope by triggering an alarm during drive and boom/platform movement, and preventing platform elevation until the equipment is brought back to a safe level;
- Entrance gates (swinging gate or sliding mid-rail), which prohibit use of chains or flexible gates from being used for a more secure barrier;
- Introduction of "indoor-only MEWPs", which are lighter and smaller for convenience, thus not rated for wind or adverse conditions as MEWPs used outdoors (operators would need to verify MEWP use for indoors only, intended to be used outdoors, or combination use);
- Platform railings, where minimum guardrail height has been raised for indoor scissor lifts, in some cases using taller fold-down railings instead of fixed railings to travel indoors; and
- Toe boards (kickplates) at the edge of platforms to prevent the hazard of falling objects due to tools or materials.

Applicable Regulations

- 29 CFR 1910.67 – Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms
- 29 CFR 1910.140 – Personal Fall Protection Systems
- 29 CFR 1910.269(p) – Electric Power Generation, Transmission, and Distribution: Mechanical Equipment
- 29 CFR 1926.21 – Safety Training and Education
- 29 CFR 1926 Subpart L – Scaffolds (specifically 29 CFR 1926.451 – 29 CFR 1926.453)
- 29 CFR 1926.502 – Fall Protection Systems Criteria and Practices
- NFPA 30 - Flammable and Combustible Liquids Code
- NFPA 58 - Liquefied Petroleum Gas Code

Procedure

A. Authorization Policy

1. Employees
   a) It is the policy of Towson University (TU) to permit only trained and authorized personnel to operate TU-owned or leased aerial platforms.
   b) Training (covered in Step I) is provided by EHS and is verified through certification.
   c) Authorization for operating such vehicles is provided by the employee's Supervisor and Department. However, authorization may be revoked by these parties, TUPD, or EHS if an individual is shown to be in violation of equipment use.

d) This policy is applicable to both daily operators and those who occasionally use an aerial platform.

2. Non-Authorized Individuals
   a) Non-authorized individuals are prohibited from using TU-owned aerial platforms. Such individuals include untrained employees, any individual under the age of 18 regardless of employment status with TU, and contractors (or other nonaffiliated individuals).
   b) Individuals under age 18 may not assist, operate, ride, or work as a spotter in proximity to this work equipment.

3. Prohibitions
   a) Improper Anchor
      i. *Employees are prohibited from anchoring themselves (e.g. tying off, belting off) to adjacent structures (e.g. pole) or separate equipment while inside the aerial lift equipment.*
      ii. *Employees are prohibited from anchoring themselves directly to the guardrail or other parts of the platform. These parts are not rated for this purpose and may fail.*
      iii. *Employees are prohibited from anchoring multiple lanyards to one anchor where there is more than one occupant in the platform, unless the anchor is explicitly certified and rated by the manufacturer or a qualified person to support multiple users.*
   b) Improper Mount
      i. *Employees may not sit, stand, nor climb on the rails of or edge of the basket of the aerial platform.*
      ii. *Employees may not use objects (e.g. ladder, plank, or box) inside the aerial platform to gain extra height.*

B. Equipment, Controls, and Instrumentation

1. Aerial Platforms
   a) Aerial Platform types currently available on campus include the following:
      i. *Articulating Boom Lift (Electric/Gasoline)*
      ii. *Push-Around Vertical Mast Lift (DC Electric)*
      iii. *Scissor Lift (DC Electric)*
      iv. *Vertical Tower (AC Power/DC Power)*

      Multiple vehicles of each type may be available on campus with differing manufacturers and models. Always follow specific manufacturer guidelines for equipment use.
   b) There are additional aerial platforms such as telescopic boom lifts and bucket trucks that may be available for use.
   c) Authorized employees will be advised of the storage and use locations by their Supervisor(s).

d) Similar devices and other types may be rented through external vendor(s), and Supervisors shall be responsible for ensuring that employees are familiar with those particular devices and attain appropriate related training.
e) Always check whether your model requires aligning the chassis and platform directional arrows before moving.
f) Insulated aerial platforms offer protection from electric shock and electrocution by isolating you from electrical ground. However, an insulated aerial platform does not protect you if there is another path to ground (for instance, if you touch another wire). The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value. To maintain the effectiveness of the insulating device, do not drill holes in the bucket/platform or allow for other defects which compromise its insulating properties.



Figure 1. Aerial Platforms. The figure depicts examples of aerial platforms on the TU campus. Clockwise from the upper left, the photos show a scissor lift, a bucket truck, a push-around vertical mast lift, and a boom lift from various manufacturers.

2. <u>Parts</u>
   a) For aerial platforms, there are different sections and parts of each vehicle which affect their movement and performance.
      i. Figures 2a and 2b illustrate the different sections of the aerial platform that an operator will need to understand in order to safely operate the vehicle.
         1) For scissor lifts and vertical mast lifts, the sections include the platform, the elevating mechanism, and the base.
         2) For boom lifts and their analogs, the sections include the platform, the boom, the turret (turntable), and the base.

ii. *Platforms are where operators will perform work and any other occupants may train, assist, or observe this work.*
iii. *Elevating mechanisms and booms are structural components of the aerial platform that move the platform to the appropriate height, reach, or position.*
    1) *An elevating section may use scissor arms or nested mast rails to lift or lower the platform, while a boom arm may lift, lower, extend, retract, or angle in a manner to steady the platform in location.*
    2) *For some models, a jib (a small extension of the boom arm) will come attached to the platform to assist in fine maneuvering and extend the working radius of the platform.*
iv. *Turrets are a part of an aerial platform (e.g. boom lift), where the boom arm is mounted and supported; house the ground controls and fuel source for the vehicle (depending on the model); and rotate itself (and effectively, the boom) horizontally, typically 360 degrees or more. The turret, in this way, is used to turn the platform without moving the base of the vehicle.*
v. *Bases (chassis) of aerial platforms are the main support of the aerial platform; house the ground controls and fuel source for the vehicle (depending on the model); and if applicable, contains the primary means of movement (often wheels, but may include tracks, or mounted to another vehicle, e.g. truck or trailer).*

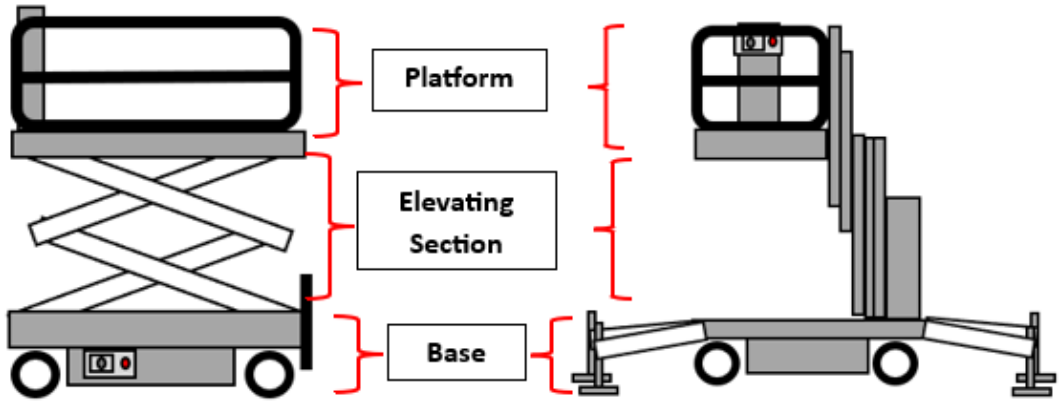


Figure 2a. Scissor Lift & Vertical Mast Lift. The figure illustrates the different sections of each mobile elevating work platform (MEWP) from the side view, including its platform, elevating section, and base. Each platform has a deck for standing, platform controls, guardrails, and an entry gate at one end. The scissor lift has an elevating section composed of lift arms and crossbars while the vertical mast lift has mast rails that are nested (slide inside one another) and rise in stages. Each vehicle has a base with wheels and ground controls; however, in the figure, the scissor lift has an entry step ladder, and the vertical mast lift has deployed outriggers (which may be available on both vehicles, based on the model).

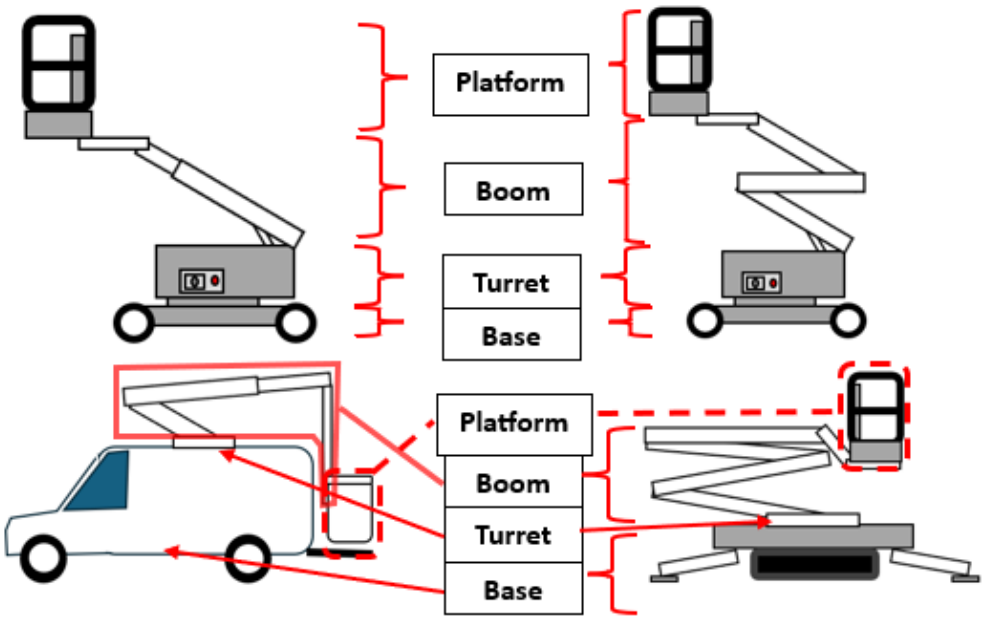


Figure 2b. Boom Lifts and Related Apparatus. The figure depicts articulating and telescoping boom lifts, a bucket truck (truck-mounted boom lift), and a crawler boom lift. The figure also illustrates the different sections of each mobile elevating work platform (MEWP) from the side view, including its platform, boom, turret, and base. Each platform has a deck for standing, platform controls, guardrails, and an entry gate, with the exception being the bucket truck (bottom left) platform having a floor and walls forming a bucket/basket. Each vehicle features a boom arm that articulates (bends) at several joints, with the exception being the telescopic boom lift which extends/retracts straight (top left). Each lift has a turret or middle section that acts as a turntable, which may feature ground controls. Each vehicle has a base with wheels or tracks, may be where ground controls are located, and may feature outriggers for stability; however, the bucket truck is road-ready, must be registered, insured, and may be operated on public roads by licensed drivers as with other automobiles (the truck itself and its reinforced chassis are considered its base).

b) Boom Lifts (including Bucket Trucks)

i. Base

1) Batteries which power electric lifts may be located in the base and must be maintained, recharged, and/or replaced as necessary. ***Note: Batteries/electric vehicles are recommended as the main power source for indoor use of aerial platforms.***

2) Wheels (tires and rims) and axles must be maintained for proper movement and support. Front wheels are used to steer while rear wheels are used to drive/power the acceleration of the vehicle.

ii. Boom

1) Boom Arm is mechanical appendage used to lift/lower and position the platform. This part contains hydraulic cylinders and linkages, which move depending on function and type.

A. Articulating Boom can bend and extend/retract using multiple sections.

B. Telescopic Boom can extend/retract using nested boxes or tubular sections.

2) *Jib provides an extension of the boom arm to add additional height, positioning, or reach. The jib boom is attached to the platform.*

iii. *Platform*

1) *Anchor points are dedicated tie-off (attachment) locations within the platform used to secure personal fall protection (e.g. lanyard/connector) to the vehicle. There will be multiple points within the platform where anchor points are located for safe use.* ***Note: The anchor point must be rated for the intended use.***
2) *Attachments may be used to hold and secure materials within the platform. Attachments must be approved for use by the manufacturer and properly affixed to the aerial platform.* ***Note: Installation of attachment(s) changes the center of gravity and platform capacity.***
3) *Data plate (or specification plate) provides information to occupants about vehicle limits (e.g. maximum platform capacity).* ***Note: This part must be present, legible, and undamaged.***
4) *Deck is used to support the occupants of the platform, their tools and other materials. Occupants must stand firmly or walk slowly on the deck; sitting on the deck is not allowed. It should be durable, free of debris/defects, and slip-resistant.*
5) *Entry gate attached to guardrails allows access to the platform. Variations may include chain gate; hinged, swing gate; and sliding mid-rail.*
6) *Guardrails (along with toe boards) act as physical barriers around the platform used as fall protection. They may not be used to tie-off operators/occupants to fall restraint/arrest systems.* ***Note: Leaning and climbing on guardrails is strictly prohibited.***
7) *Platform controls are used to activate and move the vehicle by the operator. See B3 for more information on controls and instrumentation.*
8) *Storage container (weather-resistant) is used to store documents including operator manual from the manufacturer, inspection records (e.g. pre-start inspection checklist), and any other required documents.* ***Note: It must not be damaged and its documents should be present (at all times, on the vehicle), legible, and undamaged.***

iv. *Turret*

1) *Counterweights are used to counterbalance the force/weight from the boom, platform, and any weight within the platform from occupants, their equipment (e.g. PPE, personal fall protection), tools, and materials, and attachments to prevent tip-overs. This part is located at the front of the turret.*
2) *Engines and hydrocarbon fuel tanks (e.g. diesel, gasoline, LPG/propane) power certain aerial platforms and their controls.* ***Note: Vehicles using combustion are recommended for outdoor use of aerial platforms to reduce carbon monoxide hazard.***

3) *Ground controls are used to prepare the vehicle for transport (via truck or trailer) and in cases of emergency for assisted rescue. See B3 for more information on controls and instrumentation.*
4) *Housing contains and protects the battery, engine, and internal components. This part is a shell that may be opened to inspect or maintain the vehicle.*
5) *Hydraulic reservoir/components are used to support and move the vehicle in addition to support the elevating mechanism and the platform.* ***Note: Hydraulic fluid should be full when platform is at ground level.***
6) *Turntable is used to support and rotate the turret. The turntable has a related locking pin that prevents rotation during transport.*

c) Scissor Lifts & Vertical Mast Lifts
   i. *Base*
      1) *Batteries which power electric lifts are located in the base and must be maintained, recharged, and/or replaced as necessary.* ***Note: Batteries/electric vehicles are recommended as the main power source for indoor use of aerial platforms.***
      2) *Engines and hydrocarbon fuel tanks (e.g. diesel, gasoline, LPG/propane) power certain aerial platforms and their controls.* ***Note: Vehicles using combustion are recommended for outdoor use of aerial platforms to reduce carbon monoxide hazard.***
      3) *Ground controls are used to prepare the vehicle for transport (via truck or trailer) and in cases of emergency for assisted rescue. See B3 for more information on controls and instrumentation.*
      4) *Hydraulic reservoir/components are used to support and move the vehicle in addition to support the elevating mechanism and the platform.* ***Note: Hydraulic fluid should be full when platform is at ground level.***
      5) *Ladder/steps on side or rear of vehicle is used to access the platform.*
      6) *Wheels (tires and rims) and axles must be maintained for proper movement and support. Front wheels are used to steer while rear wheels are used to drive/power the acceleration of the vehicle.*
   ii. *Elevating Section*
      1) *The elevating mechanism for scissor lifts uses linked crossbars, pivot pins, and scissor lift arms to lift/lower and support the platform.*
      2) *The elevating mechanism for vertical mast lifts are mast rails which are used to lift/lower and support the platform.*
   iii. *Platform*
      1) *Anchor points are dedicated tie-off (attachment) locations within the platform used to secure personal fall protection (e.g. lanyard/connector) to the vehicle. There will be multiple points within the platform where anchor points are located for safe use.* ***Note: The anchor point must be rated for the intended use.***

2) *Attachments may be used to hold and secure materials within the platform. Attachments must be approved for use by the manufacturer and properly affixed to the aerial platform.* ***Note: Installation of attachment(s) changes the center of gravity and platform capacity.***
3) *Data plate (or specification plate) provides information to occupants about vehicle limits (e.g. maximum platform capacity).* ***Note: This part must be present, legible, and undamaged.***
4) *Deck is used to support the occupants of the platform, their tools and other materials. Occupants must stand firmly or walk slowly on the deck; sitting on the deck is not allowed. It should be durable, free of debris/defects, and slip-resistant.* ***Note: Some models may have a deck extension, which changes the center of gravity and platform capacity when extended.***
5) *Entry gate attached to guardrails allows access to the platform. Variations may include chain gate; hinged, swing gate; and sliding mid-rail.*
6) *Guardrails (along with toe boards) act as physical barriers around the platform used as fall protection. They may not be used to tie-off operators/occupants to fall restraint/arrest systems.* ***Note: Leaning and climbing on guardrails is strictly prohibited.***
7) *Platform controls are used to activate and move the vehicle by the operator. See B3 for more information on controls and instrumentation.*
8) *Storage container (weather-resistant) is used to store documents including operator manual from the manufacturer, inspection records (e.g. pre-start inspection checklist), and any other required documents.* ***Note: It must not be damaged, and its documents should be present (at all times, on the vehicle), legible, and undamaged.***

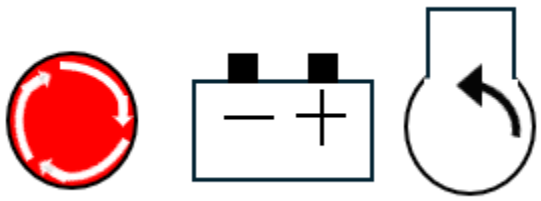


Figure 3a. Control Icons. The figure depicts common control icons found on platform or ground control panels for aerial platforms. The first symbol is that of an emergency stop button, which may be printed directly onto the red button itself, the second is a low battery icon that will appear or illuminate if battery power is low, and the last symbol is commonly used to identify the ignition or engine start function often involving a key.

3. Controls & Instrumentation
    a) For all aerial platforms, familiarize yourself with their controls and instrumentation by visual inspection and reading the operator manual prior to operation.
    b) The controls and instrumentation for an aerial platform to be used are typically found as on a diagram in the operator manual for the vehicle. While most controls are manual (by hand), there may be foot controls as well.
    c) Each model will differ in the layout and inclusion of specific controls and instrumentation. However, most aerial platforms will include the following:
        i. *Boom Control (Boom Lifts) or Elevating Section Control (for Scissor Lift/ Vertical Mast Lift)*
            1) *Controls for up/down (for either vehicle),*
            2) *Controls articulation and extension/retraction, for boom lifts*
        ii. *Brakes*
            1) *Brakes (or parking brake) are spring-applied, electrically released, or hydraulic in nature with the default state being that the brakes are locked or applied when the aerial platform is not in motion or the drive control/joystick is not engaged.*
            2) *When the drive control/joystick is released (returns to neutral), the aerial platform comes to a complete stop.*
        iii. *Deadman Switch (if equipped, when the operator is incapacitated or does not have this control depressed, the equipment stops; may be linked to manual joystick, foot pedal, or other means)*
        iv. *Drive Control/Joystick (for vehicle movement, typically uses trigger to avoid accidental or errant movement)*
        v. *Emergency [Manual] Descent Control (if equipped, to lower platform in case of emergency self-rescue)*
        vi. *Emergency Stop button (pressed to stop aerial platform, turned to right and pulled out to allow movement of aerial platform)*
        vii. *Fuel Selection (if dual powered)*
        viii. *Gauges for monitoring vehicle performance, this may include a combination meter which displays engine and battery gauges, power/fuel gauge, warnings, and other vital information. Indicators may flash or illuminate when there is an emergency stop, overload or tilt sensed or other warning.*
        ix. *Horn (to warn pedestrians and others of movement)*
        x. *Key Ignition Switch (for engine operation)*
        xi. *Platform Control (controls rotation and tilt of platform)*
        xii. *Rate/Speed (for equipment movement/function)*
        xiii. *Master Selector Switch (to switch between ground and platform control panel)*
        xiv. *Turret Control (for rotation direction and speed)*
    d) Each model will have ground and platform controls that include controls found in Step B3c. The Master Selector Switch, as indicated, will be used to switch between these modes, and may be used to switch to the ground controls in case

of emergency. The ground controls are designed to override platform controls in such cases; spotters must always alert the operator in the platform that power is switching to ground controls prior to doing so.

e) Utilities
   i. *If equipped, on-board electrical outlets within the platform may be used for power tools or minor equipment while operating within the platform.*



Figure 3b. Hazard Labels. The figure depicts hazard labels of varying severity and information. All labels should be legible and intact on the equipment. Danger (red) and Warning (orange) labels refer to equipment hazards that may cause serious injury or death, Caution (yellow) represents moderate/minor injury, Instructions (green) refers to safety-related instructions or procedures, and Notice (blue) refers to policies, practices, or rules that are not necessarily safety-related, but should be followed.

4. <u>Symbols & Labels</u>
   a) Near controls and other parts of the aerial platform, there will be symbols and labels that represent the functions and hazards of the equipment. These tend to be standardized, easily-understood signs and symbols, based on shapes and color schemes familiar to equipment operators.
   b) Symbols and labels must be present, legible, and undamaged, or they will be required to be replaced before using the aerial platform.
   c) Types
      i. *Symbols on aerial platforms will typically include*
         1) *Boom and Platform Control (arrows used to show extend/retract, rotate, tilt, up/down);*
         2) *Engine Start/Ignition (uses key or other engine symbol);*
         3) *Fuel/Power Type and Status (shows fuel types based on liquid hydrocarbon fuel or electric);*
         4) *Indications for Vehicle Movement (arrows to indicate direction [forward/reverse], acceleration, braking (if separate), steering, rate/speed [often rabbit for fast/turtle for slow])*
         5) *Master Selector Switch Indicator (uses arrows toward up for platform controls/down for ground controls)*
         6) *Turret Control (uses arrows to indicate rotation or up/down); and*
         7) *Warnings (including deadman switch, emergency [manual] descent control, emergency stop button, and horn).*

      Some examples of these symbols are found in Figure 3a.

ii. *Labels on aerial platforms will typically include those hazard labels found in Figure 3b, with their similar wording and colors.*
    1) *Danger (black/white text on red background) and Warning (black/white text on orange background) indicate a hazard that may cause serious injury or death if not prevented/avoided. Examples of these hazards include crush from moving parts, ejection/fall from the platform, and electrocution.*
    2) *Caution (black/white text on yellow background) indicates a hazard that may cause minor or moderate injury if not prevented/avoided. Examples of these hazards include mild impact/bruising, minor burns or cuts, or pinch.*
    3) *Instructions (white text on green background) indicate instructions or procedures to be followed to maintain safety, such as proper operating conditions for the equipment.*
    4) *Notice (white on blue background) indicates policies or rules that should be followed, but do not directly impact immediate danger or safety concerns. Examples may include operational guidelines or machine functions.*

C. Inspections & Maintenance

1. Periodic Inspections
    a) Frequent and annual inspections shall be performed by a trained individual.
    b) Frequent inspections shall be made every three months (quarterly) or 150 hours of operating time (whichever comes first) on all TU aerial platforms.
    c) An inspection shall be made prior to use if the aerial platform has been out of service for a period longer than three months.
    d) These frequent inspections shall be made by a person qualified (trained) as a mechanic on the specific make and model of the aerial platform. ***Note: The frequent inspection can be a part of a service contract on the aerial platform and/or can be performed by a manufacturer's representative.***
    e) The frequent inspection shall include all items specified by the manufacturer for a frequent inspection and shall include, but not be limited to the following (See Appendix H):
        i. *All functions and their control for speed(s), smoothness, and limits of motion.*
        ii. *Emergency lowering mechanism.*
        iii. *All chain and cable mechanisms for adjustment and worn or damaged parts.*
        iv. *All emergency and safety devices.*
        v. *Lubrication of all moving parts, inspection of filter element(s), hydraulic oil, engine oil, and coolant, as specified by the manufacturer.*
        vi. *Visual inspection of structural components and other critical components, such as fasteners, pins, shafts, and locking devices.*
        vii. *Placards, warnings, and control markings.*
        viii. *Items specified by the manufacturer.*

ix. *Correction of all malfunctions and problems identified and further inspection, if necessary, shall be performed before the aerial platform is returned to service.*
x. *Written documentation of all quarterly inspections shall be kept with the aerial platform and a copy forwarded to EHS.*

f) A person qualified on the specific manufacturer and model of the aerial platform shall make annual inspections. The inspection shall include all items specified by the manufacturer for an annual inspection. ***Note: The annual inspection can be a part of a service contract on the aerial platform and/or can be performed by a manufacturer's representative.***

g) Aerial platforms that are not in proper operating condition shall be removed from service until repaired. A warning tag stating "DO NOT USE" or “DANGER DO NOT OPERATE” shall be attached to the control panel of the aerial platform. Notify EHS.

h) Written records of all inspections shall include the deficiencies found, corrective action taken, the date of the inspection, and the date of the corrective action along with the name of the person(s) performing the inspection and the corrective action. Written records shall be kept with the aerial platform as part of the operating and maintenance manual and a copy sent to EHS.

2. <u>Pre-Operational Inspections</u>

a) Before use each day or at the beginning of each shift, the Supervisor shall visually inspect the aerial platform and conduct a functional test (a checklist shall be utilized for this purpose – See Appendix G) including, but not limited to the following:

i. *Vehicle Components*
   1) *Proper fluid levels (oil, hydraulic, fuel and coolant)*
   2) *Leaks of fluids*
   3) *Wheels and tires*
   4) *Battery and charger*
   5) *Lower-level (ground) controls*
   6) *Horn, gauges, lights and backup alarms*
   7) *Steering and brakes*

ii. *Lift Components*
   1) *Operating and emergency controls*
   2) *Personal protective devices, including fall protection*
   3) *Hydraulic, air, pneumatic, fuel and electrical systems (check for leaks, deficiencies)*
   4) *Fiberglass and other insulating components*
   5) *Missing or unreadable placards, warnings, or operational, instructional and control markings*
   6) *Mechanical fasteners and locking pins*
   7) *Cable and wiring harnesses*
   8) *Outriggers, stabilizers and other structures*

9) Loose or missing parts
10) Guardrail systems

iii. Other Safety devices

iv. Items specified by the manufacturer

b) A completed pre-operational inspection record must be present on the aerial platform during the shift for the operator. The inspection record should be completed at least daily prior to aerial platform use, if not for each shift.
c) If the aerial platform is safe to operate, place the completed inspection record in its holder on the unit during the shift. This serves as a visual notice that no further inspections are required during the shift, and it may be requested at any time.
d) At the end of the shift, turn record in to the Supervisor (each is kept for 5 years).
e) Do not operate any aerial lift if any of the components in Step C2a are defective until it is repaired by a qualified person. Remove defective aerial lifts from service (tag out) until repairs are made, see Step C3 below.

3. Out-of-Service (OOS) or Unsafe Aerial Platforms (Before Use)
   a) If the aerial platform is out-of-service or otherwise unsafe, the operator must note this on the inspection record and notify their Supervisor.
   b) Shut down the equipment and engage all emergency stops. Remove the key and place a DO NOT USE or DANGER DO NOT OPERATE tag on the control panel. If the applicable unit does not use a key, then it must be properly locked out and tagged out to avoid accidental activation. ***Note: Only individuals trained in Lockout/Tagout may use this method.***
   c) Provide the completed inspection record to personnel responsible for repairs or the appropriate vendor.
   d) The Supervisor will file the inspection record once the work order is written.
   e) It is against TU Policy to operate equipment with DO NOT USE or DANGER DO NOT OPERATE tag.

4. Maintenance
   a) A preventive maintenance program shall be established for each aerial platform in use at TU, by the maintenance supervisor responsible, in accordance with the manufacturer's recommendations.
   b) REPLACEMENT PARTS - When parts or components are replaced, they shall be identical or equivalent to the original aerial platform parts or components.
   c) MAINTENANCE SAFETY PRECAUTIONS - Before adjustments and/or repairs are started on an aerial platform, the following precautions shall be taken as applicable:
      i. The platform shall be lowered to the full down position, if possible, or otherwise secured by blocking and cribbing to prevent dropping.
      ii. All controls shall be in the "off" position and all operating features secured from inadvertent motion by brakes, blocks, or other means.

iii. *The equipment shall be stopped, de-energized and locked out to prevent inadvertent activation or starting.*
iv. *Hydraulic oil pressure shall be relieved from all hydraulic circuits before loosening or removing hydraulic components.*
v. *Safety props or latches shall be installed where applicable as described by the manufacturer.*

Any additional precautions specified by the manufacturer shall be followed.

D. Pre-Operational Procedures

1. Before authorizing an individual to operate an aerial platform, the Supervisor shall:
   a) Ensure that everyone who will be working on the aerial platform has been properly trained on this procedure, the operator manual of the specific type of aerial platform to be used, and that this training has been properly documented.
   b) Determine that the manufacturer, within the scope of the intended applications, defines the purpose for which the aerial platform is to be used.
   c) Provide approved fall protection devices and other safety gear (e.g. PPE) for all individuals who will be working on the platform (if applicable). The scissor lifts and vertical mast lift (e.g. JLG lift, Genie Lifts, and Upright Airlift) do not require a harness and lanyard; however, appropriate guardrails shall be in place at all times to provide fall protection.
   d) Inspect the work area where the aerial platform is to be used for possible hazards, which must be corrected prior to work. Hazards will include, but are not limited to:
      i. *Drop-offs, holes, or unstable surfaces such as loose dirt.*
      ii. *Bumps, ditches, slopes, or floor/ground obstructions (including debris).*
      iii. *Overhead obstructions (including power lines) and high voltage conductors.*
      iv. *Hazardous locations and atmospheres.*
      v. *Inadequate surface and support to withstand all load forces imposed by the aerial platform in all operating configurations.*
      vi. *Wind and weather conditions (if outside). ISO standards recommend a maximum wind force (wind gusts) of 28 miles per hour.*
      vii. *Other possible unsafe conditions.*
      viii. *Presence of unauthorized persons.*
   e) Inspect the aerial platform to be used as stated in Step C2. If problems are found or unusual sounds are heard, they should be reported and the aerial platform not operated until repairs are completed.
   f) After identifying the hazards and planned control measures, a written work plan or procedure should be created and communicated to all personnel involved including rescue plans.

2. Prior to operating an aerial platform, the Employee shall:
   a) Ensure that the pre-operational inspection has been completed by Supervisor and that the inspection form is onboard the aerial platform to be used.

b) Inspect the work area where the vehicle is located and where it will travel for obstructions, defects, and other hazardous conditions as mentioned in Step D1d.
c) Be aware of your surroundings and pedestrians.
d) Know pedestrian paths and entryways.
e) Wear all appropriate personal fall protection and other PPE for the specific task.
f) No use of drugs or alcohol prior to use of the aerial platform.

E. Operational Procedures

The aerial platform shall be operated in accordance with this procedure.

1. Safety Requirements
   a) Only authorized individuals (e.g. those who have been properly trained and certified) shall operate an aerial platform/lift, extensible boom platform, aerial ladders, articulating boom platforms, vertical towers, ladder trucks, tower trucks, or any combination of such devices.
   b) All operators and workers who are to perform work from any aerial platform shall be trained on this procedure and on the operating manual of the specific device which is to be operated or work performed from.
   c) Individuals who are scheduled to perform routine maintenance, inspections, or to repair any aerial platform shall have received training or possess appropriate knowledge on this procedure and on the operating manual of the specific device PRIOR to performing any work on that device. ***Note: Operating and maintenance manuals should be obtained from the manufacturer of the aerial platform.***
   d) A copy of the operating manual, maintenance manual, and the log of inspections shall be kept with each aerial platform, the department which owns the equipment, and forwarded to EHS. These documents are considered an integral part of the aerial platform and are vital to communicate necessary safety information to users and operators.
   e) No aerial platform shall be modified or altered without the modifications or alterations being approved and certified in writing by the manufacturer. Records of all approved modifications and alterations, including written authorization from the manufacturer for the modification or alteration, shall be kept with the aerial platform as part of the operating and maintenance manual, the department that owns the equipment, and forwarded to EHS. The altering or disabling of interlocks or other safety devices is prohibited.
   f) All manufacturer safety bulletins shall be complied with as received from the manufacturer or dealer. Copies of these bulletins shall be kept with the aerial platform as part of the operating and maintenance manuals, with the department that owns the equipment, and forwarded to EHS.

2. Precautions (Supervisor)

   The supervisor shall direct the operator to ensure the following before each elevation of the platform:
   a) That the aerial platform is operated on a surface within the limits specified by the manufacturer.

b) That the outriggers, stabilizers, extendable axles, or other stabilizing methods are used as required by the manufacturer. They must be stowed when not in use (i.e. during transit or while parked and unattended) and only deployed during operation of the platform/bucket after the equipment is in place.
c) That no loose hoses, cables, or tools are trailing or hanging from the equipment.
d) That the guardrails are installed, and access gates or openings are closed, per manufacturer instructions.
e) That the load and its distribution on the platform and any platform extension are in accordance with the manufacturer rated capacity for that specific configuration.
f) That there is adequate clearance from overhead obstructions.
g) That the minimum safe approach distances (MSAD) to energized power lines and parts are maintained. See Appendix J. (Ref. ANSI/SIA A92.6-1999.)
h) That all safety precautions defined in this procedure and the Operating and Maintenance Manual for the specific model of aerial platform being used are followed during the operation of the aerial platform.
i) That all individuals maintain a firm footing, with both feet, on the platform floor while working thereon. The use of planks, ladders, or any other device on the aerial platform for achieving additional height or reach is prohibited.
j) Special precautions shall be taken when other moving equipment or vehicles are present to comply with local ordinances or safety standards established for the workplace. Warnings such as but not limited to the following: flags, roped off areas, flashing lights, and barricades shall be used.

3. <u>General Guidelines</u>
   a) Use three-point contact to enter/exit the platform (two hands and one foot <u>or</u> one hand and two feet, while facing the platform).
      i. Properly anchor yourself at the designated anchor point on the platform (e.g. atop the guardrail near the control panel) upon entering the platform through the access gate and close/secure the gate after entry. Employees must be anchored to their own aerial platform by personal fall restraint (e.g. safety harness lanyard) to the designated anchor point on the platform.
      ii. When ready to exit, the platform must be completely lowered, with the engine off. Open the access gate and disconnect your lanyard with the anchor point immediately before stepping onto the ground.
      iii. Never jump or climb from the platform.
   b) Occupants (operators and any assistants) in the platform may not sit, stand, nor climb on the rails of or edge of the basket of the aerial platform. Never lean over the guardrails of the platform. Occupants in the platform must always keep both feet firmly on the floor of the platform (e.g. basket/bucket) and should avoid standing on the same side of the platform to maintain balanced weight.
   c) Wear the appropriate personal fall protection and PPE and remain properly mounted (i.e. standing inside/behind guardrails on floor of platform), or if on the ground, standing directly in front of the ground controls.

d) All body parts (hands, arms, head, feet, legs, etc.) are to be kept inside the platform, within the guardrails, while the aerial platform is moving, whether. Never allow someone to put their limbs near the moving mechanisms on the aerial platform while it is in operation (moving or at rest).
e) Pay attention to all warning labels and safety decals attached to the aerial platform.
f) Do a 360° look around you before moving.
g) Note and follow all traffic signs.
h) No horseplay is allowed. No cell phones or other distractions allowed while operating the aerial platform.
i) Take breaks as necessary to avoid fatigue.
j) Never allow anyone to stand on or ride the aerial platform outside the protection of the guardrails of the platform (e.g. basket/bucket). Some platforms are designed for multiple personnel within the platform, and each individual must be properly anchored if the vehicle requires it.
k) Aerial platforms shall not be used for any purpose other than what they were designed. Review the operator manual to confirm appropriate use.
l) Aerial platforms shall not be started or any of its functions or attachments operated from any position other than from the designated operator position.
m) Unauthorized use is prohibited and means shall be used to protect against use by authorized person(s).
n) Be aware of your blind spots. Lifts may create large or shifting blind spots as the platform moves. The floor of the platform and boom arm obstructs views below, below it, the base/turntable, outriggers, and wheels may obstruct views depending on their distance away from the platform or its angle, and as the boom arm extends, rises, or swings, the blind spot will shift. For this reason, you may use spotters during movement (rotation)
o) Shutdown of the Aerial Platform (Due to Inoperability or Malfunctions)
    i. *The operator shall cease operation of the aerial platform in case of any suspected malfunctions, any hazard, or potentially unsafe conditions that may be encountered.*
    ii. *The operator shall immediately report any problems or malfunctions that become evident during operation of the aerial platform to the supervisor.*
    iii. *Notify EHS.*
    iv. *The aerial platform and/or the work area shall then be inspected, and any malfunction or problem shall be corrected before further operation of the platform.*

u) The operator shall take care to prevent rope, electric cords, hoses, etc., from becoming entangled in the aerial platform.
v) Aerial platform rated capacities shall not be exceeded when loads are transferred to the platform at any height. Capacity and stability will be discussed further in Step E6.

w) The operator shall ensure that the work area surrounding the aerial platform is clear of personnel and equipment before lowering the platform. A spotter may be useful for this purpose as well.
x) Towing or Long-Distance Hauling (of aerial platform equipment):
    i. *Check operator manual for specific information about transport vehicles, proper stowing and restraints, locking parts, chocking, and any coupling or disengagement of parts that are required to prevent accidental damage or movement.*
    ii. *For ladder trucks/tower trucks: Before the truck is moved for highway travel, aerial ladders shall be secured in the lower traveling position by the locking device above the truck cab, and the manually operated device at the base of the ladder, or by other equally effective means (i.e., cradles which prevent rotation of the ladder in combination with positive acting linear actuators).*
    iii. *For boom lifts: Before moving an aerial platform for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position.*

4. <u>Personal Protective Equipment (PPE)</u>
    a) A protective helmet, eye protection, hearing protection, high visibility safety vest, work gloves, long pants, and foot protection are all appropriate general PPE for aerial platforms use.
    b) Climbers shall not be worn while performing work from an aerial platform.
    c) Personal fall protection (e.g. personal fall arrest system or fall restraint system) shall be used within an aerial platform that requires it and allows for proper anchoring.
        i. *These systems must have proper anchorage (anchor point) on the platform, body harness fitted and worn by the worker, an appropriate connector (e.g. lanyard) that attaches to both the anchor and the body harness (dorsal D-ring, according to manufacturer specifications).*
            1) *Never anchor to guardrails, mid-rails, or external structures outside the lift.*
            2) *Do not attach connector to side D-rings as this does not provide proper fall arrest.*
            3) *Side D-rings on a body harness may be used for tool tethers to prevent falling object hazard or if configured properly and allowed by manufacturer, travel restraint.*
        ii. *In the case of personal fall arrest system use, a post-fall rescue plan is required.*
        iii. *For smaller platforms (e.g. bucket), are best for fall restraint systems to be used.*
        iv. *For larger platforms where the operator is expected to move to a different area within the platform, active fall arrest systems with the shortest necessary length is to be used. Alternatively, a fall restraint system (e.g. body harness and lanyard) may be used if working at lower heights or where there*

is not enough fall clearance for the operator (i.e. greater risk of striking the ground or a lower level below the platform.

v. *As referred to in Step D1c, scissor lifts and vertical mast lifts do not require personal fall protection per OSHA, if guardrails (required to be 42 or more inches in height) are present and in adequate condition; however, manufacturers may require its use, depending on the specific model used. Also, if a guardrail is removed, damaged, missing, or if you must step outside or lean over the rails while elevated, a personal fall arrest or restraint system is required.*

5. Fall Protection
   a) Ensure that access gates or openings are closed.
   b) Stand firmly on the floor of the bucket or lift platform.
   c) Use a body harness with a lanyard attached to the boom or bucket. Do not tie-off or belt-off to adjacent poles or structures; never anchor to guardrails, mid-rails, or external structures outside the lift. Adjust the lanyard to a length that avoids ejection, if it is adjustable.
   d) The occupants of the platform must always be attached to the anchor point at all times while within the platform (as in Step E4b).
   e) Personal fall protection may only be used with an aerial platform if the anchor point on the platform is rated for its use by the manufacturer. Anchor points must be rated for the specific protection being used (i.e. rated for fall restraint use and/or rated for active fall arrest system). A personal fall arrest system may be used. It is recommended to use fall restraint to remain within the platform and avoid the fall hazard altogether.
   f) Do not climb on or lean over guardrails or handrails.
   g) Do not use planks, ladders, or other devices as a working position.

6. Turning On/Off Aerial Platform
   a) Start the engine
      i. *Pull or twist up the emergency stop to the "on" position.*
      ii. *Insert the key into the control station and turn the key switch to the desired mode.*
         1) *Turn the key toward the ground control position, if the aerial platform is operated from the base (which is located on the ground or lower level).*
         2) *Turn the key toward the platform control position, if the aerial platform is operated from the platform/bucket (which is the upper level of the equipment).*
      iii. *If the machine has a hybrid, electric, or gas/diesel engine selector switch, toggle it to your required power setting.*
      iv. *Press and hold the engine start toggle or push the ignition button (often marked with a start symbol or lightning bolt) until the motor or system engages. Audible alarms or indicator lights may confirm start-up depending on the model.*

v. *Press and hold the deadman/function enable switch located on the joystick, control handle, or lower panel while operating any boom or drive functions.*
vi. *The aerial platform will automatically disengage the parking brake when the operator initiates a drive or travel function. The parking brake will re-engage automatically when the drive function (or joystick) is released or if the machine is turned off.* ***Note: The default state of the platform at startup/idle is for the parking brake to be locked. Manually disengaging the parking brake (using a brake release switch or freewheeling valve) is strictly intended for emergency towing or winching while the machine is powered off and chocked—never for normal operation or immediately after startup.***
vii. *Consult the operator manual for specific control layouts on aerial platforms.*

b) Shut off the engine (to park)
   i. *Lower the platform/boom slowly and carefully until it reaches the fully stowed or down position.*
   ii. *Move all function and master switches on the platform (and ground control panel) to the "off" position.*
   iii. *Turn the key switch to the off position to stop the engine or disconnect the main battery/power source.*
   iv. *Apply the parking brakes (older equipment, newer models will automatically re-engage parking brake), stow or retract outriggers/stabilizers if used, and use wheel chocks if parked on an incline.*
   v. *Remove key.* ***Note: Lock out the power if performing maintenance on the aerial platform.***

7. <u>Aerial Platform Steering & Maneuvering</u>
   a) The operator shall observe all traffic regulations and under normal traffic conditions, keep to the right.
   b) Operators shall slow down and sound the horn at intersections, aisles, blind corners, and other locations where vision is obstructed, including when backing up.
   c) The operator shall adhere to the following actions when traveling in reverse:
      i. *Verify drive orientation*
         1) *Boom lifts can rotate 360 degrees. If the boom is rotated past the rear drive wheels, your control joystick actions will be reversed.*
         2) *Check the color-coded directional arrows and drive orientation indicator.*
         3) *You must engage the drive orientation override switch while moving the joystick in the direction corresponding to the chassis arrows.*
      ii. *Lower and retract the platform/boom fully.*
      iii. *Look in the direction of travel, pivot your body and face the path. Never solely rely on mirrors or other backup tools. Maintain direct line of sight.*
      iv. *Check clearances above, below, and to the sides of the aerial platform continuously. Avoid ground hazards.*

v. *If your view is obstructed by the structure, boom geometry, or materials, do not reverse blindly. Use a spotter to guide you using hand signals or other approved communications.*
vi. *Sound the horn to alert any pedestrians that may or may not be visible.*

d) The operator must keep a clear view of the path of travel and observe for other traffic, personnel, and safe clearances. Ensure that there is enough clearance to avoid striking objects. A spotter may be used on the ground if there are blind spots. For boom lifts, if there are obstructions to the forward view, the operator may travel with the turntable trailing.
e) Always look for obstacles or pedestrians in your blind spot. Blind spots can be created by the guardrails, platform floor, boom, or base.
f) Under all travel conditions, the operator shall limit travel speed according to conditions of ground surface, congestion, visibility, slope, locations of personnel, and other factors causing hazards of collision or injury to personnel.
g) Orientation of the aerial platform matters. Check the chassis directional arrows against your platform controller. For example, rotating the turret on boom lifts can reverse the functional response of your joystick relative to the wheels.
h) Power. Aerial platforms may be two-wheel drive or four-wheel drive.
i) Steering. Most aerial platforms steer from the front axle only. However, four-wheel drive may be available on some models, and may have multiple steering modes as follows:
    i. *For Boom Lifts, modes for steering include circle (front/rear wheels steer in opposite directions), crab (front/rear steer in same direction), front (front wheels steer only), and rear (rear wheels steer only).*
    ii. *For Scissor Lifts, modes for steering include circle (front/rear wheels steer in opposite directions), crab (front/rear steer in same direction), and front (front wheels steer only).*
j) Stop the aerial platform before raising or lowering the platform, or extending or retracting the boom, if equipped.
k) Do not drive with the lift platform raised/elevated (unless the manufacturer's instructions allow this). For boom lifts, do not drive or reposition the lift while elevated or its boom is extended/turned. Always operate on sturdy surfaces, and for scissor and vertical mast lifts, surfaces must always be level before raising the platform.
l) Never lift workers on an unapproved platform. Never go below a raised platform or allow anyone else to.
m) PLATFORM POSITIONING: The aerial platform shall not be positioned against another object to steady the platform.
n) MIS-USE AS A CRANE: The aerial platform shall not be used as a crane.
o) Operating Area: The aerial platform shall not be operated from a position on trucks, trailers, railway cars, floating vessels, scaffolds, or similar equipment, unless the application is approved in writing by the manufacturer.
p) Do not carry objects larger than the platform.

q) Do not operate lower-level controls unless permission is obtained from the worker(s) in the lift (except in emergencies).
r) Do not exceed vertical or horizontal reach limits.
s) Do not operate an aerial lift in high winds above those recommended by the manufacturer.
t) Do not override hydraulic, mechanical, or electrical safety devices.
u) Do not attempt to clean, oil, or adjust a machine while it is in motion. Do proper maintenance and housekeeping to remove materials (e.g. conductive materials) from platform only when it is safe to do so.

8. <u>Capacity & Stability</u>
   a) Stability of the aerial platform depends on leverage, the center of gravity (COG) of the base of the aerial platform or the combined center of gravity of both the platform/load and the base of the aerial platform, movement of the equipment or its parts, and addition of attachments.
      i. Leverage is force exerted by a lever on a fixed point (fulcrum). Force may be exerted on either side of the fulcrum, either as load or effort.
         1) In the case of a boom lift, the load is the platform, while the base/boom provides the effort (in part due to the counterweight), and the fulcrum is the wheel track that is in between these areas. When these forces are equal and at an equal distance from the fulcrum, the lever is balanced; if the forces are unequal or not the same distance away, the greater force will determine how the vehicle moves.
         2) In the case of a scissor lift, the lift has weight at each end, with the front wheels acting as the fulcrum. If there is an extension on one side, the force will increase on that end.
      ii. Center of gravity (COG) is the point where the mass of the object (aerial platform) is equally distributed in all directions and the act of force on parts of the vehicle affects where this point will be.
         1) Both the platform and the base of the aerial platform unit have centers of gravity. Together, these points are taken as a combined center of gravity and the vehicle is treated as one object.
         2) If the combined center of gravity for the aerial platform is balanced (stable), the aerial platform is supported.
         3) Factors that affect center of gravity are load weight (the center of gravity's front to back component tending to move toward the load), the load balance (the center of gravity's side-to-side component, moving the load toward the side where the load is heavier), and the load height (the center of gravity's vertical component tends to move toward the load where it is highest). Each of these properties relate to the location for the platform, boom, and base for the aerial platform.
         4) Extending the boom arm for boom lifts, moving/swinging/tilting the platform, raising the platform for boom lifts (raising scissor lift or vertical mast lift), or swinging the base (turret) around the chassis or positioning

the turret sideways may each move the COG away from the vehicle, making it less stable.

5) *Outriggers, stabilizers, and extendable axles increase vehicle stability by extending the pivot point (fulcrum), decreasing tipover potential, and providing for a larger acceptable range for the COG to remain stable based on their exact footprint (see Figure 4, not to scale).*

b) Figure 4 represents stability as an imaginary rectangle that illustrates limits on aerial platform movement with respect to the center of gravity, particularly, the acceptable range for the center of gravity to avoid tipping. As illustrated, the front and rear axles represent tipping lines along their tracks as two legs of the rectangle, the other two legs are lines drawn from the ends of the front and rear axle (wheelbase) as additional tipping lines to close the rectangle. If the combined center of gravity remains within the rectangle, the equipment should remain stable.

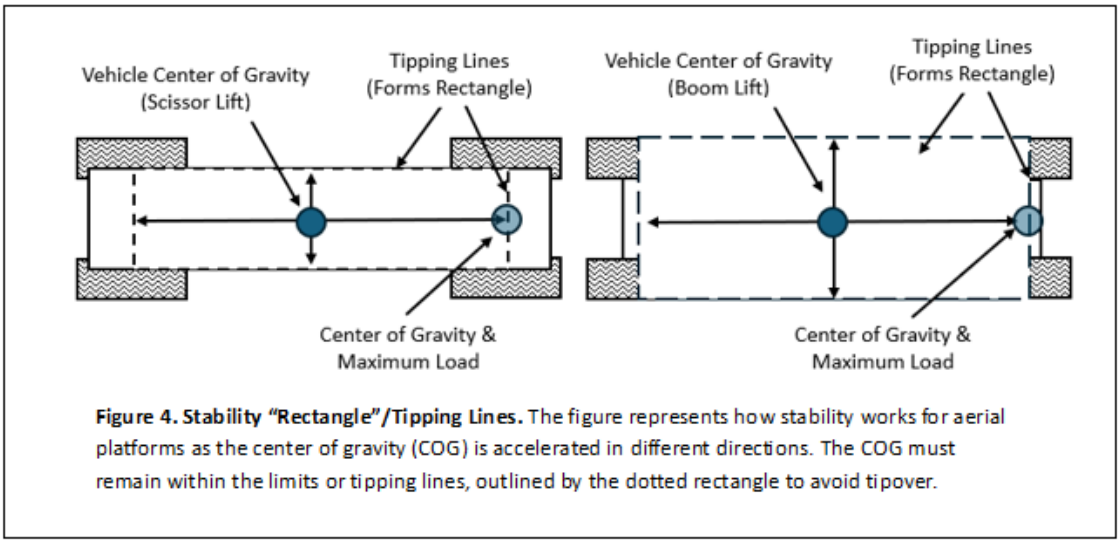


Figure 4. Stability "Rectangle"/Tipping Lines. The figure represents how stability works for aerial platforms as the center of gravity (COG) is accelerated in different directions. The COG must remain within the limits or tipping lines, outlined by the dotted rectangle to avoid tipover.

c) A stable vehicle will have a low center of gravity that keeps towards the center of the aerial platform. This will typically have the platform upright and at its lowest height, and the boom (if applicable) will be completely retracted and centered opposite the counterweight for the aerial platform.

d) Any sudden bump, turn, tilt, start, stop, or reverse travel can make the aerial platform less stable or tip it over. Inclined or uneven surfaces move the center of gravity in the downward direction (because of gravity). Momentum is a greater factor when the equipment is in motion which means the weight, direction, and speed of the load matter. Acceleration moves the center of gravity to the rear, while with deceleration towards the front toward the load. A turn moves the center of gravity toward the outside (or opposite direction of turn), the faster or sharper the turn, the more unstable it becomes. A tire dropping four inches can generate two feet of boom sway, while six inches causes 3 feet of sway. Boom sway is a form of tilt and recoil by the boom and platform (bouncing).

e) Figure 5 shows the separate centers of gravity for the platform and for the base, as well as the combined center of gravity. When the combined center of gravity is not in aligned with the vertical stability line or line of action, the vehicle becomes unstable and can tip over.

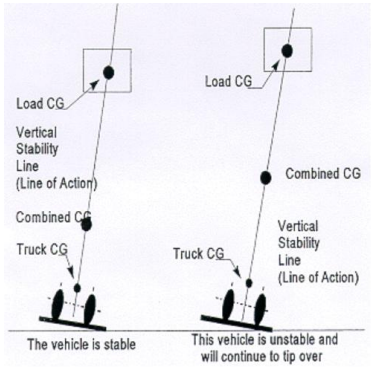


Figure 5. Vehicle Line of Action. The figure represents two examples of line of action, one vehicle is stable and the other unstable. When the line of action falls outside the stability triangle, the vehicle is at risk of tipover.

f) The data plate (or specification plate) is permanently affixed by the manufacturer near the ground controls for a boom lift or on the chassis frame of the scissor lift (typically near the entry ladder or ground controls) and is made of metal. It will display the following information:
   i. Equipment Identification (e.g. manufacturer, model/serial numbers, year of manufacture)
   ii. Power/Fuel Specifications (e.g. voltage, battery/fuel type, pressure limits)
   iii. Operational Limits & Capacity (e.g. maximum platform/lift capacity, maximum occupant limit, maximum platform height, maximum horizontal reach, maximum allowable wind speed, maximum manual force)
   iv. Physical & Environmental Constraints (e.g. gross vehicle weight, maximum slope, maximum wheel load)
   v. Standard Compliance (e.g. certification markings)

   Do not use the forklift, if the data plate is damaged, illegible, or missing.

g) Maximum Platform Capacity & Maximum Wheel Load
   i. The maximum platform capacity and maximum wheel load for the vehicle are listed on the data plate.
      1) The maximum platform capacity is the designed carrying capacity of the aerial platform specified by the manufacturer, and it includes the total combined weight of all personnel, personal gear, tools, equipment, materials, and attachments brought onto the platform. Never exceed this weight for the platform.
      2) Only use manufacturer-approved attachments; attachment addition will reduce available platform capacity as its weight must be taken into account. Do not modify attachments without written approval from manufacturer.

ii. The maximum wheel load for the aerial platform is the minimum weight capacity requirement that a floor must be able to sustain, whether entering a trailer or driving over any surface, to avoid falling through, causing injury or damage. This quantity takes into account the full platform capacity and vehicle weight combined and also takes into account the dynamics of leverage and distribution of weight. For example, when the boom extends, elevates, or rotates, the center of gravity shifts, this in turn, places more weight on a specific wheel or outrigger on the loaded side, not evenly across all wheels. External forces such as wind or manual push by operator on an adjacent wall also contribute to this shift, potentially. Each of these factors increases the maximum load a single wheel must bear to remain stable.

iii. Always make sure trailer wheels are chocked to avoid creeping or shifting during aerial platform movement. Trailers must be chocked so they do not pull away from the dock while the aerial platform enters it.

h) Set outriggers on pads or on a level, solid surface, if applicable to the equipment being used and set brakes when outriggers are used. Outriggers should never be placed on soft or unstable soil/floor, obstructions, (e.g. manhole covers), or slopes unless the manufacturer has designed it to do so.

i) Use wheel chocks on sloped surfaces when it is safe to do so.

j) Weather such as high wind also impacts stability, so avoid aerial platform use under these conditions.

k) Working Envelope

i. The working envelope of an aerial platform is the total three-dimensional space or range of motion that the platform can physically reach. The key components of this envelope are the maximum height, which is the highest vertical point to which the platform can elevate, the horizontal outreach or how far away from the center and base of the vehicle the boom can extend, and the range of motion is the shape on a manufacturer's reach chart, showing all safe accessible coordinates for that equipment (which may be shaped like an arc or sawtooth geometric shape). Also note that the maximum working height is the maximum platform height plus the 6-foot allowance for human reach.

ii. The envelope is restricted by total aerial platform weight, counterweights, and tip-over physics. Reaching too far out at a low angle creates forward instability, while high vertical angles or retracted towers can cause different stability limits. Many lifts allow heavier loads in the platform with operators and tools only when operating inside a restricted, tighter portion of the working envelope. Modern aerial platforms use onboard sensors and computers to automatically monitor boom position and prevent the operator from pushing past safe boundaries.

l) Dual Capacity

i. Some aerial platforms are considered dual capacity aerial lifts, which may also be called extra capacity or dual-zone lifts. These are aerial platforms

engineered to automatically adjust their working envelope and maximum platform based on weight.

9. Parking
    a) Precautions
        i. *Never block emergency exits or access to emergency equipment such as fire extinguishers, eyewashes/safety showers, first aid kits, or electrical panels.*
        ii. *Never leave a platform elevated when parked or unattended.*
            1) *Under the best conditions, the hydraulics can shift over time and lead to a tip over.*
            2) *Leaving the platform in a raised position puts additional strain on the hydraulic components for the scissor or boom.*
            3) *If parked outdoors with the platform elevated, wind shear, ground settling, or accidental bumping from other vehicles may cause the equipment to tip-over, or objects in the platform may fall.*
            4) *Return the aerial platform to its fully stowed and lowered position before parking or leaving it unattended.*
        iii. *Do not block entryways or heavy traffic corridors if it can be avoided as there is the potential for unsuspecting pedestrians to be harmed. Do not block other vehicles when you park.*
        iv. *Always park away from flammable or combustible materials as vehicles may have a hot exhaust system which releases hot gases, either of which can ignite such materials.*

    b) General Guidelines for Aerial Platform Parking
        i. *Park the aerial platform in a safe well-lit area.*
            1) *Park in a low-traffic, well-ventilated area, away from vehicles, other traffic, or active work areas.*
            2) *Avoid parking near hazardous locations where there is open flame, sparking, flammables, etc.*
            3) *Ensure that there is clearance to lower/retract the platform with no obstructions such as wires, pipes, or protruding wall or ceiling fixtures.*
            4) *For LPG/Propane-powered equipment, avoid parking near pits, basements, or drains as vapors are heavier than air.*
        ii. *Clear the area below the platform of personnel, other vehicles or equipment, tools, and debris.*
        iii. *Fully lower, retract, and center the boom or platform completely to the stowed position to ensure stability and a low center of gravity.*
        iv. *Retract and stow any outriggers or stabilizers, if applicable.*
        v. *Park on flat, level ground whenever possible.*
        vi. *The parking brake should automatically re-engage once drive control or joystick is not moved.*

vii. *Place wheel chocks against the tires for the aerial lift to prevent rolling, especially if the vehicle is parked on an incline/slope. Avoid parking on steep grade or soft ground.*
viii. *Turn off the emergency stop for the platform controls and then for the ground controls <u>OR</u> turn off the platform and ground controls (return all control switches and joysticks) to the "off" or neutral position. For some machines, this means turning the Platform/Ground select switch to "off" (center) position.*
ix. *Cover the platform control panel if necessary to shield instruction placards, warning decals, and joysticks from harsh weather or rain.*
x. *For LPG/Propane-powered aerial platforms (for gasoline/diesel/electric, go to the next Step):*
    1) *Close the tank valve first: While the engine is still running, tightly close the manual valve on top of the LPG/propane gas cylinder.*
    2) *Let the engine starve: Allow the engine to run until it naturally sputters and dies. This burns off all remaining gas left in the fuel lines and regulator, minimizing leak risks.*
xi. *Turn off the vehicle and remove the ignition key to prevent unauthorized use.*
xii. *Detach any fall restraint device from the anchor point and exit the platform through its gate. Maintain three points of contact when dismounting the machine.*
xiii. *Place physical safety barriers around the perimeter of the aerial platform in areas where there is pedestrian or vehicular traffic or if the shift is over, remove caution tape, safety cones, and warning signs from the immediate workspace.*

10. <u>Workplace Guidelines & Procedures</u>
    a) Ground Spotter
        i. *Spotters shall have the same training as an aerial platform operator; be familiar with the aerial platform being used, its hazards and capabilities; and be knowledgeable about the work site and its potential hazards.*
        ii. *Spotters shall use PPE, including high-visibility safety vest, so that the operator and pedestrians can easily see you. The spotter must always be visible to the operator.*
        iii. *Spotters shall always stand in a safe area and safely position themselves outside the travel path of the aerial platform and its pinch points (never between the equipment and a fixed object or another machine). When moving to reposition, always walk forward with eyes remaining on path, never walk backwards.*
        iv. *Use of a ground spotter or spotter is the best way to guide an aerial platform operator away from hazards and traffic, including pedestrians, during travel and while stationary in the work area (See Step E10g).*
            1) *Spotters will guide the aerial platform operator using the established route plan and communicate when there is an obstruction or other issue.*

2) *Spotters redirect traffic away from the aerial platform that may enter its operating radius or its blind spots.*
3) *Spotters identify overhead hazards (e.g. ceiling clearance, protruding obstructions), defects in the floor/ground, or nearby environment that imperil the aerial platform and its operator.*
4) *Spotters observe vehicle operation, reach, and range that may become hazardous for the vehicle, its operator, the facility, or bystanders.*
5) *Spotters shall recognize hazardous equipment conditions when the operator must pause/stop operation and exit the aerial platform.*

v. *Spotters will help to establish safe work areas with proper signage or barriers for the aerial platform to operate when required.*
vi. *Spotters must have dedicated focus to the aerial platform and its operator during operations.*
1) *The spotter must not have any other assigned duties nor be distracted in any way.*
2) *The spotter must be in constant visual, verbal, or radio contact with the operator with an established communications plan, involving two-way radio or agreed-upon and understood hand signals.*
3) *If a hazard arises such as communication fails, loss in visibility, pedestrian enters work zone, hazardous obstruction or other condition, work should stop immediately and the spotter must alert the operator to stop.*

vii. *Spotters will understand how to use ground controls and emergency descent systems for the aerial platform in case of emergency. Spotters shall provide assisted rescue or contact rescue services if the aerial platform and/or operator become incapacitated.*

b) Establish a Route Plan
i. *When operating an aerial platform, there should be an agreed upon route plan known and understood by the supervisor, operator, and spotter (if present). A route plan establishes where the aerial platform may safely travel and avoid most obstructions.*

c) Carbon Monoxide/Exhaust
i. *For internal combustion engines, which include LPG or propane, gasoline, and diesel engines, their exhaust results in the release of carbon monoxide, a poisonous gas that can easily build up in enclosed areas, especially if the vehicle is running continuously. This is another reason why you should turn off the aerial platform when it is unattended or not in use.*
ii. *Idling while riding an aerial platform is still producing combustion and exhaust (unless electric, battery-powered).*
iii. *Carbon monoxide is colorless, odorless, and tasteless, so it may not be obvious that it is present. It is best to use adequate ventilation with aerial platform use indoors. Opening bay doors or use of large fans or ventilation units may also be useful here.*

iv. *Carbon monoxide can be deadly. Early poisoning symptoms include dizziness or confusion, fatigue or weakness, headache, nausea, shortness of breath, and sleepiness. If you are feeling any of these symptoms, park the aerial platform and remove yourself to go outside to get fresh air. Call 911 and let your Supervisor know.*

d) Surface Conditions
   i. *Forklifts need smooth, level surfaces for safe operation. Make sure that your intended path is clear.*
   ii. *Dirty, rough, and uneven surfaces make the aerial platform unsteady. Look for any issues with warehouse floors, trailers, docks, the ground, or road surfaces.*
   iii. *Watch for loose materials (debris), open or loose drainage channel covers, posts, or gratings.*
   iv. *Ice, oil, sand, snow, and water can cause loss of control. Keep the driving surface clean and dry, remove hazards or obstacles quickly, if possible. The operator is responsible for cleaning up all fluid leaks (oil, hydraulic, transmission, etc.) from the floor.*
   v. *Steer to avoid surface obstructions, if you cannot clean them. If impossible to avoid them (wet road, for example), proceed with caution and go over them slowly. Good housekeeping and surface maintenance will keep you safe.*

e) Equipment Infrastructure
   i. *Hazards from infrastructure include obstructions such as overhead or protruding fixtures such as pipes, sprinklers, and hanging lights indoors. These can come from the ceiling or from walls. Outdoors, this would include overhangs, overhead doors, and power lines as examples. Make sure that the forklift has clearance. Do not position aerial lift between overhead obstructions if possible.*
   ii. *Always stay at least 10 feet away from high voltage equipment and power lines to avoid an electrical arc. Ensure electric utility workers de-energize power lines in vicinity of work; always treat power lines as energized.*
   iii. *Narrow aisles present a hazard for maneuvering. Give yourself enough room to lift the platform or extend/swing the boom.*
   iv. *Use the right equipment for the job.*
   v. *Check maximum platform capacity prior to use and check clearances and beware of surrounding racks prior to moving.*

f) Load Composition and Stability
   i. *Do not carry loose or unstable loads as this can cause a tip-over or loss of the load.*
   ii. *Never exceed the maximum platform capacity (also known as the manufacturer's rated workload or safe working load) for the aerial platform.*

1) *This is the designed carrying capacity of the aerial platform specified by the manufacturer, and it includes the total combined weight of all personnel, personal gear, tools, equipment, materials, and attachments brought onto the platform.*
2) *These exact limits are stamped on the aerial platform data plate (specification plate) and detailed in the specific operator manual for the aerial platform.*
3) *Always verify the capacity before loading anything onto the platform.*
4) *The total load weight should be known or calculated. Overloading the platform can cause a tipover.*

iii. *Carry all loads within the platform.*
1) *Do not drag loads along the surface, as this may damage the equipment or the surface, cause a sparking hazard, or a tipover.*
2) *Do not use the guardrails to carry loads or for overhang. Never rest heavy panels, pipes, or lumber on top of the guardrails unless using a manufacturer-approved attachment (e.g. panel cradles, mesh kit, or pipe racks).*
3) *Secure loose loads or materials (e.g. rope, chains) from falling to avoid falling object hazards, damaging the equipment, or tipovers. Also, secure loose/large loads from blocking air/wind as "sails", which can destabilize the vehicle.*
4) *Never suspend loads from the platform – this is misuse as a crane, which is strictly prohibited.*
5) *Never attach the aerial platform as a way to drag, push, or pull items outside the platform, including loose objects or objects attached to the facility/ground. The load may damage the equipment or cause a tipover.*

iv. *Balance the load by making sure to spread the weight evenly and avoid stacking materials on one side of the platform. Keep the center of gravity as low and as centered as possible.*

v. *Travel slowly with increased loads.*

vi. *Reduce the load if:*
1) *The load is tall, wide, or oddly shaped.*
2) *The load must be lifted or stacked high.*
3) *The route is rough or bumpy.*
4) *Tight turns or inclines involved.*

Loads under these conditions can fall off and be damaged, interfere with a doorway or overhead beam, and cause a tip over or fall onto the operator or a bystander. Sometimes, for example, wide loads must be carried high to be lifted over other stacked material. If so, the minimum load, height, and speed must be used.

g) Pedestrians

i. Watch for pedestrians. Look and listen for pedestrians in your area. Think about how people may enter your path, from the dock, doorways, aisles, and intersections.

ii. Yield to pedestrians when necessary.

1) When pedestrians are traveling where aerial platforms operate, the pedestrians have the right-of-way to avoid hazards. Make sure that pedestrians are not on your path, but if they are nearby, keep them as far away from your aerial platforms as necessary to do your work.

2) If you have to stop to let them pass, do so. If you can see them, sound your horn to make sure that they are aware of you. Make eye contact with them so that you are confident that they know you are nearby.

3) Never drive up to anyone standing in front of a fixed object, including to communicate with pedestrians. You could lose control of your vehicle, the brakes can fail, and the person is either crushed or pinned against the object.

4) Pedestrians should not approach the aerial platform, nor should they stand or travel underneath the raised platform or boom, which includes not being in the base's swing radius, near outriggers, or any other part of the equipment where they may be harmed during operation.

5) If a pedestrian must pass near an aerial platform, they should stop, make eye contact, and wait for a clear hand/verbal gesture from the operator or spotter before proceeding.

iii. Pedestrians should not be allowed to enter the work area.

1) The operating area must be physically cordoned off using safety cones, caution tape, or other physical barricades to create an exclusion zone.

2) Only an operator, their spotter, and relevant personnel should be in this area.

3) Using a trained ground spotter guide the aerial platform is best to prevent pedestrians from entering your path or near the equipment. Spotters guide operators, pedestrian and vehicle traffic, and provide an effective way for an operator to communicate with people on the ground. ***Note: Spotters have the full authority to prevent pedestrians from entering the path or work area of an aerial platform.***

4) The operator or the spotter may provide hand or verbal signals for pedestrians to stop and/or back away from aerial platforms or the work area to avoid injury. Speak clearly or shout when necessary, to ensure pedestrians can hear and understand your warning.

6) If the operator needs to talk to someone on foot, he/she may pause their work, lower the platform/boom completely, and exit to address them.

7) Equipment alarms (lights and sound) should also be a useful, effective way to communicate your presence to pedestrians.

h) Hazardous Locations

i. Hazardous Atmosphere

1) Equipment must be approved to operate in hazardous material locations. Notify Supervisor if hazardous location is found during operations.

ii. LPG/Propane Storage

1) LPG cylinders should be limited to a one-month supply.
2) Cylinders must be stored in safe place away from traffic.
3) Cylinders must be stored in a way to avoid puncture or damage.
4) Avoid sources of heat, open flame, sparks, or electrical equipment.
5) Store the fuels separately from oxidizers.
6) Take caution: LPG has gas expansion rate of 270 times, is heavier than air, and can cause frostbite.

iii. Floor/Grounds

1) Never drive over loose soil or ground that can collapse under the weight of the aerial platform.
2) Never drive over an unrated floor covering.
3) Avoid obstructions such as bumps, ditches, drainage grates/manholes, edges/drop-offs, holes, steps, or any prone objects/debris that could cause damage to wheel/tires or uncontrolled movement of the aerial platform.

iv. Inclines

1) For operating on an incline, the steeper the incline, the higher the hazard.
2) Drive in the center of the incline, avoid the edges on the sides.
3) Never drive onto a slope, ramp, or other incline that is not rated to support the aerial platform.
4) Avoid parking on an incline, when feasible. If required to park on an incline, use wheel chocks under the wheels down the incline from the vehicle (i.e. in front of the front tires, if the vehicle front faces downhill, or to the rear of the back tires if the vehicle is facing uphill). Never park on a steep incline/slope or one that is not rated/allowed by manufacturer instructions. A steep incline may have a ground slope exceeding 3° to 5° (about 5% to 9% grade), which means that there is 5 to 9 feet of rise/drop in elevation for every 100 feet of horizontal distance (from initial point to final point).
% Grade = Rise [Height, Depth] / Run [Length] X 100%
5) Never turn on an incline, approach an incline at a diagonal, or drive sideways on an incline. This can cause a tipover or rollover. Always approach an incline straight up or down.
6) For driving on an incline, lower the platform fully, and only operate on slopes rated by the manufacturer.

7) *Only raise the platform of aerial platforms that are designed to do so by the manufacturer. For some models, this will involve deploying its outriggers. Avoid raising the platform of scissor lifts or vertical mast lifts on an incline, as these vehicles are typically designed to only elevate their platform on a level, steady floor/ground, and may only be done safely if the specific model is designed for it.*

v. *Trailers*
   1) *Never elevate/extend aerial platforms while parked on or in a trailer.*
   2) *If stowing for transport or working within a trailer:*
      A. Ensure that the trailer capacity can handle the weight of the aerial platform.
      B. Make sure that the trailer's truck parking brake is on, wheels of the trailer you are moving aerial platform from are chocked properly to limit any movement, and if available use a dock lock. The trailer must be stable, so watch for any shifting of the trailer or the plate during forklift operation.
      C. To drive the aerial platform from the dock or ground into the trailer, use a ramp or dock plate. Secure the ramp or dock plate in place after opening the trailer door/gate. The ramp or plate must be rated for the aerial platform.
      D. Watch the overhead clearance for the trailer to make sure the platform can fit under it and keep the platform stowed before exiting the trailer.
      E. Turn on any lamps for improved visibility in the trailer.
      F. Focus on the task at hand.
      G. Sound the horn as you exit the trailer to alert any pedestrian that may be nearby on the dock.
      H. Drive slowly into and out of warehouses or truck trailers. Going from bright daylight into darkened warehouses or trucks will blind operators just long enough to run into somebody or something. And stay as far away from dock drop-offs or edges as possible, as this can lead to injury or death.
      I. For operating aerial platform in trailer without tractor, the front and rear of trailer must be held up by jacks when necessary.
   3) *For trailer-mounted (tow-behind) boom lifts*
      A. This equipment is a single axle trailer unit, built onto a trailer chassis with a hitch.
      B. Such a unit can only be safely operated after unhitching from the trailer and deploying its outriggers/stabilizers to lift its wheels off the ground and locked into a stable, stationary position.

F. Fueling/Charging

1. Batteries/Electric-Powered Aerial Platform
   a) The following precautions should be followed for battery-powered or battery-equipped aerial platforms:
      i. *Batteries may contain acid or other hazardous material, so protective gloves, goggles, and long sleeves must be worn when working with batteries.*
      ii. *Batteries should be inspected for:*
         1) *Cracks or holes,*
         2) *Securely sealed cells,*
         3) *Frayed cables,*
         4) *Broken insulation,*
         5) *Tight connections, and*

6) *Clogged vent caps.*

b) Batteries shall be charged in a well-ventilated area free of flame, sparks, or other hazards that may cause fire or explosion.
c) Aerial platforms that are electric may be plugged into an electrical outlet for charging. Consult the operator manual to choose power source that is rated to provide the proper voltage.
d) Do not attempt to elevate or drive the aerial platform while it is plugged in for charging. Aside from the electrical hazard to personnel, this may damage the battery, the charging cord, or trigger a safety interlock, which disables the platform driving/raising functions. The presence of the cord itself present a tripping hazard, so it must be removed and stored properly before using the equipment.
e) Do not attempt to use an on-board electrical outlet (e.g. AC power outlet) within the platform for charging, this is accessory meant for use with power tools or minor equipment while in the platform, not to recharge the unit.

2. <u>Diesel & Gasoline-Powered Aerial Platform</u>
   a) There must be a dedicated area for refueling or equipment for using portable fuel cans. The area will be well-ventilated, level, and stable.
   b) There should be no smoking or sparking hazard nearby.
   c) Ensure that equipment is properly grounded prior to refueling.
   d) Wear personal protective equipment such as long sleeves, insulated neoprene or leather gloves, safety glasses, and a face shield.
   e) To refuel the tank:
      i. *Park the aerial platform.*
      ii. *Lower the platform to the ground. Never refuel with the platform/boom elevated.*
      iii. *Turn off any electronics.*
      iv. *Disengage the Power Take-Off (PTO), for vehicle-mounted lifts (e.g. bucket truck). Scissor lifts, boom lifts, and towed/trailer lifts do not use a PTO.*
      v. *Shut off the engine. Never refuel while the engine is running.*
      vi. *The parking brake should engage automatically; if it does not (for older models), do so manually. Engage emergency stops for platform and ground controls, if required by manufacturer.*
      vii. *Make sure that correct fuel is used. Always verify fuel type.*
      viii. *Locate the correct tank as there are multiple tanks (e.g. hydraulic fluid reservoir, fuel). Ensure that you are opening the fuel cap.*
      ix. *Open the fuel cap.*
      x. *Fill the tank slowly and clean up any spilled fuel with the appropriate spill kit. Let your Supervisor and EHS know if this occurs.*
      xi. *Close the fuel cap.*

3. LPG/Propane-Powered Aerial Platform
    a) There must be a dedicated area for refueling or changing out cylinders. The area will be well-ventilated, level, and stable.
    b) There should be no smoking or sparking hazard nearby.
    c) Wear personal protective equipment such as long sleeves, insulated neoprene or leather gloves, safety glasses, and a face shield.
    d) To change gas cylinder/tank:
        i. *Park the aerial platform.*
        ii. *Lower the platform to the ground. Never refuel with the platform/boom elevated.*
        iii. *Turn off any electronics.*
        iv. *Shut off the engine. Never refuel while the engine is running.*
        v. *The parking brake should engage automatically; if it does not (for older models), do so manually.*
        vi. *Close the valve on the fuel tank (LPG/propane cylinder).*
        vii. *Run the engine dry (if applicable). Start the engine and let it idle until it burns off the remaining fuel in the lines and stalls out on its own, then turn the ignition key to the off position. You will let the engine run until it stops, in order to relieve the gas pressure, and then shut off the aerial platform.*
        viii. *Put on PPE and disconnect the hose (i.e. the quick-release coupling or other connector to the fuel supply hose). Be mindful of a small hiss or burst of residual gas.*
        ix. *Release the tank mount by unlatching/loosening the holding strap/clamp securing the LPG cylinder to the platform frame.*
        x. *Carefully lift out the empty cylinder (using proper lifting techniques, as steel LPG tanks are heavy). Remove the empty tank and put it where empty cylinders should be stored.*
        xi. *Replace the empty tank with a full tank. Ensure that the replacement tank is of the correct type and size, and that it is closed to avoid an accidental spill or discharge.*
        xii. *Inspect the replacement tank for damage such as dents, scrapes, or gouges. If damaged, do not use the tank. Let your Supervisor and EHS know if there is any accidental discharge of fuel.*
        xiii. *Place the full tank onto the forklift and reattach the straps and hose.*
        xiv. *Position the tank to ensure the centering pin (locator pin) on the bracket aligns with the hole on the tank collar so the relief valve points in the correct safe direction.*
        xv. *Clamp the tank securely by fastening and locking the tank retention strap tightly so the cylinder cannot shift or rotate during operation.*
        xvi. *Reconnect the fuel line by attaching the fuel supply hose connector firmly to the tank's service valve.*
        xvii. *Slowly open the valve slightly and assure that there are no leaks from the connection. If you open the valve too fast, the excess-flow check valve inside the system will trip and restrict gas flow. If this happens, close the valve*

completely, wait 5 seconds, and open it very slowly. To check for leaks, brush or spray a soapy water solution (or leak-detection spray) over the fittings, connections, and hose. If bubbles form, close the valve immediately and re-tighten the connection before trying again.

xviii. *Then open the valve fully to allow gas to the engine.*

G. Emergency Procedures

1. Rescue Plan
   a) Because aerial platforms require working at heights, there is a risk of worker(s) becoming stranded in the platform, falling, or being ejected from the platform, though wearing a fall arrest lanyard and safety harness may prevent injury.
   b) Rescue planning and training must be in place for prompt rescue in case of ejection or fall from aerial platform using operating and emergency controls.
   c) A rescue plan developed by the Supervisor and their department must be communicated to all workers using the platform. Workers must be trained on rescue procedures by their Supervisor.
   d) The rescue plan will detail how to retrieve workers safely if an aerial platform cannot be lowered by normal means or if an accident occurs. It should take into account the environmental conditions, workplace, and specific aerial platform and its controls.
   e) The rescue plan should include three rescue methods:
      i. *Self-rescue, where the operator in the platform uses available platform controls or emergency descent systems to bring themselves down while still in the platform.*
      ii. *Assisted rescue, where a trained and familiarized operator on the ground (e.g. spotter) is able to use ground controls or auxiliary emergency descent systems to override the platform controls for the stranded/incapacitated aerial platform.*

      Note: Do not use another aerial platform to help lower the incapacitated aerial platform or retrieve the stranded worker. Using additional equipment to dislodge or force malfunctioning aerial platforms may damage each piece of equipment, cause damage to facilities/ground, lead to leaks/spills, or other issues. The transfer of personnel between aerial platforms is discouraged as slips, trips, falls, collisions, tip-overs, and additional hazards are present.

      iii. *Technical rescue: Rescue services (e.g. Baltimore County Fire Department) are called in to perform the rescue if the situation is beyond the workers' or equipment's capabilities.*

   f) The rescue plan must be documented and worker training in its use must be documented.

2. To ensure emergency controls for aerial platforms:

a) An emergency stop button shall be easily accessible and located within reach of the operator for immediate use.
b) A key mode selector system shall be present to switch between upper and lower control modes for platform (e.g. basket/bucket) and base (e.g. pedestal, turntable, or turret) to ensure that lower controls may override the upper controls in case of emergency.

3. Emergency vehicles in your vicinity or path, always have the right-of-way, similar to driving a road vehicle.
4. In case of an accident or spill/fluid leak, report it to your Supervisor, Facilities Management, and EHS immediately. Operators are required to report all aerial platform accidents (and near-misses) involving personnel, building structures, and equipment to these parties. Call 911 and TUPD if anyone is injured, including yourself.
5. If the aerial platform begins to tilt or become unstable (prior to falling):
   a) Stop all movement.
   b) Do not try to drive, jerk, or aggressively reposition the machine. Sudden movements shift the center of gravity and speed up a tip-over.
   c) Keep your harness secured to its designated anchor. Never attempt to jump out of an elevated platform, climb down the boom, or try to slide/climb to the ground. Exiting while the platform is elevated or falling may lead to injury or death.
   d) Warn ground personnel to clear of the area near the aerial platform verbally or by other signal.
   e) Alert the spotter to use ground controls to lower the platform if it is safe to do so, and they are not in the path of the tilt/falling machine. Otherwise, this may require contacting rescue services due to the incapacitated aerial platform. Follow your rescue plan.
6. In case of aerial platform rollover/tipover:
   a) Brace your arms, legs, and feet (hold on tightly) and keep inside the platform guardrails with your safety harness attached.
   b) Warn ground personnel to clear of the area near the aerial platform verbally or by other signal. If you are the ground (e.g. spotter, other personnel), stay clear of the equipment, its fall radius and the swing/reach zone for its boom. Never attempt to prop up, hold, or catch a falling aerial platform.
   c) This will likely require contacting rescue services (911). Dial 911 immediately if anyone is injured, trapped, or suspended in a harness after a fall or structural failure. Follow your rescue plan.
   d) Keep your harness secured to its designated anchor. Never attempt to jump out of an elevated platform, climb down the boom, or try to slide/climb to the ground. Exiting while the platform is elevated or falling may lead to injury or death.

e) Do not attempt to right, restart, or use the aerial platform after a tip-over incident. The machine must be taken out of service and fully inspected/certified by a qualified technician or the manufacturer before any recovery or movement.

7. If brakes fail while traveling:
   a) Release the drive controller (joystick). Most aerial platforms are built with a "deadman" spring-loaded controller or joystick. Letting go of the drive function automatically returns the control to neutral and engages the spring-applied, hydraulically released parking brakes.
   b) Pump the brake pedal/switch. If the machine uses a foot brake or manual brake, try pumping it quickly to build up lost hydraulic pressure.
   c) If the primary brakes are unresponsive, engage the mechanical emergency or parking brake switch immediately.
   d) Steer around hazards, and towards level ground or a barrier. Steer the equipment away from pedestrians, drop-offs/edges, slopes, and other obstructions. Aim the equipment toward a stable, level surface or gently guide the wheels towards a secure curb or barrier that increases friction on the side of wheels, if at low speed.
   e) Once the equipment comes to a stop. Lower the platform/boom completely to exit. Chock the wheels and tag out the machine and have the vehicle inspected by a qualified technician.
   f) Keep your harness secured to its designated anchor until you can safely exit once the platform/boom has been lowered. Never attempt to jump out of an elevated platform, climb down the boom, or try to slide/climb to the ground. Exiting while the platform is elevated or falling may lead to injury or death.

11. In case of a breakdown or if the engine stops while traveling, stop the aerial platform as soon as possible.
   a) A hydraulic failure on an aerial platform causes a sudden loss of system pressure, erratic movement, or uncontrolled lowering of the platform.
   b) If you are in the platform, stop all functions immediately, release the control levers, shut off tool valves, and activate the emergency stop switch or engine stop/start switch.
   c) If you are at the ground controls, move the control selector to the lower position and push the engine stop/start switch to turn off the power. Depending on the model used, disengage the PTO (if applicable), or switch the outrigger controls. In the case of proximity to power lines, use non-conductive hot sticks to stop/start switch.
   d) If a hydraulic line is ruptured, shut off the engine or PTO immediately to stop the high-pressure oil flow and prevent fire or slip hazards.
   e) Tag out the vehicle after any breakdown or engine failure as it will require inspection and repair by a qualified technician.

12. If pedestrians or other machines enter your path or work area:
   a) A spotter, if present, should alert, stop, and redirect pedestrians.
   b) The operator must sound the horn or shout to alert pedestrians.

c) Stop all movements of platform and boom. Release the drive/steer controls to come to a complete, controlled stop. Gently press brakes, if necessary. Do not make any sudden movements or maneuvers, such as hard stops, turns/ swerves, or swings in the aerial platform while elevated or in motion, as this can cause a loss of control (e.g. tilt, bounce), tip over, ejection, or fall.
d) Tag out the vehicle if it is inoperable due to an accident or a breakdown.

H. Recordkeeping

1. EHS will maintain a roster of trainees who have completed the Aerial Platform Training and other training records associated with said trainees.
2. EHS will maintain an inventory of aerial platforms available for use on campus.
3. The Supervisor must ensure that training is adequate for individual operators.
   a) The supervisor shall ensure that for each individual who operates; performs inspections; and/or repairs on aerial work platform equipment, there is a written record for that individual which verifies that the employee has received general training. The supervisor shall also keep a photocopy of the training certificate received by the individual from the trainer.
   b) The supervisor shall ensure there is a record of familiarization for every unit that each employee has received instruction. A sample copy of the familiarization record form can be found in Appendix I as the Aerial Platform Equipment Familiarization Form. This form serves as a record of instruction for that unit. The appropriate fields must be completed by the supervisor or trainer. These include:
      1) Name of trainee and TU ID#
      2) Date of instruction
      3) Name of trainer
      4) The trainer's affiliation
      5) Manufacturer, model and serial number of the unit
      6) Signature of trainee
   c) The supervisor shall maintain a copy of all training and familiarization records. Copies shall be sent to the Department of EHS.
   d) The following records shall be maintained for a minimum of five (5) years by the Department/Supervisor (copies shall be provided to EHS):
      i. Written records of the frequent and annual inspections on each aerial platform owned or rented by TU (if rented for a period of time to require frequent or annual inspection, e.g. 150 hours operation or three months). These records shall include the date of the inspection, model and serial number of the aerial platform, name and affiliation of the person performing the inspection, any deficiencies found, and the corrective action recommended.
      ii. Written records of all repairs accomplished on each aerial platform owned or rented by TU, including the date of the repair, a description of the work accomplished, the work order number, model and serial number of the aerial platform, and the identification of the person(s) performing the work.

iii. *Written records of inspections, repairs, modifications, alterations, and statements of manufacturer approval for any modifications and alterations shall be maintained for five (5) years after sale or other disposition of the aerial platform.*

I. Training

1. Under no circumstances shall an employee operate an aerial platform until they have successfully completed Aerial Lift Safety Training through EHS (or equivalent). Employees shall request training for Aerial Lift Safety through EHS by emailing safety@towson.edu or by calling at 410-704-2949.
2. All individuals who perform the functions of operators or maintenance on any aerial platform equipment shall have received both general training and familiarization for the type of unit being operated. The training program includes classroom instruction and operator evaluation with the employee.
3. General training covers topics applicable to most aerial platform equipment. This training will provide the individual with the requisite knowledge and skills necessary for performing inspections; the universal applications; limitations; and operation of the aerial platform equipment, including recognition and avoidance of hazards associated with their use.
4. General training will be performed by a competent person as determined by the term "competent person" in the Definitions section of this document.
5. General training will include but is not limited to the following:
   a) Regulations and standards associated with aerial work platform equipment.
   b) General equipment components.
   c) The proper selection of the aerial work platform equipment for the job at hand.
   d) Safe use of the equipment.
   e) Operator warnings and instructions.
   f) The purpose and use of manuals.
   g) Explanation of electrical, falling, and falling object hazards, and factors affecting stability.
   h) Instructions for correct operation of the lift (including maximum intended load and load capacity).
   i) Procedures for dealing with hazards.
   j) Recognition and avoidance of unsafe conditions in the work settings.
   k) Personal protective equipment.
   l) Pre-operational inspections, the need to perform workplace inspections, and when and how to perform inspections.
   m) Manufacturer's requirements.
   n) The application and understanding of typical options that are likely associated with larger machines such as:
      i. *Outriggers and stabilizers*
      ii. *Extendable axles*
      iii. *Envelope management systems*
      iv. *Load-moment devices*

v. Dual capacity

o) The actual operation of the aerial work platform equipment "under the direction of a qualified person".

p) The need of the trainee to operate the aerial platform(s) for a sufficient period of time to demonstrate proficiency in the actual operation and of all functions of the aerial platform, i.e. the skills and knowledge needed to operate an aerial lift before operating it on the job.

6. For each model, the employee is to operate, inspect or maintain, the employee will receive familiarization for that unit. He/she will only be qualified to operate the specific group and type from their training. Familiarization will include as a minimum the following:
   a) The location of the weather-resistant compartment for storing the operator manual.
   b) The purpose and function of all controls.
   c) Safety devices and operating characteristics specific to that aerial platform unit.

   Familiarization can be performed by a competent person.
7. The trainee will be required to read or be instructed on and understand the manufacturer operating instructions, maintenance manual, and safety rules. In addition, individuals shall be instructed in performing frequent inspections (every three months or 150 hours of operation, whichever occurs first), and pre-operational inspections of all aerial platforms maintained by TU.
8. Upon completion of both general training and familiarization, the operator trainee shall operate the aerial platform in an area free of obstructions under the direction of the qualified person for a time sufficient to determine that the trainee displays proficiency in knowledge and actual operation of the aerial platform.
9. Employees who have successfully completed the classroom instruction and operational evaluation will be issued an operator certification from EHS. Appropriate training certificates will be issued upon completion.
10. The trainer, in consultation with the Supervisor (competent person), unless they are the same, shall agree that this individual is suited for aerial platform operation. Only properly trained and authorized individuals shall be permitted to operate any aerial platform. Only properly trained individuals shall be permitted to perform inspections and required maintenance of aerial platforms.
11. Additional familiarization shall be conducted whenever a new model aerial platform is acquired or rented by TU.
12. Additional general training will be required when an individual demonstrates less than proficiency in the operation or maintenance of aerial platforms.
13. Re-training is tracked via computer and reviewed once each year. Re-training will be performed under the following conditions:
    a) Every three years.
    b) When an employee is involved in an accident or near-miss with an aerial platform.
    c) When an employee is observed operating an aerial platform in an unsafe manner.
    d) An evaluation of the employee's skills indicates a need for re-training.

e) When a different aerial platform is introduced into the workplace, or an employee uses aerial platform for which they have not previously received training.
f) New workplace hazards are observed or created.

14. Individuals in the following departments will receive training:
    a) Access Control
    b) Events & Conference Services
    c) Facilities Management
    d) Other individuals as determined by area management
15. The Supervisor will identify all new employees who will be responsible for operating an aerial platform and will notify EHS to schedule training.
16. Other Trainings
    a) Trainees will require Fall Protection training to properly wear and use PPE related to aerial work platform operation.
    b) Trainees will be encouraged to complete training for Compressed Gas Safety. Those who use LPG- or propane-powered aerial work platforms must complete this training for safe operation and handling of this type of fuel.
    c) Training may be accessed virtually through Vector Solutions SafeColleges found at the following URL: https://towsonehs-md.safecolleges.com/training/home. Employees shall request training by emailing safety@towson.edu or by calling the Environmental Health & Safety (EHS) office at 410-704-2949.

Resources

A. ANSI

1. ANSI A92.2 Vehicle-Mounted Elevating and Rotating Aerial Devices
2. ANSI A92.3 Manually Propelled Elevating Aerial Platforms
3. ANSI A92.5 Boom-Supported Elevating Work Platforms
4. ANSI A92.6 Self-Propelled Elevating Work Platforms
5. ANSI A92.20 Design, Calculations, Safety Requirements and Test Methods for Mobile Elevating Work Platforms (MEWPs)
6. ANSI A92.22 Safe Use of Mobile Elevating Work Platforms (MEWPs)
7. ANSI A92.24 Training Requirements for the Use, Operation, Inspection, Testing and Maintenance of Mobile Elevating Work Platforms (MEWPs)

B. CDC-NIOSH Aerial Lifts Safety

C. MOSH Safe Operation of an Aerial Lift

D. OSHA

1. OSHA Fact Sheet: Aerial Lifts
2. OSHA Standard Interpretation Letter, Scissor Lifts

E. UP RIGHT

F. Environmental Health & Safety

1. Request Training
   Employees shall request training for Forklift Safety through EHS by emailing safety@towson.edu or by calling at 410-704-2949.
2. Requests for Documentation and Reviews
   To request documents, reviews for procedures or equipment, or general inquiries, contact EHS by emailing safety@towson.edu or by calling the Environmental Health & Safety (EHS) office at 410-704-2949.

Appendix A: Emergency Contact Telephone Numbers

FIRE - RESCUE - EMERGENCY MEDICAL SERVICE : 911

At the emergency blue-light and yellow phones located around campus, press the emergency button to be connected to the University Police who can contact 911 for you, or dial 911 on the keypad to be connected directly to the 911 Center. Give the dispatcher all of the requested information.

Towson University Police Department [TUPD]: (410) 704-4444
For Other Emergencies

Department of Environmental Health and Safety: (410) 704-2949

Concentra Urgent Care [Timonium, MD]: (410) 252-4015
For Occupational Health, Medical Consultation and Evaluation

Facilities Management - Work Control Center: (410) 704-2481

Appendix B: First Aid & Reporting Instructions

Note: The following are suggested medical care facilities. Individuals may choose their own providers for medical care.

For major, immediate illness/injuries: Call 911 and/or go to the nearest hospital (UMD St. Joseph Medical Center, 7601 Osler Dr, Towson, MD 21204)

For minor injuries/illnesses and chronic/ongoing work-related injuries:
Employees: Concentra Occupational Health is open on Monday-Friday, 7:30AM-6:00PM (Concentra Occupational Health, 1830 York Road, Suite F, Timonium, MD 21093). Complimentary transportation is available for work-related injuries. You may also make a telemedicine visit: by visiting Concentra Telemed.

Students: TU Health Center is open on Monday-Friday, 8:00AM-5:00PM. (Ward West, University Avenue; TU Shuttle Bus service stops here, check schedule for times/stops). Please note that when Towson University is closed, the Health Center is also closed. There is an after-hours answering service and on-call physician available when the center is closed.

Other Nearby Medical Facilities:
MedStar Urgent Care Facility (MHUC) at the following locations:

- Towson at Hillside Avenue is open on Monday-Friday, 8:00AM-8:00PM (MedStar Urgent Care, 7825 York Road, Towson, MD 21204; Phone: 855-910-3278)
- Towson at Anneslie is open on Monday-Friday, 8:00AM-8:00PM (MedStar Urgent Care, 6317 York Road, Towson, MD 21212; Phone: 833-735-1958)

Please see next page for First Aid & Reporting Instructions table.

	Hazard Class:	Biological, Chemical	Biological, Chemical	Biological	Biological, Chemical	Chemical Physical	Chemical, Physical, Radiological	Biological		All	
Personnel Action	**Incident Type:**	Severe Allergic Reaction, Anaphylaxis	Accidental Ingestion	Animal Contact (Bite, Scratch, Other Contact) Biotoxin/ Venom	Accidental Inhalation	Burns/ Contact Exposure	Burns > 3 inch diam., deep/ all skin layers; covers hands, feet, face, groin, buttocks, or major joint/ encircles arm or leg	Injection Needlestick, Sharps Exposure		*If victim is unconscious/ not breathing/ no pulse:	**If victim is conscious, but not breathing normally:
	Severity:	Major	Major	Major	Major	Minor	Major	Minor	Major	Major	Major
Reduce Danger		Stop work immediately.								Stay with victim, if safe to do so. Ensure area is secure.	
		Exit the area, if possible. Seek fresh air.								Keep calm.	
Contact Emergency Medical Services		Call 911 or TUPD at (410) 704-4444					Call 911 or TUPD at (410) 704-4444		Call 911 or TUPD at (410) 704-4444		
		Consult Poison Control Center at 1-800-222-1222 or Safety Data Sheets (SDS) for the chemical [find Section 4: First Aid Measures].							Consult Poison Control Center at 1-800-222-1222 or Safety Data Sheets (SDS)		
Use First Aid		Use EpiPen/ equivalent. *See Right **See Right	Wash affected area (foaming soap & water, or for chemicals – use water only; 15-minute minimum) and/or use eyewash/shower (15-minute minimum) Flush splashes to the nose, mouth, or skin with water. Do not induce vomiting unless instructed.							*Use CPR/AED until assistance arrives.	**Place in recovery position.
		If bleeding, apply firm pressure and wrap. Dry, use first aid kit for ointment and bandage as required, and/or mark area for post-exposure identification/treatment.									
Alert Others		Warn/seek assistance from other personnel, if necessary. Notify Supervisor or have other personnel do so, after commencing first aid.									
Seek Immediate Medical Treatment		Minor Incident: Students – TU Health Center during the times, dates, and address listed. Employees – Concentra Occupational Health during the times, dates, and address listed. Other nearby providers are listed, if the above are not available. Major Incident: UMD St. Joseph Medical Center, Emergency Room, 24 hours/day, 7 days/week.								**Drive self, drive other(s), or request transport.**	
Report Injury/Incident		File a First Report of Injury with Human Resources, and submit an Environmental Health & Safety Incident Report Form within 24 hours of the injury (or your Supervisor may do this on your behalf). For fatal accident or hospitalization, report to EHS within 8 hours (or TUPD at 410-704-4444 after office hours).									
Seek Post-Exposure Care		Seek medical advice from your primary care physician after initial treatment and advise them that you work with animals. Employees may go to Concentra for follow-up, post-exposure treatment as required.									

Appendix C: Aerial Platform Standards & Regulations

29 CFR 1910.67: Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.67

29 CFR 1910.140: Personal Fall Protection Systems
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.140

29 CFR 1910.269(p): Electric Power Generation, Transmission, and Distribution - Mechanical Equipment
https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.269_2

29 CFR 1926.21: Safety Training and Education
https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.21

29 CFR 1926.451-453: Scaffolds
https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.451
https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.452
https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.453

29 CFR 1926.502: Fall Protection Systems Criteria and Practices
https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.502

Appendix D: Aerial Platforms Equipment Inventory List

Authority	Manufacturer & Model	Serial #	Type	Power/Fuel	Location
COFAC	GENIE Model AWP-20S AC	AWP02-24097	Vertical Mast Lift, Push-Around	AC Power (Electric)	Center for the Arts, Scene Shop
COFAC	GENIE Model IWP-25S DC	4000-3498	Vertical Mast Lift, Push-Around	DC Power, 12V Battery (Electric)	Center for the Arts, Scene Shop
FM	JLG Model #3246E2	0200096953	Scissor Lift	Electric	Towson Center, Arena
FM	Air-Lift Air-Deck Model 3036-07	B-2338	Vertical Mast Lift, Push-Around	Compressed Air (CO_2)	Hawkins Hall, Mechanical Room
COFAC	MEC Aerial Work Platform Model 24D	7501513	Vertical Mast Lift, Push-Around	DC Power, Battery (Electric)	Stephens Hall Theatre
COFAC	GENIE Model AWP-30S AC	AWP06-53565	Vertical Mast Lift, Push-Around	AC Power (Electric)	Center for the Arts, CA 4052
Campus Recreation	JLG Model 30AM	0900028043	Vertical Mast Lift, Push-Around	Electric	Burdick Hall, Campus Recreation
FM	GENIE Model GR-20	GR10-16462	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	LA Penthouse
FM	GENIE Model GR-20	GR15-38106	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	SECU, TA 0117
FM	GENIE Model GR-20	GR15-38081	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	SECU Storage Room
FM	Teupen Model LEO18GT	141957	Articulating Boom Lift (Tracks)	Dual Power	TC, outside Storage Shed
FM	Genie AWP-25S	AWP10-68101	Vertical Mast Lift, Push-Around	Electric	Unitas Stadium, SW Electrical Room-Concourse Level
FM	GENIE Model GR-15	39176	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	LA Penthouse A
FM/Access Control	Versalift ET32NF01	EA110001	Bucket Truck	Gasoline	General Services Building
FM	GENIE Model GR-20	21453	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	WC 0111
FM	GENIE Model GR-20	21454	Vertical Mast Lift, Push-Around	DC Power, 24V Battery (Electric)	WC 4th Floor Storage, Near Ballroom A
COFACE	Balleymore Model BL-315	BL-5511	Vertical Mast Lift, Push-Around	Manual, Hydraulic Hand Pump	CA Gallery

Appendix E: Fall Protection Systems in Use with Aerial Platforms

A. Passive Fall Protection

Passive fall protection are physical safety features that do not move and once installed do not require additional action from workers for its protection.

1. Guardrails
   - Guardrails are installed on aerial platforms and are barriers used for personal fall protection and include the top rail, mid-rail, and toeboard (see below). Any gates or chains that allow entry onto the platform must also be closed to maintain this barrier during work. Workers are not allowed to lean over or climb guardrails for additional reach.
2. Nets
   - Different from being used as personal fall protection from a building site, safety nets that are offered and rated by the equipment manufacturer may be used with aerial platforms to capture tools, building material and parts (e.g. bolts), or other debris from falling and striking workers or bystanders at ground level.
3. Toeboards
   - Toeboards are used for both personal fall protection and protection from falling objects. This equipment protects a workers' feet from slipping past the edge of the platform as well as materials and debris from falling over edges.

B. Fall Restraint

Fall restraint is an active personal fall protection that prevents a worker from reaching a fall hazard. This is done by use of personal protective equipment such as a lanyard which attaches from a full-body harness worn by the worker to an anchor point inside the platform. The lanyard will be of limited length, enough to do work within the platform, but not enough to allow for an ejection or fall.

C. Fall Arrest

Fall arrest is an active personal fall protection that halts a workers' descent after a fall occurs, preventing a strike or drop to another level below potentially. It requires anchorage (secure fixed point), body support to distribute forces safely (e.g. harness), and a connector to link these parts (e.g. lanyard).

1. Type 1 Device
   - This device arrest falls when the anchor is at or above workers' center of gravity.
2. Type 2 Devices
   - This device arrest falls uses shock-absorbing lanyards at anchor below workers' center of gravity.
3. Type 3 Device (e.g. Self-Retracting Lanyard (SRL)
   - This device uses an inertia reel with retrieval function, engaging during descent to lock and slow down fall, and allow for worker to retract line to anchor

Appendix F: Hierarchy of Hazard Controls for Equipment Use

A. Elimination

- Avoid work at heights by redesigning tasks so that they can be done safely from the ground (examples include assembling materials/equipment on ground level, lowering components to ground-level repairs, using extension tools, relocate equipment that requires frequent maintenance to ground level, use of drones for inspections)

B. Substitution

- Use aerial platform rather than unsecured ladder or climbing structure to reduce fall hazard
- Use battery-powered MEWP instead or gas/diesel MEWP to avoid emissions

C. Engineering Controls

- Use outriggers for stability
- Equipment will employ tilt sensors and interlocks
- Use gates to enter platform, never climbing over sides
- Use guardrails to protect from falls
- Use emergency stop button(s) and key mode selector to switch eqpt. control from platform to base (emergency)

D. Administrative Controls

- Be authorized and trained to use aerial platforms to do work
- Inspect equipment and work area prior to use, periodically (every 3 months or 150 hours of use), and annually
- Maintain aerial platforms adequately and regularly
- Practice proper housekeeping of the work area
- Monitor and avoid poor weather conditions, obstructions, and clearances
- Read, understand, and possess manufacturer operator manual, standard operating procedure, communication plan, rescue plan and maintain these documents on aerial platform
- Read and understand hazard label(s)/decal(s) on aerial platform and related eqpt.

E. Personal Protective Equipment

- Inspect and wear general PPE such as protective helmet, eye protection, hearing protection, high visibility safety vest, gloves, long pants, and foot protection
- Inspect and wear fall restraint PPE (e.g. lanyard) unless manufacturer specifications specify that the anchor point is rated for fall arrest PPE use; avoid tie-off to guardrails or handrails themselves
- Inspect and wear any other work-specific protective gear (e.g. electrical safety gloves, mats)

Appendix G: Aerial Platform Equipment Pre-Operational Inspection Checklists

TOWSON UNIVERSITY	Occupational Safety
	Aerial Platform Program
	Form

Aerial Platform Pre-Start Inspection Checklist

Section 1: Applicable Equipment Inspected (AWP Genie Lift; etc.)		
Manufacturer & Model	**Serial #**	**Location (Bldg./Room)**

BEFORE USE EACH DAY OR AT THE BEGINNING OF EACH SHIFT, THE SUPERVISOR SHALL VISUALLY INSPECT THE AERIAL PLATFORM AND CONDUCT A FUNCTIONAL TEST INCLUDING BUT NOT LIMITED TO THE FOLLOWING ITEMS (ALL NO or Poor responses require service):

Section 2: Inspection Checklist					
ITEM(S) PRESENT OR ADEQUATE			**YES**	**NO**	**N/A**
OPERATOR MANUALS (FOR SAFETY & RESPONSIBILITIES) ARE COMPLETE, LEGIBLE & STORED ON PLATFORM					
ALL DECALS LEGIBLE & IN PLACE					
BATTERY FLUID (Check leaks and proper fluid level. Add distilled water if needed.)					
HYDRAULIC OIL (Check for leaks and proper oil level. Add oil if needed.)					
LUBRICATION OF ALL MOVING PARTS					
FILTER ELEMENTS					
HYDRAULIC OIL, ENGINE OIL, AND COOLANT					
CHECK THE FOLLOWING COMPONENTS OR AREAS FOR DAMAGE, MODIFICATIONS & IMPROPERLY INSTALLED OR MISSING PARTS:					
Component	**OK**	**Poor**	**Component**	**OK**	**Poor**
Electrical Components, Wiring & Electrical Cables			Nuts, Bolts & Other Fasteners		
Hydraulic Power Unit, Hoses, Fitting & Cylinder			Mast Columns & Counterweight		
Platform Entry Mid-Rail or Gate			Breather Cap		
Sequencing Cables & Pulleys			Outriggers, Leveling Jacks & Footpads		
Lifting Chains & Idler Wheels			Adjustable Glide Pads		
Notes/Comments:					

SAMPLE

ITEM(S) COMPLETE	YES	NO	N/A
CHECK ENTIRE MACHINE FOR DENTS, DAMAGE, CORROSION, OXIDATION, CRACKS IN WELDS OR STRUCTURAL COMPONENTS			
INSPECT & CLEAN BATTERY TERMINALS & ALL BATTERY CABLE CONNECTIONS (Wear protective clothing, eyewear, etc.)			
BE SURE THAT ALL STRUCTURAL & OTHER CRITICAL COMPONENTS ARE PRESENT & ALL ASSOCIATED FASTENERS & PINS ARE IN PLACE & PROPERLY TIGHTENED			
ITEM(S) COMPLETE (FUNCTION TESTS, OK?)	**YES**	**NO**	**N/A**
TEST EMERGENCY STOP BUTTON			
TEST OUTRIGGER INTERLOCK			
TEST AUXILIARY PLATFORM LOWERING MECHANISM			
TEST MANUAL LOWERING MECHANISM			
TIRES AND WHEELS			
ITEM(S) COMPLETE	**YES**	**NO**	**N/A**
CHECK THE AREA IN WHICH THE AERIAL PLATFORM IS TO BE USED FOR POSSIBLE HAZARDS SUCH AS, BUT NOT LIMITED TO: Drop-offs or holes, bumps or floor obstructions, debris, overhead obstructions and high voltage conductors, hazardous locations, inadequate surface and support to withstand all load forces imposed by the aerial platform in all operating configurations, wind and weather conditions (if outside), other possible unsafe conditions, presence of unauthorized persons.			
HOUSEKEEPING/DEBRIS REMOVED, PREPARED AREA FOR WORK			
Notes/Comments:			

SAMPLE

ANY AERIAL PLATFORM FOUND DEFECTIVE SHALL BE TAGGED OUT OF SERVICE IMMEDIATELY (i.e., not used) UNTIL SUCH TIME IT IS REPAIRED.

Section 3: Signature & Date		
Supervisor Name	Supervisor Signature	Date

2

TOWSON UNIVERSITY	Occupational Safety
	Aerial Platform Program
	Form

Aerial Platform Pre-Start Inspection Checklist

Section 1: Applicable Equipment Inspected (JLG Lift; etc.)		
Manufacturer & Model	**Serial #**	**Location (Bldg./Room)**

BEFORE USE EACH DAY OR AT THE BEGINNING OF EACH SHIFT, THE SUPERVISOR SHALL VISUALLY INSPECT THE AERIAL PLATFORM AND CONDUCT A FUNCTIONAL TEST INCLUDING BUT NOT LIMITED TO THE FOLLOWING ITEMS.

Begin the "Walk-Around Inspection" at Item #1, as noted on the diagram in the manual. Continue to the right (counterclockwise viewed from the top) checking each item in sequence for the conditions listed.

Section 2: Inspection Checklist		
X	**#**	**TASK**
		WORKPLACE INSPECTION
	1	Check floor surfaces for holes, bumps, level and other hazards.
	2	Check overhead for wires, beams and other hazards.
		MACHINE INSPECTION
	1	**Platform controls:** Properly secured; No visible damage. Placards are secure and legible.
	2	**Steer Cylinder and Linkage:** Properly secured; No visible damage.
	3	**Safety Prop** – Properly secured; No visible damage.
	4	**Scissor Arms & Sliding Wear Pads:** Properly secured; No visible damage.
	5	**Wheel & Tire Assembly (Left Front):** Properly secured; No visible damage; No loose or missing lug nuts.
	6	**Drive Cutout Switch:** Properly secured; No visible damage.
	7	**Compartment Cover & Latches:** Properly secured; No visible damage.
	8	**Ground Controls:** No visible damage; switches operable; Placards legible.
	9	**Hydraulic Reservoir:** No visible damage; No leaks or missing parks; Breather cap secure.
	10	**Hydraulic Filter:** Properly secured; No visible damage; No leaks.
	11	**Motor/Pump Unit:** Properly secured; No visible Damage; No leaks.
	12	**Pothole Protection System:** No visible damage; Support broilers, limit switches & links properly secured.
	13	**Hour meter:** No visible damage.
	14	**Wire Installation:** Properly secured; No visible damage.
	15	**Control Valve Installation:** Properly secured; No visible damage; No leaks.

SAMPLE

X	#	TASK
	16	**Wheel & Tire Assembly (Left Rear):** Properly secured; No visible damage; No loose or missing lug nuts.
	17	**Drive Motor (Left Rear):** Properly secured; No visible damage; No leaks.
	18	**Scissor Arms & Sliding Wear Pads:** Properly secured; No visible damage.
	19	**Handle for Manual Descent Pump:** No visible damage.
	20	**Manual Descent Pump:** Properly secured; No visible damage; No leaks; Functions properly.
	21	**Break Cylinder:** Properly secured; No visible damage; No leaks.
	22	**Ladder:** Properly secured; No visible damage.
	23	**Scissor Arms & Sliding Wear Pads:** Properly secured; No visible damage.
	24	**Drive Motor (Right Rear):** Properly secured; No visible damage; No leaks.
	25	**Wheel & Tire Assembly (Right Rear):** Properly secured; No visible damage; No loose or missing lug nuts.
	26	**Lift Cylinder:** Properly secured; No visible damage; No leaks.
	27	**Tilt Switch:** Properly secured; No visible damage; No loose or broken wiring.
	28	**Battery Installation:** Proper electrolyte level; Cables secure; No damage or corrosion.
	29	**Pothole Protection System:** Support Bar, Rollers, Limit Switches & Links properly secured; No visible damage or loose parts.
	30	**Battery Charger:** Properly secured; No visible damage.
	31	**Compartment Cover & Latches:** Properly secured; No visible damage.
	32	**Wheel & Tire Assembly (Right Front):** Properly secured; No visible damage; No loose or missing lug nuts.
	33	**Handrail Installation:** All railings securely in place; No visible damage; Chain in proper working order.
	34	**Platform Assembly:** No loose or missing parts, No visible damage; Platform Deck Extension works properly.
	35	**Scissor Arms & Sliding Wear Pads:** Properly secured; No visible damage.
	36	**Valves, Valve Fittings, Hosing & Tubing:** Properly secured; No loose or missing parts; No visible damage; No leaks.
	37	**Overall Cleanliness:** Check all standing surfaces for oil, fuel & hydraulic oil spillage & foreign objects. Ensure overall cleanliness.
	38	**Placards:** Keep all information & placards clean & unobstructed.
	39	**Operators & Safety Manual:** Copy kept in manual storage box.
	40	**Machine Log:** Ensure machine operating log is maintained.
	41	**Functional Check Completed:** Operate lift. Ensure proper functioning before use. • **ALL FUNCTIONS AND THEIR CONTROL FOR SPEED(S), SMOOTHNESS AND LIMITS OF MOTION** • **EMERGENCY LOWERING MECHANISM (Manual Lowering Mechanism)** • **ALL CHAIN AND CABLE MECHANISMS FOR ADJUSTMENT AND WORN OR DAMAGED PARTS** • **ALL EMERGENCY AND SAFETY DEVICES**

SAMPLE

Notes/Comments:

ANY AERIAL PLATFORM FOUND DEFECTIVE SHALL BE TAGGED OUT OF SERVICE IMMEDIATELY (i.e., not used) UNTIL SUCH TIME IT IS REPAIRED.

Section 3: Signature & Date		
Supervisor Name	Supervisor Signature	Date

SAMPLE

Appendix H: Aerial Platform Frequent Inspection Checklist

TOWSON UNIVERSITY.	Occupational Safety
	Aerial Platform Program
	Form

Aerial Platform Frequent Inspection Checklist

SAMPLE

Inspections shall be performed only by a person who is qualified (trained) on the specific Aerial Platform model(s) to be inspected. Inspections shall be made every three (3) months or 150 hours of operating time or prior to use if the Aerial Platform has been out of service for a period longer than three (3) months.

ANY AERIAL PLATFORM FOUND TO BE DEFECTIVE SHALL BE TAGGED OUT OF SERVICE IMMEDIATELY (i.e., not used) UNTIL SUCH TIME IT IS REPAIRED. CORRECTION OF ALL MALFUNCTIONS AND PROBLEMS IDENTIFIED AND FURTHER INSPECTION, IF NECESSARY, SHALL BE PERFORMED BEFORE THE AERIAL PLATFORM IS RETURNED TO SERVICE.

The inspection shall include each of the items specified by the manufacturer and shall include, but is not limited to the following:

Section 1: Inspection Checklist			
ITEMS INSPECTED	DEFECT	NO DEFECT	N/A
ALL FUNCTIONS AND THEIR CONTROL FOR SPEED(S), SMOOTHNESS AND LIMITS OF MOTION			
EMERGENCY LOWERING MECHANISM (Manual Lowering Mechanism)			
ALL CHAIN AND CABLE MECHANISMS FOR ADJUSTMENT AND WORN OR DAMAGED PARTS			
ALL EMERGENCY AND SAFETY DEVICES			
LUBRICATION OF ALL MOVING PARTS			
FILTER ELEMENTS			
HYDRAULIC OIL, ENGINE OIL, AND COOLANT			
STRUCTUAL AND OTHER CRITICAL COMPONENTS, SUCH AS FASTENERS, PINS, SHAFTS, AND LOCKING DEVICES.			
DC MODEL – CHECK BATTERY WATER			
PLACARDS, WARNINGS, AND CONTROL MARKINGS			
ITEMS SPECIFIED BY THE MANUFACTURER (IF ANY, LIST THEM):			

Section 2: Applicable Equipment Inspected		
Manufacturer & Model	**Serial #**	**Location (Bldg./Room)**

Note: One form may be used to record up to 4 inspections of safe aerial platforms. Each defective aerial platform must be recorded on a separate form; if defect(s) are found, use separate form and identify specific defective aerial platform.

SAMPLE

Section 3: Signature & Date		
Supervisor Name	Supervisor Signature	Date

Appendix I: Aerial Platform Equipment Familiarization Form

TOWSON UNIVERSITY.	Occupational Safety
	Aerial Platform Program
	Form

Aerial Platform Equipment Familiarization Form

Employee Name (Print)	**TU ID #**

On this day, (Insert date) _____, I received instruction for the following equipment:

Manufacturer	Model #	Serial #

SAMPLE

Instructions were provided by: (Name of trainer) _____
of (Affiliation of trainer) _____ on the following information:

1) The location of the weather resistant compartment for storing the operator's manual.
2) The purpose and function of all controls.
3) Safety devices and operating characteristics specific to that aerial platform unit.
4) An explanation of all decals, warnings, and instructions displayed on the aerial platform.
5) Determination that the purpose for which the aerial platform is to be used is within the scope of the intended application defined by the manufacturer.
6) An explanation on the contents of the manufacturer's operating instructions and user's safety rules.

Employee Signature	**Department**

This information is collected for documentation purposes only. Failure to provide this data may result in the improper identification of the individual participating in the activity. This information may be inspected, amended, or corrected by contacting the Department of Environmental Health & Safety. This information is generally not available for public inspection. It will be shared only with other departments at Towson University, the University System of MD, the State of Maryland, the U.S. federal government, and with other entities permitted by law and/or as authorized by you.

Appendix J: Minimum Safe Approach Distance Chart

MINIMUM SAFE APPROACH DISTANCES (MSAD)

To energized (exposed or insulated) power lines and parts.

Voltage Range (phase to phase)	Minimum safe approach distance (Feet)	(meters)
0 to 300V	Avoid Contact	
Over 300V to 50KV	10	3.05
Over 50KV to 200KV	15	4.60
Over 200KV to 350KV	20	6.10
Over 350KV to 500KV	25	7.62
Over 500KV to 750KV	35	10.67
Over 750KV to 1000KV	45	13.72

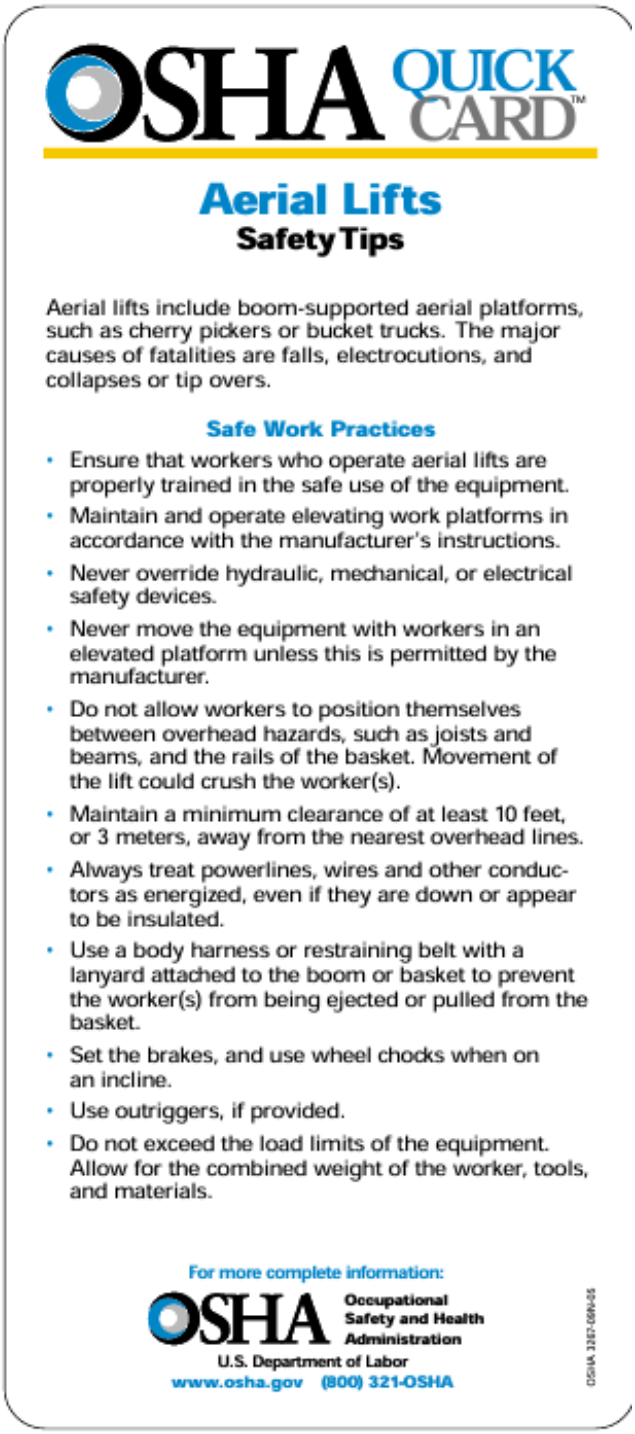
Adopted from ANSI A92.6-1999

Table 1. Minimum Safe Approach Distance. The table shows the minimum safe approach distances for equipment operators to work near energized power lines and related high voltage equipment. This minimum distance is used to avoid accidental shock or electrical arcs. The different distances in both feet and meters are based on the voltage ranges shown. As voltage increases, the required distance away from equipment increases.

Appendix K: Beaufort Wind Scale (per National Weather Service)

Force	Speed (mph)	Speed (knots)	Description	Specifications for use at sea Specifications for use on land
0	0-1	0-1	Calm	Sea like a mirror. Calm; smoke rises vertically.
1	1-3	1-3	Light Air	Ripples with the appearance of scales are formed, but without foam crests. Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	4-6	Light Breeze	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break. Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	7-10	Gentle Breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses. Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	Moderate Breeze	Small waves, becoming larger; fairly frequent white horses. Raises dust and loose paper; small branches are moved.
5	19-24	17-21	Fresh Breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	22-27	Strong Breeze	Large waves begin to form; the white foam crests are more extensive everywhere. Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	28-33	Near Gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	34-40	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind. Breaks twigs off trees; generally impedes progress.
9	47-54	41-47	Severe Gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility Slight structural damage occurs (chimney-pots and slates removed)
10	55-63	48-55	Storm	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The tumbling of the sea becomes heavy and shock-like. Visibility affected. Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	64-72	56-63	Violent Storm	Exceptionally high waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected. Very rarely experienced; accompanied by wide-spread damage.
12	72-83	64-71	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected. see Saffir-Simpson Hurricane Scale

Appendix L: OSHA Quick Card for Aerial Lifts



OSHA QUICK CARD™

Aerial Lifts
Safety Tips

Aerial lifts include boom-supported aerial platforms, such as cherry pickers or bucket trucks. The major causes of fatalities are falls, electrocutions, and collapses or tip overs.

Safe Work Practices

- Ensure that workers who operate aerial lifts are properly trained in the safe use of the equipment.
- Maintain and operate elevating work platforms in accordance with the manufacturer's instructions.
- Never override hydraulic, mechanical, or electrical safety devices.
- Never move the equipment with workers in an elevated platform unless this is permitted by the manufacturer.
- Do not allow workers to position themselves between overhead hazards, such as joists and beams, and the rails of the basket. Movement of the lift could crush the worker(s).
- Maintain a minimum clearance of at least 10 feet, or 3 meters, away from the nearest overhead lines.
- Always treat powerlines, wires and other conductors as energized, even if they are down or appear to be insulated.
- Use a body harness or restraining belt with a lanyard attached to the boom or basket to prevent the worker(s) from being ejected or pulled from the basket.
- Set the brakes, and use wheel chocks when on an incline.
- Use outriggers, if provided.
- Do not exceed the load limits of the equipment. Allow for the combined weight of the worker, tools, and materials.

For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA