



Safety Training Course B

BOOM LIFT/SCISSOR LIFT OPERATOR SAFETY

Presented by
Contract Services

As part of the
Safety Pass Training Program for the Motion Picture and Television Industry

B

Second Edition
July 2017

**LINKS TO
SUPPLEMENTAL
MANUALS:
See Page 57**



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Safety Pass Training Program

The Entertainment Industry is committed to maintaining a safe and healthful working environment. To that end, all major studios have a safety representative on staff. In addition, all employers have a safety program in force. This Safety Pass Program has been designed to further promote safety and health and to prevent injuries, illnesses, and accidents on all productions, both on-lot and off-lot.

Studios and production companies may have more restrictive safety requirements than those mandated by local, state, or federal laws or regulations. They also may assign different duties or responsibilities to employees. Therefore, in addition to this Safety Pass training course, employees should refer to the safety manual and materials provided by their employers.

Employees must adhere to all safety rules and regulations. Failure of any employee to follow safety rules and regulations can lead to disciplinary action, up to and including discharge. However, no employee shall be discharged or otherwise disciplined for refusing to perform work that the individual reasonably believes is unsafe.

No safety training can comprehensively cover all possible unsafe work practices. Each production and its employees, therefore, should fully promote each employee's personal obligation to work safely in order to prevent accidents involving, and injuries to, the employee and to his/her fellow employees.

The Safety Pass Program derives from Federal and California Occupational Safety and Health Administration (OSHA) safety regulations. However, the material included in this workbook and its accompanying presentation should be used only as a general guideline. It is not intended as a legal interpretation of any federal, state, or local safety standard.

During the course of your employment, you may be acting as a supervisor or manager. In California, individuals with management authority and actual authority for the safety of a business practice could be convicted of a crime if they have actual knowledge of a serious concealed danger and fail to warn the affected employees and report the hazard. If a hazard exists, immediately notify the employer or studio safety department of the hazard and insure that potentially affected employees are informed of the danger and that steps are taken immediately to mitigate it.

Although the information contained in this training program has been compiled from sources believed to be reliable, the Alliance of Motion Picture and Television Producers, Contract Services Administration Trust Fund, Contract Services Administration Training Trust Fund, and the instructor make no guarantee nor warranty as to, and assume no responsibility for, the accuracy, sufficiency, or completeness of such information.

The Entertainment Industry is committed to maintaining a safe and healthful working environment.

Injury and Illness Prevention Program

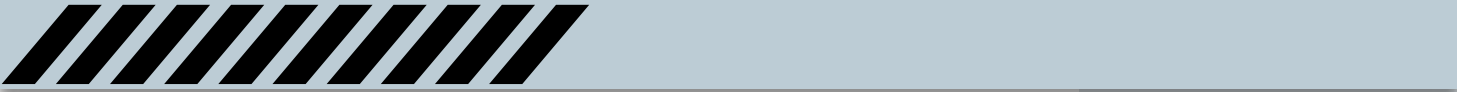


This class is part of the employer's safety program.

Employers must provide workers a place of employment free from recognized hazards and must have a safety training program in place.

In the State of California, this program is known as an Injury and Illness Prevention Program (IIPP). One requirement of an IIPP is that every employee must be properly trained in safety.

The IIPP and Safety Pass training courses are part of the employer's safety program.



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Disclaimer

Safety Pass training course B, *Boom Lift/Scissor Lift Operator Safety* does not cover the use or modification of aerial and elevated work platforms for mounting lighting, camera, or diffusion equipment. Instruction for those procedures is offered to designated classifications through Safety Pass training courses B2, *Boom Lift/Scissor Lift Rigging for Set Lighting Technicians* and B3, *Boom Lift/Scissor Lift Rigging for Studio Grips*, which provide the required training, special manuals, and exceptions to normal operation for lighting, camera, or diffusion purposes that have been approved by Genie/Terex Corporation, JLG Industries, Inc., and Snorkel.



Introduction

About This Course

Boom lifts and scissor lifts can be safe, effective equipment for lifting and positioning personnel and materials. At the same time, they are large, heavy machines that have specific requirements for proper use and operation. When not done safely, lift work can endanger operators and bystanders and cause damage to property and to the machine itself.

OSHA¹ and individual lift manufacturers require that all persons who operate a lift be trained and authorized. This course covers the safe operation of boom lifts and scissor lifts for use in the motion picture industry, including:

- Parts and mechanics of lifts
- Hazards associated with lifts
- Inspection procedures
- Basic driving and operation
- Load capacities
- Use of personal fall protection equipment (PFPE)
- Safe use and restrictions of leveling blocks (cribbing)

1. Throughout this course, the term “OSHA” will refer to both California OSHA and federal OSHA regulations.

**Safe lift operation
depends on you.**



Scissor lift.



Boom lift.

Terminology

The lifts discussed in this course go by a number of names. In general, they can be called *mobile elevating work platforms* (MEWPs) or *aerial lifts*. In OSHA regulations, a scissor lift is called an *elevating work platform*, and a boom lift is referred to as an *aerial device* or an *extendible boom platform*. Boom lifts also have nicknames such as *Condor*, *stick boom*, *knuckle boom*, *cherry picker*, or *Z boom*.

In the interest of simplicity, this course will use *scissor lift* and *boom lift* to refer to the individual machines. The terms *platform*, *machine*, *lift*, and *device* will apply to both types unless otherwise indicated. *Boom* and *basket* will apply only to boom lifts.

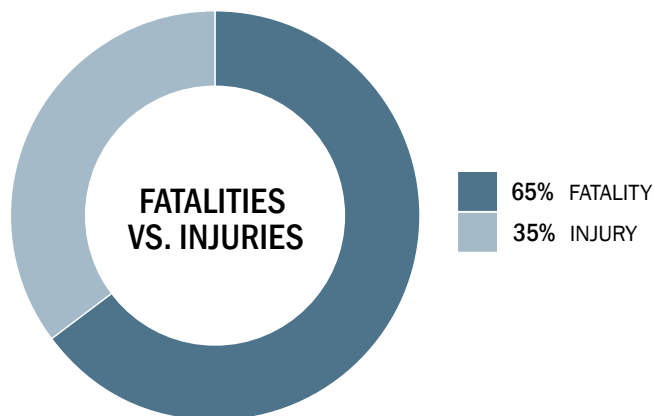
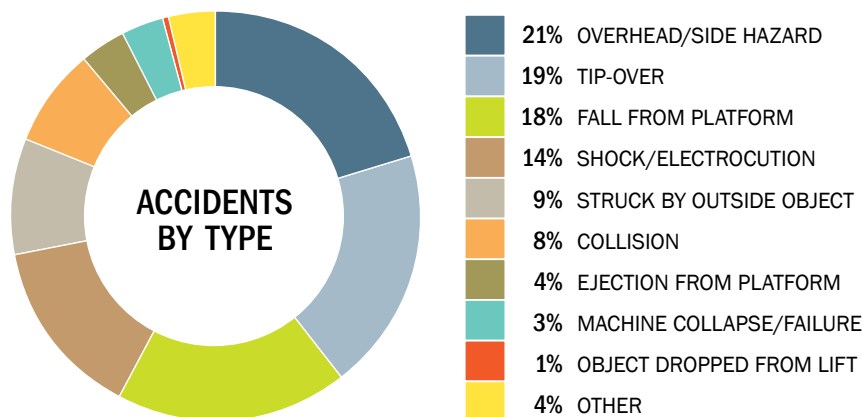
Scene 1

Hazards Associated with Lifts

The charts below show statistics for lift-related accidents that occurred in the U.S. over a 10-year period, along with the resulting injuries and fatalities.

Accidents seldom happen without a reason. This scene describes the most common types of lift hazards and their possible causes.

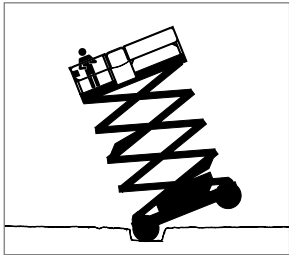
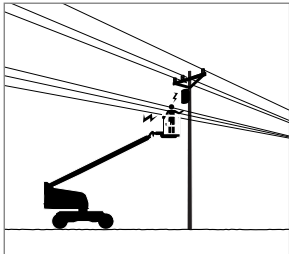
OSHA LIFT ACCIDENTS



Source: US Dept. of Labor/Occupational Safety and Health Administration (OSHA)
Fatality and Catastrophe Investigation Summaries. 2006-2015.



Common Lift Hazards and Possible Causes

Hazard	Description	Possible Causes
Overhead/Side Hazard 	Operator or passenger gets pinched, trapped, or crushed between the platform and an outside structure or object	• Not looking in the direction of the platform's movement • Clothing or equipment snagging on control lever • Unfamiliarity with controls
Tip-Over 	Machine becomes unbalanced and falls over	• Overloading the platform, or not balancing the load in the platform • Driving over or working on an incline with too steep a grade or sideslope • Driving over, or parking on, a curb, bump, edge, hole, or unstable surface • Working in high winds • Using the lift as a crane
Fall From Platform 	Falling while entering or exiting the platform, or falling from the platform itself	• Not facing the platform (or not using three points of contact) while exiting or entering • Standing on the toeboard, guardrails, or other objects in the platform to gain height • Reaching too far over the guardrails • Not wearing PFPE (when required) • Not securing entry gate or chain
Electrical Hazard 	Shock or electrocution through contact with energized wires, equipment, or the vehicle itself	• Using the machine as a ground for welding • Improper use or dressing of power cables • Not following minimum safe approach distance (MSAD) requirements (see page 5)

Minimum Safe Approach Distance

Boom lifts and scissor lifts are not insulated and do not provide any protection from contact with (or proximity to) energized power sources. To avoid electrical hazards, lift operators must maintain the proper minimum safe approach distance (MSAD) from energized overhead lines, as set by state or federal OSHA (see tables below).

When determining a safe distance, consider the operator's height in the platform, any equipment in the platform, and machine and electrical line sway. For details, see Safety Bulletin #22A, *Power Line Distance Requirements*, as well as the operator's manual for the lift being used. When in doubt, stay the maximum distance away from power lines.

California Boom-Type Lifting or Hoisting Equipment Clearances Required from Energized Overhead High-Voltage Lines

Nominal Voltage (Phase to Phase)	Minimum Required Clearance (Feet)
600 50,000	10
over 50,000 75,000	11
over 75,000 125,000	13
over 125,000 175,000	15
over 175,000 250,000	17
over 250,000 370,000	21
over 370,000 550,000	27
over 550,000 1,000,000	42

Source: 8 CCR §2946 (2)

Federal Clearances Required When Working On or Near Exposed Energized Parts

Nominal Voltage (Phase to Phase)	Minimum Required Clearance (Feet)
50,000 or below	10
over 50,000	10 feet plus 4 inches for every 10,000 volts over 50,000 volts

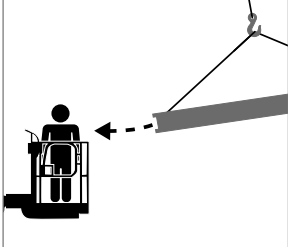
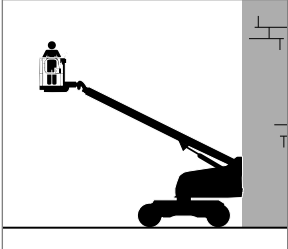
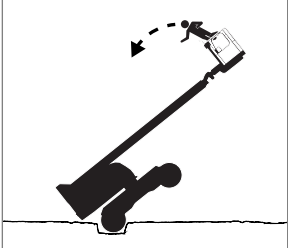
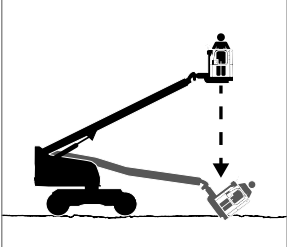
Source: 29 CFR §1910.333

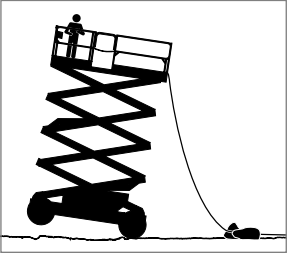
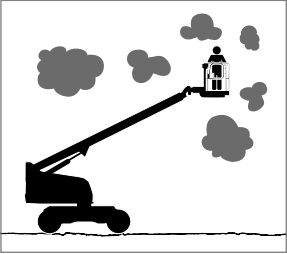
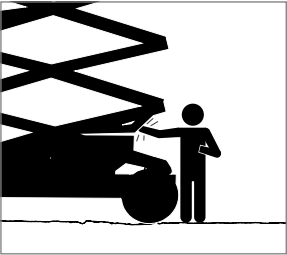


Rule of thumb: Always assume that power lines are energized.

Your employer may set greater MSAD requirements than the clearances set by OSHA.



Hazard	Description	Possible Causes
Struck by Outside Object 	Personnel or lift struck by a moving object or a falling structure	• Not properly assessing work zone hazards • Inattention to work being done from the platform or near the lift
Collision 	Impact between lift and another vehicle, object, or person	• Not signaling before moving the machine • Not looking in the direction of the machine's movement • Allowing personnel and vehicles to enter the work zone • Not allowing for backswing (boom lifts)
Ejection From Platform 	Operator and/or passenger is catapulted from boom lift platform	• Driving over, or parking on, a curb, bump, edge, hole, or unstable surface • Platform caught under an obstacle, then released • Contact with another object or vehicle • Not wearing PFPE
Collapse 	Structural failure causes machine to collapse	• Poor maintenance • Defect in machine • Misuse of machine • Unauthorized modifications to machine • Overloading the platform

Hazard	Description	Possible Causes
Entanglement 	Machine tip-over or equipment damage when cables hanging over the platform become snagged on an outside structure or driven over by another vehicle (or the lift itself)	• Not properly organizing cords and cables • Not properly assessing work zone hazards
Environmental 	Working in a hazardous environment (exhaust, toxic chemicals, combustible dust, flammable vapors, etc.)	• Not properly assessing work zone hazards • Not wearing appropriate personal protective equipment (PPE) • Operating a lift in a confined space • Operating a lift in an unapproved area
Weather Hazards 	Operator injury or machine tip-over due to weather conditions	• Working in wind speeds that exceed industry or manufacturer limits (page 22) • Rain, ice, or snow causes the platform to become slippery or the ground to become unstable • Working in extreme heat or cold without proper safety precautions • Working during lightning or storms
Other 	Injuries from pinch points, protrusions, equipment, or falling objects while working on, near, or under a lift	• Inattention while entering or exiting a lift • Inappropriate use of the lift for material handling • Inattention while using tools or other equipment on the platform • Horseplay on or around a lift • Allowing personnel to enter the work zone



Notes



Scene 2

Lift Basics

Boom Lifts

A boom lift is comprised of a wheeled chassis that supports a turntable with an extendable boom. At the end of the boom is a platform. A telescopic boom (above) is straight, while an articulating boom (Figure 2.1 A) is hinged and can reach over or under obstacles. Either type of boom might have a short jib extension (Figure 2.1 B), which allows the platform to reach more positions.

The turntable can typically rotate 360° and the boom arm can be positioned vertically and horizontally. Boom lift models can reach from about 30 ft. to 185 ft. in height.

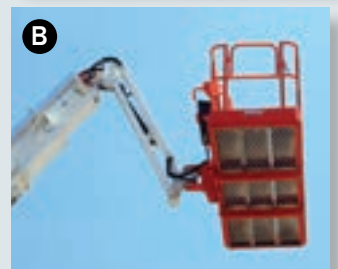
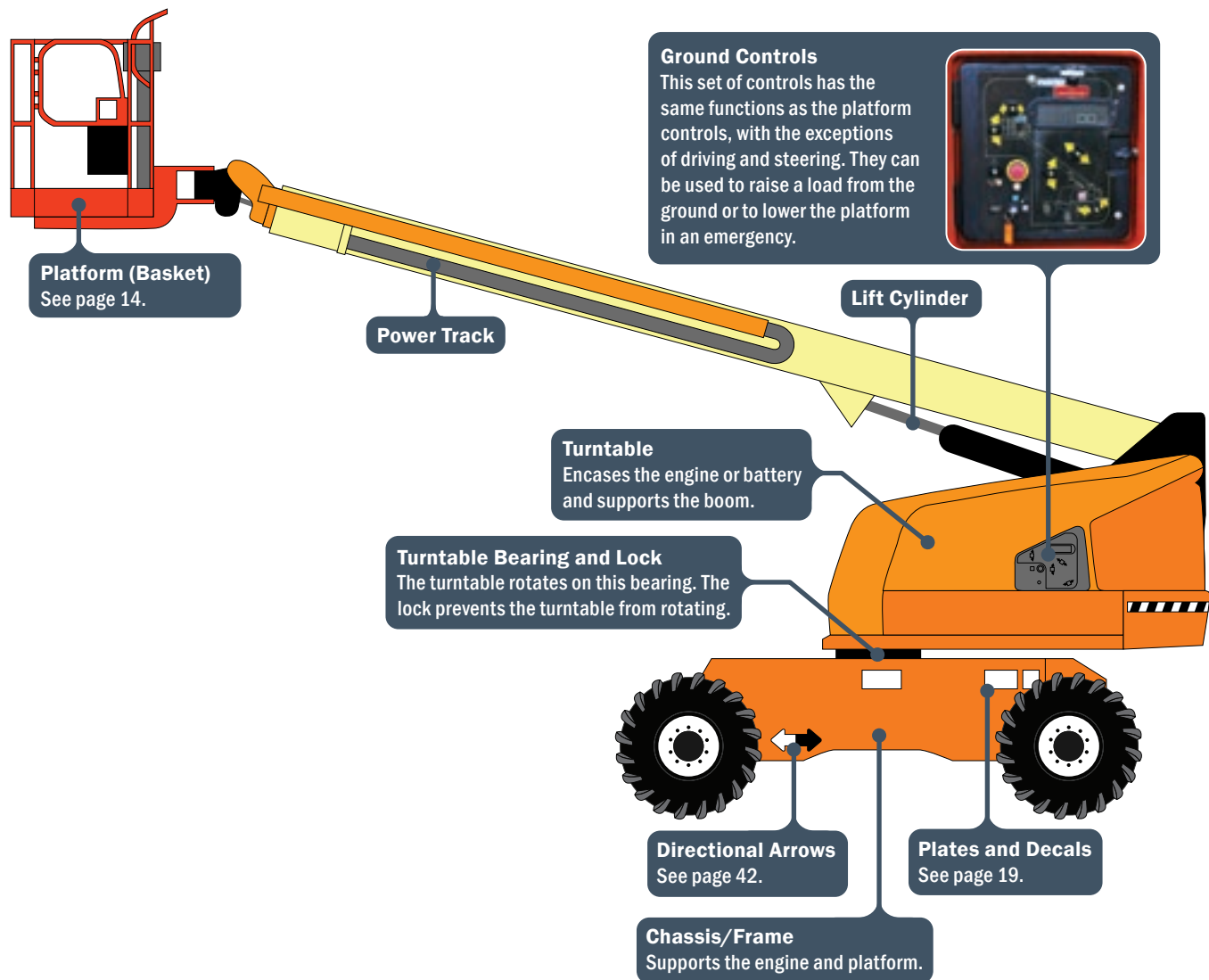
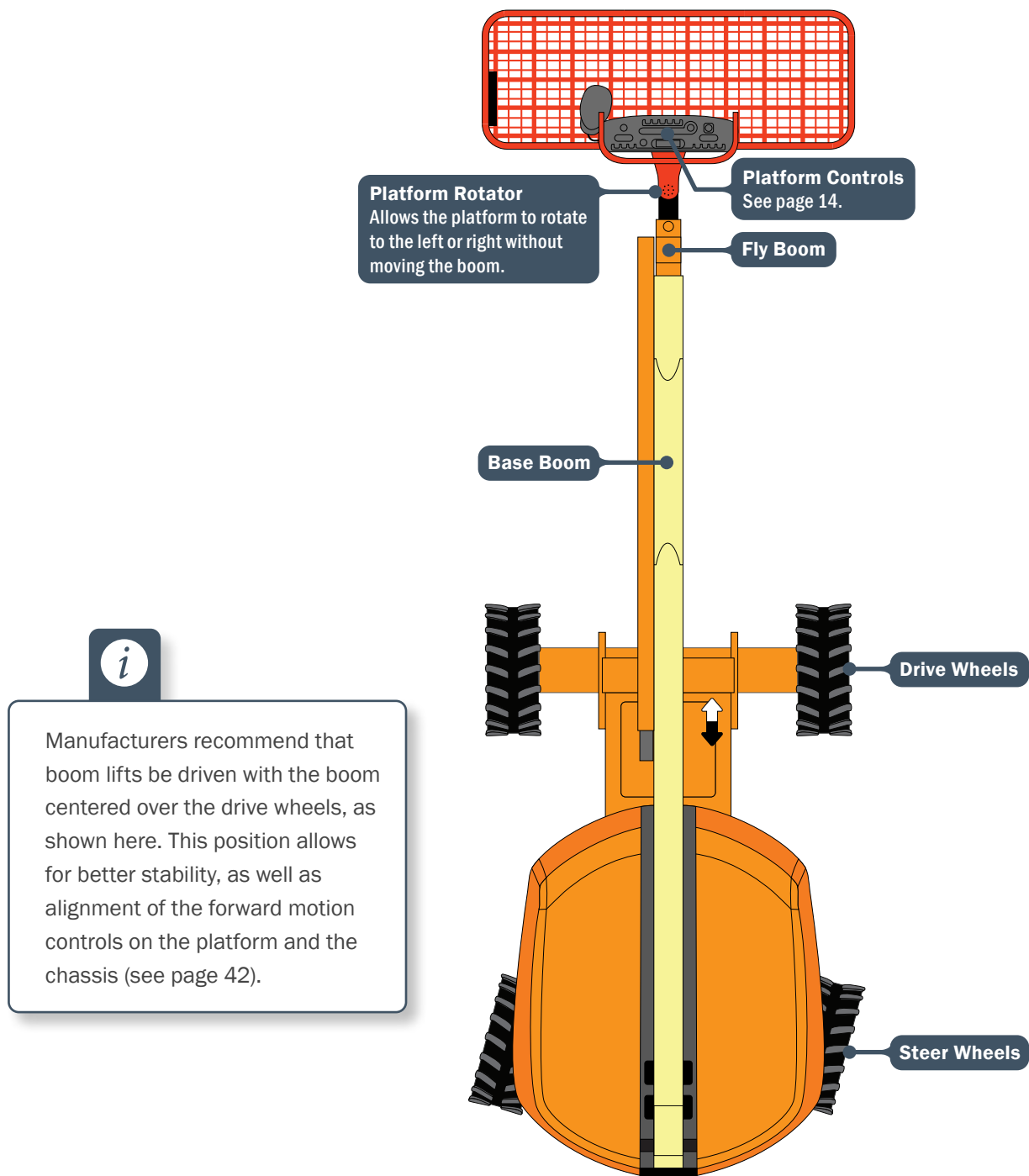


Figure 2.1. (A) Articulating boom lift. (B) Boom with jib extension.

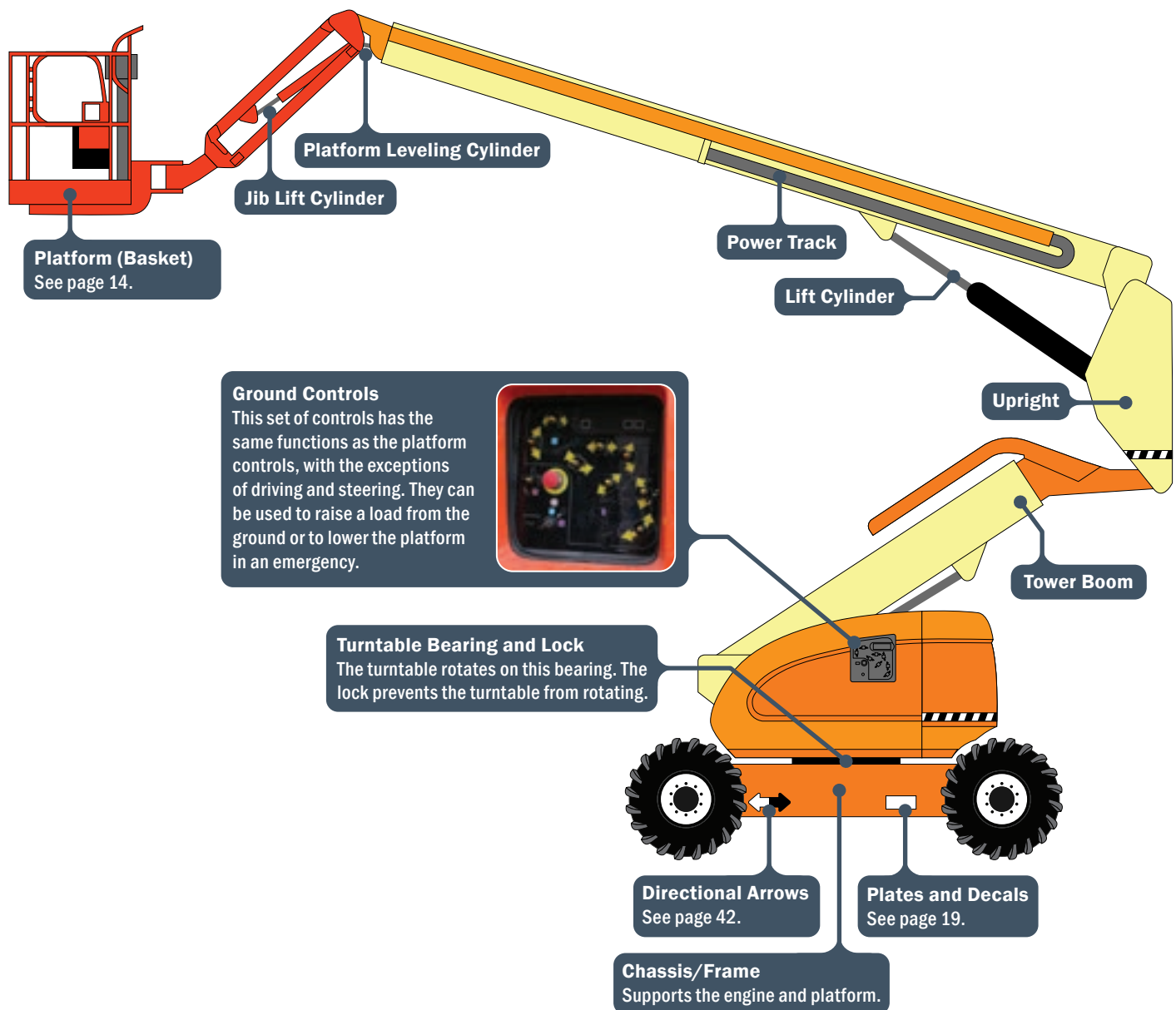
Main Parts of a Telescopic Boom Lift: Side View



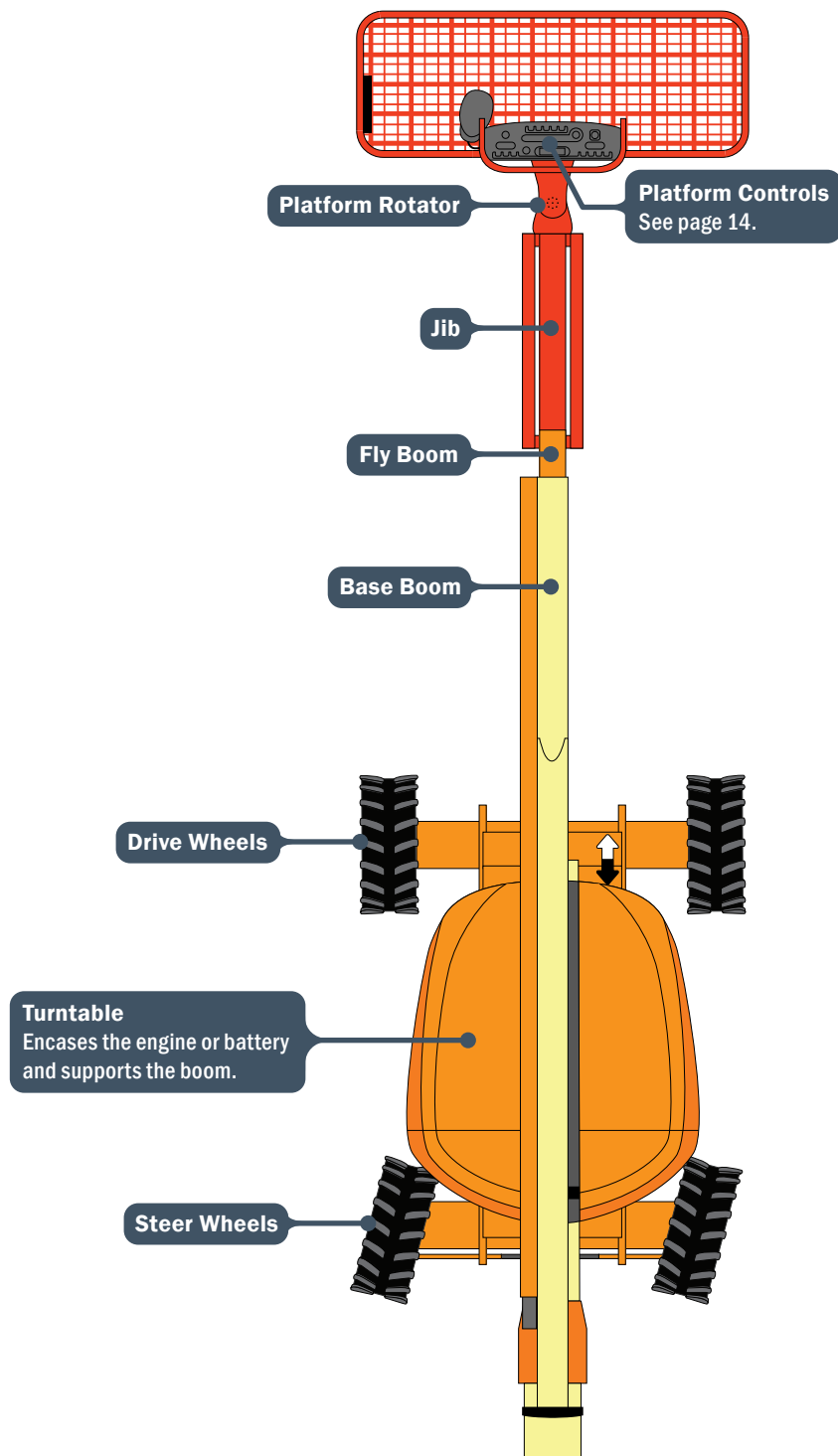
Main Parts of a Telescopic Boom Lift: Overhead View



Main Parts of an Articulating Boom Lift: Side View



Main Parts of an Articulating Boom Lift: Overhead View



Parts of the Platform: Boom Lift



The platform of a boom lift is often called the “basket.”

Platform Controls

The main operator controls are on the platform. From these controls, the operator can drive and steer the machine, raise and lower the platform, and extend and retract the boom. Controls may look different between lift makes and models.



Anchor Points

Approved for attaching PFPE. Each person in the platform must use a separate anchor point. Do not attach equipment to an anchor point.

Entry Gate

Top Rail

Midrail

Toeboard

Prevents materials from falling off of the platform.

Floor

The metal floor of the platform is constructed so that the area underneath can be seen by the operator.

Footswitch (“Dead Man’s Switch”)

The footswitch must be depressed in order to perform any function. Releasing the footswitch removes power from all controls and applies the drive brakes.

Manual Storage Box

Designated compartment for manual storage, typically a weather-resistant plastic case.

Scissor Lifts and Vertical Mast Lifts

A scissor lift (Figures 2.2 and 2.3) is a wheeled chassis that supports a platform. The platform is raised and lowered in a vertical direction by a series of arms. Scissor lift models can reach from about 15 ft. to 60 ft. in height.

Vertical mast lifts (“manlifts”) also operate only in a vertical direction (Figure 2.4). Their small size allows them to fit through doorways or in tight spaces, but they have low load capacities and are generally intended to lift only one worker at a time. The control panel is in the platform—there are no ground controls. They can reach about 40 ft. in height.



Figure 2.2. Electric scissor lifts operate on rechargeable battery power, which makes them suitable for indoor use. They have small, solid tires which can only be used on smooth surfaces, usually indoors.

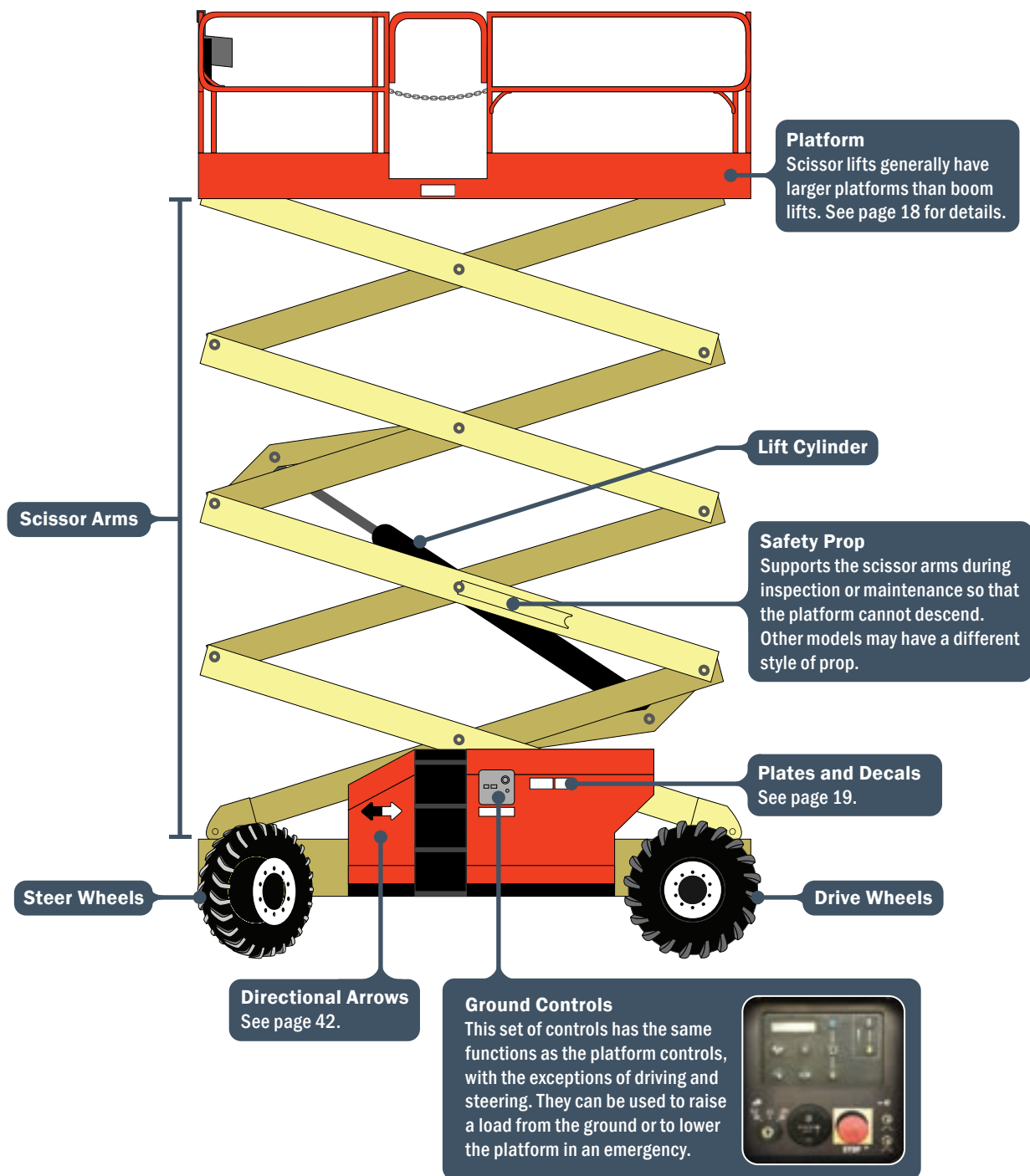


Figure 2.3. Rough terrain scissor lifts are usually engine-powered, and have large, rugged tires. They are better-adapted than an indoor lift for work on uneven surfaces and inclines.

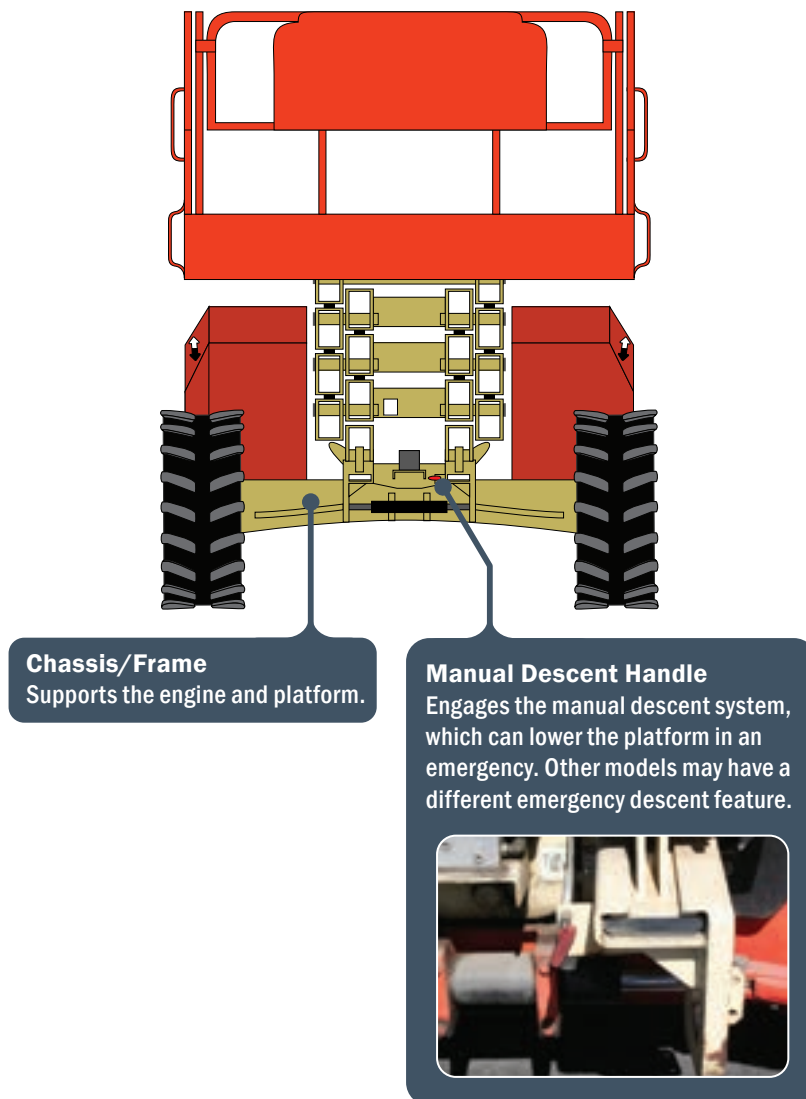


Figure 2.4. Vertical mast lifts are available in “push-around” or electric versions (shown here). If the lift is equipped with outriggers, they must be set before the platform can be elevated.

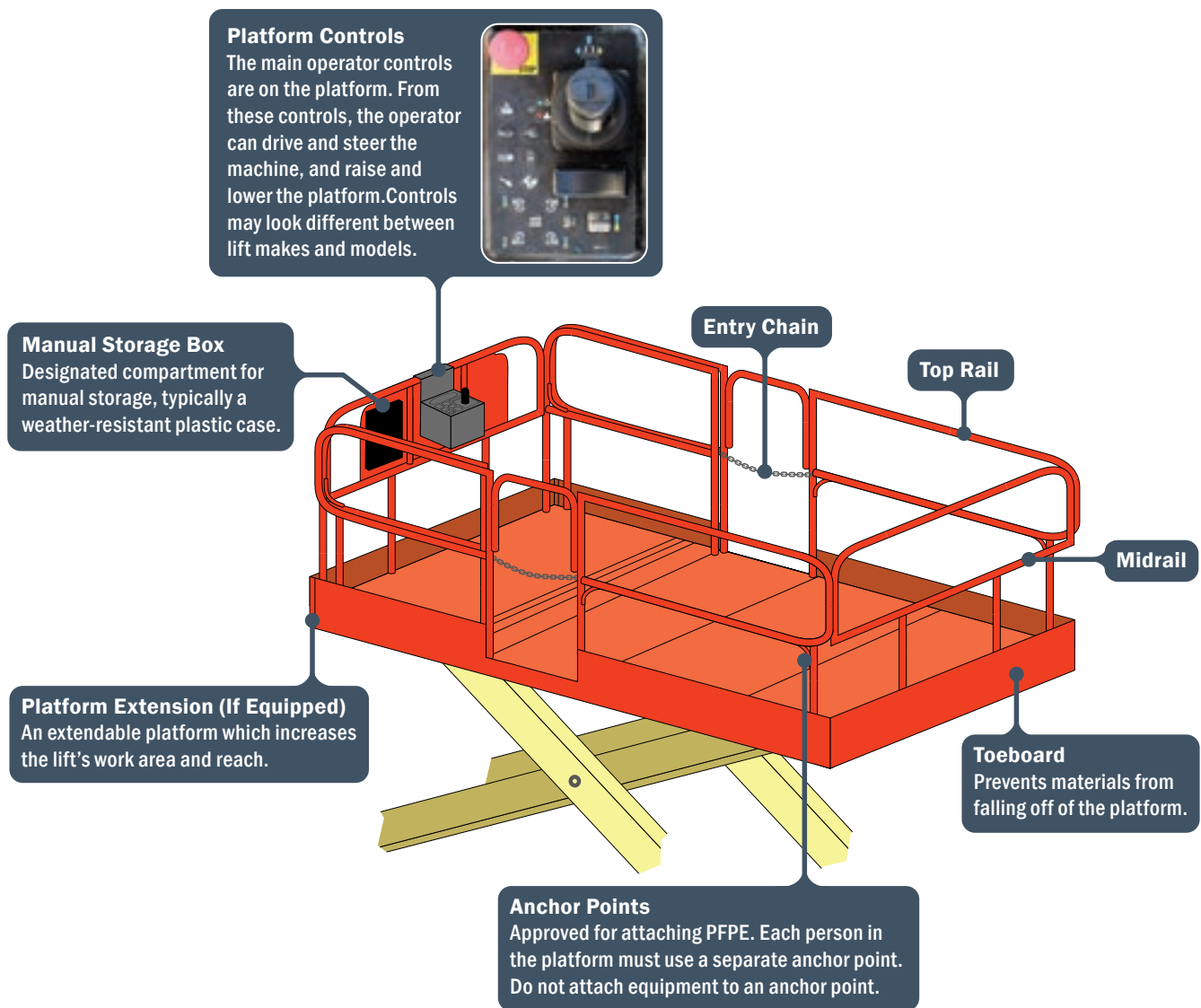
Main Parts of a Scissor Lift: Side View



Main Parts of a Scissor Lift: Front View



Parts of the Platform: Scissor Lift



Manuals

The operator's manual provides operational, safety, and emergency procedures for a specific lift model. Although the mechanics of a lift may be similar between types, the layout and location of driving controls and emergency features can vary greatly between makes and models. The operator's manual (and any other manual applicable to the use of the machine) must be with the machine at all times. It is typically stored in the weatherproof box on the platform.



Do not operate a lift that does not have the proper manuals onboard. Manuals can be requested or downloaded from the manufacturer.

Plates and Decals

Important information about technical specifications and safe use of the machine appears in various locations on a lift (Figure 2.5). Check the operator's manual for specifics on where decals are located. Do not operate a machine on which they are missing or illegible.



Figure 2.5. Read and understand information plates and warning decals before operating a lift.

Power Sources

The platform system of a lift is powered by pressurized hydraulic fluid. The motor that propels the chassis can be electric (run by rechargeable batteries) or engine-powered (using diesel, gasoline, or propane fuel).



Active brakes use pressure to slow down and stop a vehicle. Passive brakes use pressure to keep the brakes off—when the pressure is released, the brake is activated and stops the vehicle. The brake is either “off” or “on.”

Suspension and Brakes

Boom lifts and scissor lifts do not have a suspension system, such as springs or shock absorbers, as automobiles do. They also use a passive brake system instead of an active one. As a result, any bumps or sudden stops are transferred from the ground to the platform. For example, a tire drop of 4 in. can cause the platform of a 40-foot boom lift to sway 2 ft., which might catapult personnel from the platform.

Drive System

Lifts may be four-wheel drive (4WD), where the engine powers all of the wheels, or two-wheel drive (2WD), where the engine powers only the front or rear wheels. The 4WD version of a lift may have more speed and gradeability (discussed in Scene 6) than the 2WD version of the same model.

Steering

In general, the front wheels of a lift will be the steer wheels, although some boom lift models have rear-wheel or all-wheel steering.

Tires

Rough terrain models typically have large pneumatic or foam-filled tires that are appropriate for uneven or rugged terrain. Lifts designed for use indoors or on smooth surfaces have smaller, solid tires.



Scene 3

Pre-Use Inspection

Before the lift is used each day, or when there is a change in operators, a three-part **pre-use inspection** must take place.

- ① A **work zone inspection** ensures that there are no hazards in the immediate work area.
- ② A **walk-around inspection** is a visual assessment of the physical condition of the lift.
- ③ A **function test** is a check of the machine's power sources, controls, and operation.

This scene discusses the general procedures for each part of the inspection. Always follow the specific inspection procedures for the lift model you will be using (located in the operator's manual).

If a malfunction occurs during use, or if any part of the machine fails an inspection, safely shut down and exit the machine and contact a supervisor. Never operate a defective machine.

The effects of driving over a rough surface are magnified when the platform is elevated.

1. Work Zone Inspection

Before operating any lift, it is crucial to ensure that you will be working in (or creating) a safe work environment. The work zone inspection is an effective defense against lift accidents—in fact, most of the hazards discussed in Scene 1 can be prevented by performing a thorough evaluation of the surroundings before putting a lift into use. The following conditions must be avoided or mitigated (if possible):

- Bumps, drop-offs, and holes (Figure 3.1)
- Ground obstructions
- Non-load-bearing work surfaces—whether indoors or outdoors, a surface must be able to support a lift and its load (Figure 3.2)
- Stage pits or underground tanks (Figure 3.3)
- Ground surface debris
- Vehicle or pedestrian traffic
- Overhead obstructions and power lines
- Wind speeds that are over the industry standard of 25 mph, or over a lower wind speed set by a manufacturer (check the operator's manual or any supplemental manuals)
- Slippery work surfaces caused by spills or weather conditions
- Hazardous atmospheres



Figure 3.1. Always check the surroundings and travel route before operating a lift. An uneven surface could cause a tip-over.



Figure 3.2. Be sure the work surface can support the weight of a lift and its load. When on location, consult a site representative for maximum weight limits. A lift's weight and ground bearing pressure are listed in the specs in the operator's manual.



Figure 3.3. A soundstage map (left) shows the location of pits (right), tanks, or other potentially unsafe areas of a soundstage. Check with studio operations or a studio safety representative for specifics.

Boom lifts and scissor lifts are intended for use on firm, smooth, and level surfaces. What are the differences?

Firm—Able to support the machine and its load in all configurations.

Smooth—Free of bumps, holes, and debris.

Level—An incline that does not exceed manufacturer recommendations.
(See Scene 6).



Always check the weight limits of a stage floor or filming location before operating a lift.

2. Walk-Around Inspection

The walk-around inspection is a visual verification that the lift and its components are in safe operating condition. Below are some general guidelines—always follow the checklist provided by the manufacturer for the lift in use.

Pre-Inspection

Before beginning the physical inspection, be sure that:

- The machine is up-to-date with its scheduled maintenance and inspections (Figure 3.4)
- The correct operator's manuals are in the manual holder on the platform
- You are familiar with the safety and warning decals, control panel symbols, and applicable operator's manuals
- The machine's power is off
- The platform is in the lowest position
- The machine is on a firm, level surface

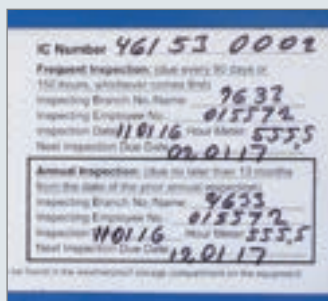


Figure 3.4. Inspection dates can be found on a decal or in the operator's manual.

Performing the Inspection

Inspect the areas of the machine listed on the following pages for tight connections, signs of damage, and overall good condition. Fuel and fluids should be filled to the proper levels and tires properly inflated.

Keep an eye out for:

- Missing bolts, pins, or other hardware
- Missing or damaged safety labels
- Debris that has collected in moving parts or under the lift
- Cracked cables or hoses
- Sharp edges, burrs, and hazardous projections
- Fluid leaks
- Bent or broken guardrails
- Unauthorized modifications



Never touch hydraulic lines to check for leaks. The hydraulic fluid is under extreme pressure and can burn or penetrate the skin. Report hydraulic fluid leaks (or any fuel spills) to the studio safety department.

General Inspection Areas

Include the following areas when inspecting both boom and scissor lifts.

Wheel and Tire Assemblies



Steering Cylinder Assembly



Doors, Covers, and Latches



Ground Controls



Platform Controls



Engine



Hydraulic Fluid Tank



Hydraulic System



Battery



Platform Assembly



Steps/Ladder



Propane Cylinder





Boom Lift Inspection Areas

Boom and Power Track



Turntable Bearing and Lock



Platform Rotator Pivot Point



Footswitch



Scissor Lift Inspection Areas

Scissor Arms and Travel Tracks



Guardrails



Outriggers (If Equipped)



Safety Prop (If Equipped)





Figure 3.5. Check a lift's functions from the ground controls before operating it from the platform.

3. Function Test

Once the work zone and the physical condition of the lift have been checked, the operator must test the controls and mobility of the machine (Figure 3.5). As with the walk-around inspection, refer to the operator's manual for specific procedures.

Before beginning the function test:

- Check for clearance around and above the machine and ensure the travel path is free of debris and obstacles.
- Ensure that there is no load on the platform.
- Be sure that you are wearing the appropriate PFPE and PPE, supplied by your employer.
- Be sure you are familiar with the ground and platform controls for the lift.

All functions should operate smoothly. If any function does not work properly, stop the machine and contact a supervisor.



Continue to visually inspect the cables and hydraulic lines under the platform after it is raised.

Testing the Ground Controls

General (All Lifts)

- Before starting the engine, test that all switches and levers return to neutral when released.
- Turn the key of the main control to the “ground” position.
- Check that the emergency descent system will lower the platform using auxiliary power.
- Check that the emergency stop control is operating properly.

Boom Lifts

- Elevate the base boom. Watch for any delays, which may indicate loose cables. Inspect the length of the boom and under the platform for loose or missing hardware, damage, or leaks, and that the hydraulic lines are secure.
- Rotate the turntable in both directions.
- Extend any other boom sections.
- Rotate and tilt the platform in each direction.
- Return the platform and turntable to their starting positions and retract and lower all of the boom sections.

Scissor Lifts

- Raise the platform and inspect the scissor arms, lift cylinder, and areas under the platform for loose or missing hardware, leaks, cracks, or damage.
- Check that the hydraulic lines are secure.
- Check that the platform can be lowered using the battery-powered or manual descent system. (This feature may be located on the chassis.)
- Check that the pothole protection system engages (if equipped).

Testing the Platform Controls

General (All Lifts)

- Turn the key of the main ground controls to “platform.”
- Enter the platform using three points of contact.
- Ensure that the gate or chain securely latches.
- If wearing PFPE, attach the lanyard to an approved anchor point.
- Check that all switches and levers return to neutral when released.
- Check that the emergency descent system will lower the platform using auxiliary power.
- Check that the emergency stop control is operating properly.
- Use the horn to signal any movement of the machine.
- Follow manufacturer’s procedures to check that all safety features (overload warning, control panel contact sensor, etc.) are functioning properly when they are activated.
- Follow manufacturer procedures to check the machine’s tilt sensor.

Boom Lifts

- Press the footswitch and start the engine—it should not start. Remove your foot and start the engine.
- Test the function controls with your foot off the footswitch—they should not work. Press the footswitch to test each function.
- Raise, lower, extend, and retract the boom sections.
- Rotate and tilt the platform in each direction.
- Rotate the turntable in both directions.
- With the boom at horizontal, test the forward and reverse operation of the machine.
- Test the steering, the brakes, and the extendable axles (if equipped).

Always refer to the operator’s manual for a lift model’s specific functions and how to check them.



Figure 3.6. Check a scissor lift's platform extension(s) as part of the function check.

Scissor Lifts

- Check that the platform extension (if equipped) extends and retracts properly and locks in place.
- Start the engine.
- Locate the lift enable feature. Without engaging it, test the control that elevates the platform—it should not work. Engage the lift enable feature and try again—the platform should now elevate properly. Repeat the process to test the control that lowers the platform.
- Locate the drive enable feature. Without engaging it, test the drive control—the machine should not move. Engage the drive enable feature and try again—the machine should move when the drive control is in use.
- With the platform lowered, test the machine's forward and reverse operation.
- Test the steering, brakes, and outriggers (if equipped).

Scene 4

Lift Physics

Height and Reach

Vertical Height

Manufacturers often list the maximum vertical height of their lifts using two measurements: **platform height** and **working height** (Figure 4.1). Platform height is the distance from the ground to the platform in its highest vertical position. Working height adds 6 ft. to the platform height.

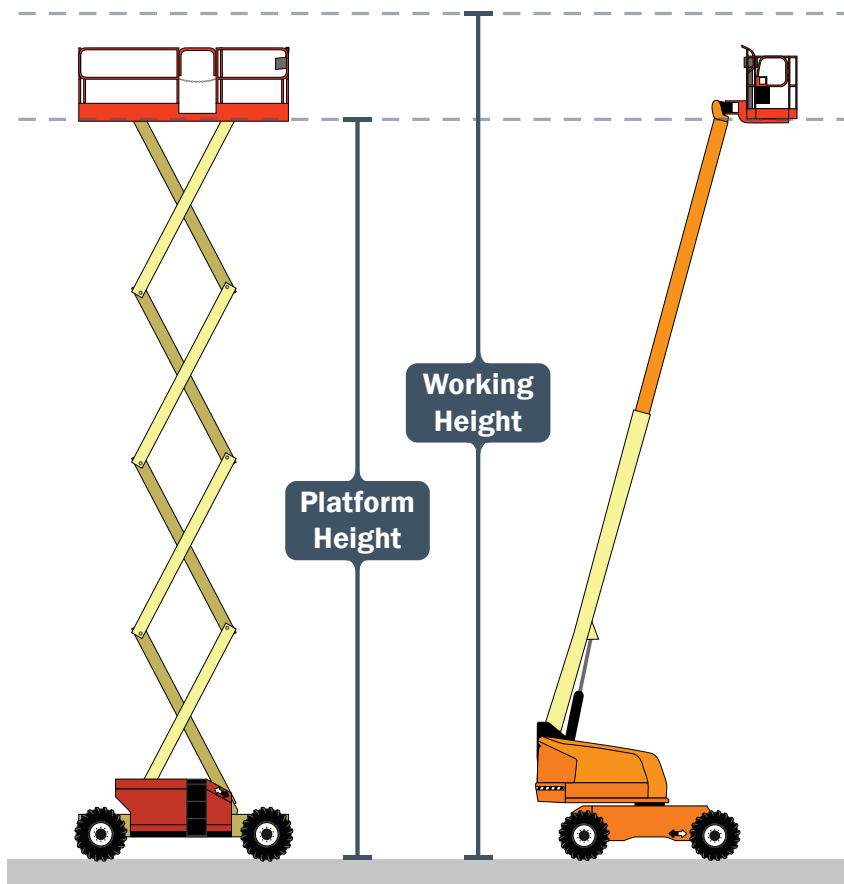
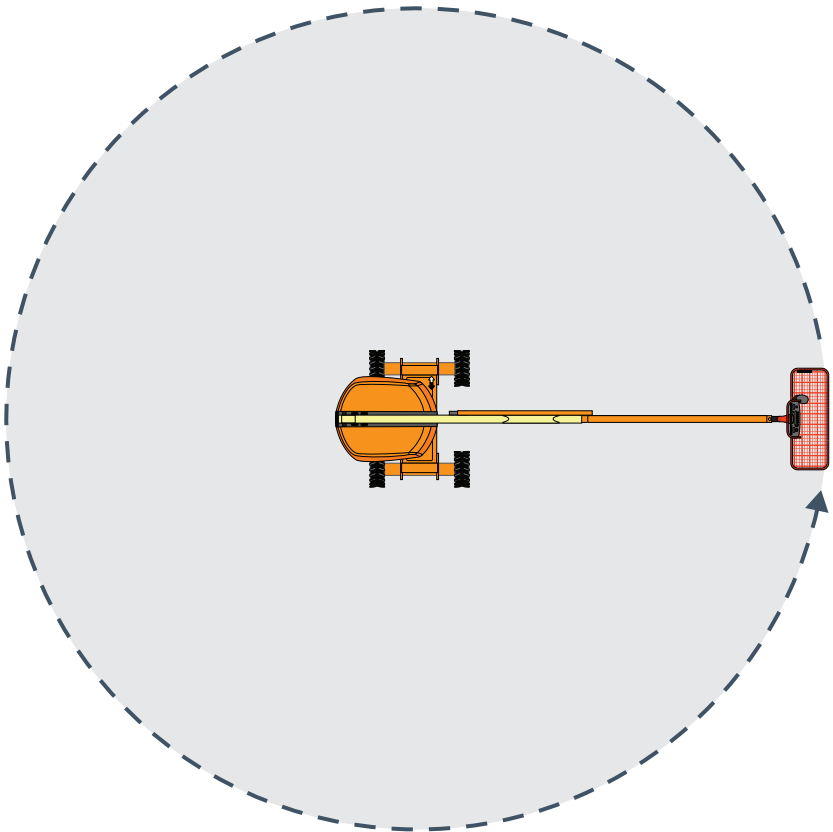
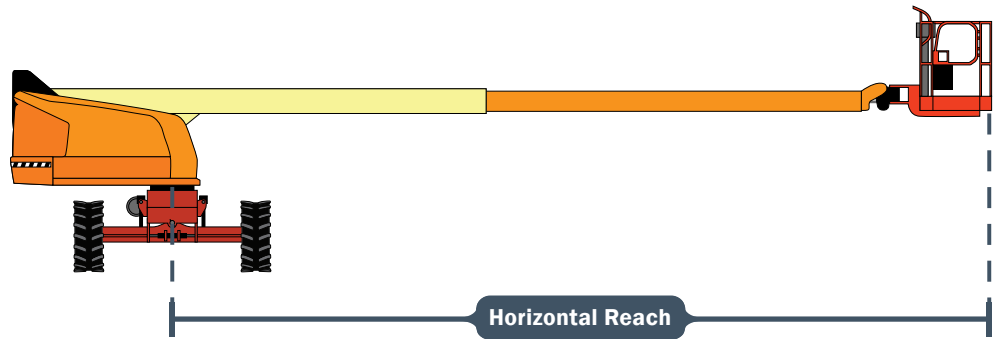


Figure 4.1. Platform height and working height.

Horizontal Reach (Boom Lifts)

Horizontal reach is the maximum distance from the center of the turntable's rotation to the outer edge of the platform when the boom is parallel to the ground (Figure 4.2).



A boom lift's maximum horizontal reach will always be less than its maximum height.

Figure 4.2. Maximum horizontal reach of a boom lift (top). The reach extends 360° (bottom).

Stability and Tipping

Combined Center of Gravity

Every lift has a specific **combined center of gravity (CCG)**, which is the point where the center of gravity of the lift and the center of gravity of the load on its platform are concentrated. Any action that changes the configuration or angle of the machine (raising the platform, extending the boom, driving on an incline, increasing the load weight) will affect its CCG (Figure 4.3).

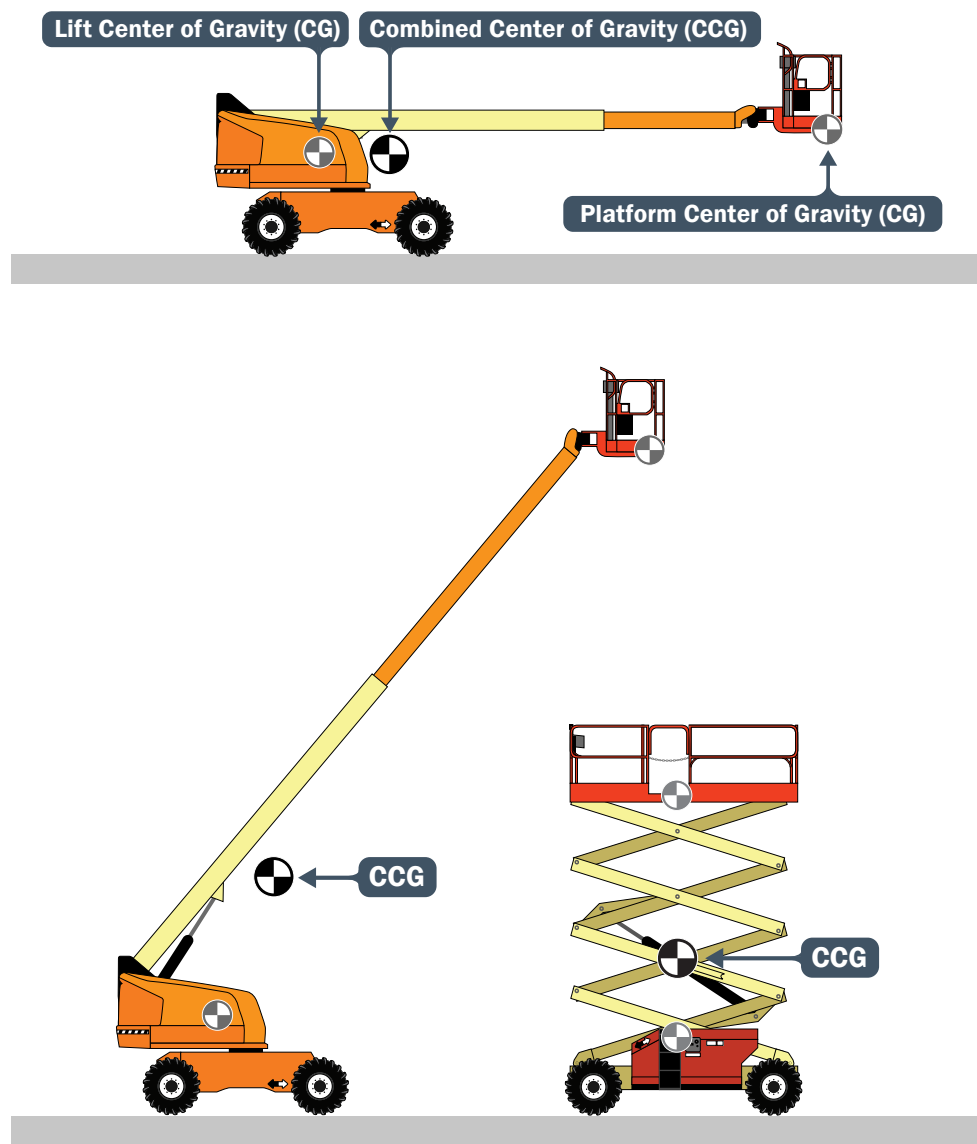


Figure 4.3. A lift's CCG will shift as the platform is extended or raised. (All drawings are approximations.)

Area of Stability

A lift rests on four wheels, which creates two tipping axes (front-to-back or side-to-side). Within the wheelbase is an **area of stability** that supports the machine within its normal usage limits (Figure 4.4). If the CCG extends past the area of stability, the machine is likely to tip (Figure 4.5). This could occur due to driving over a bump or a hole, working in strong wind, traveling while elevated, side loading, or working on an incline (see Scene 6).

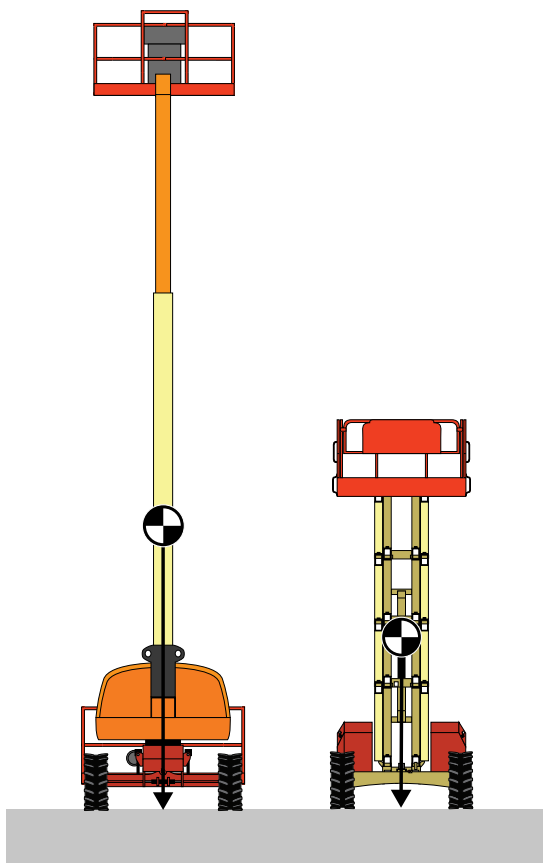


Figure 4.4. Boom lifts and scissor lifts can be safely used in a range of positions as long as the CCG remains within the lift's area of stability.

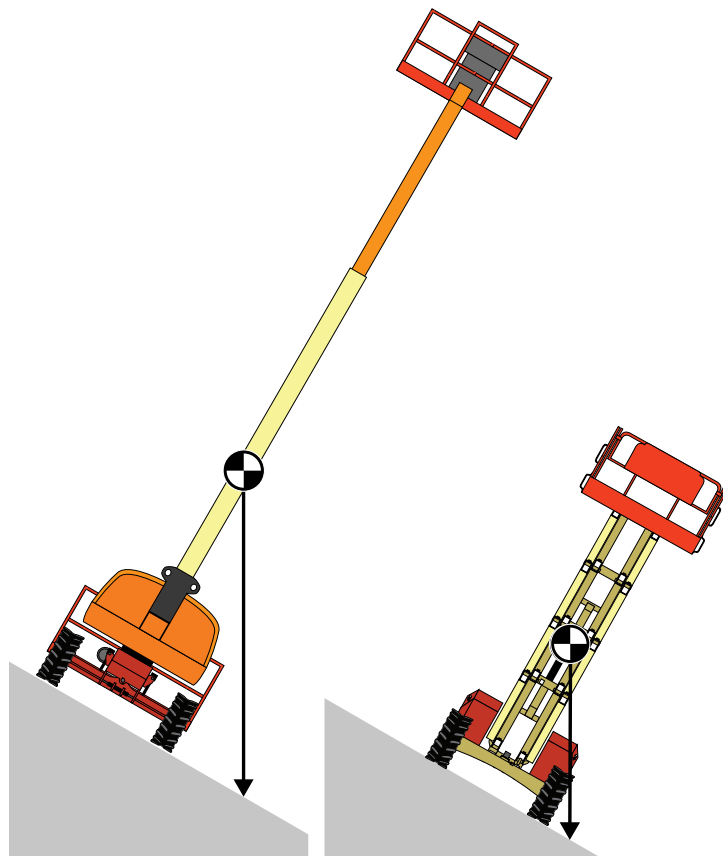


Figure 4.5. If the CCG moves outside of the area of stability, (such as when a lift is on too steep an incline), the lift is likely to become unstable and tip.

Stability-Increasing Features

Features such as outriggers (Figure 4.6) or extendable axles allow a lift to be used in more configurations by increasing its area of stability. Some outriggers can also level the machine if it is on an uneven surface.



Figure 4.6. This Genie scissor lift is equipped with outriggers. When they are not in use (left), the platform can be raised to 30 ft. When they are extended (right), the platform can be raised to 53 ft.

Positions of Least Stability (Boom Lifts)

A boom lift can be used safely in many configurations, but some are inherently more stable than others. In general, stability is increased when the weight of the machine is over the front and back wheels (the long axis). The more the weight shifts towards the sides (the short axis), the less stable the machine will become if it is overloaded or is on an incline (Figure 4.7). The positions of least stability vary by model and should be avoided. Check the operator's manual for specifics.

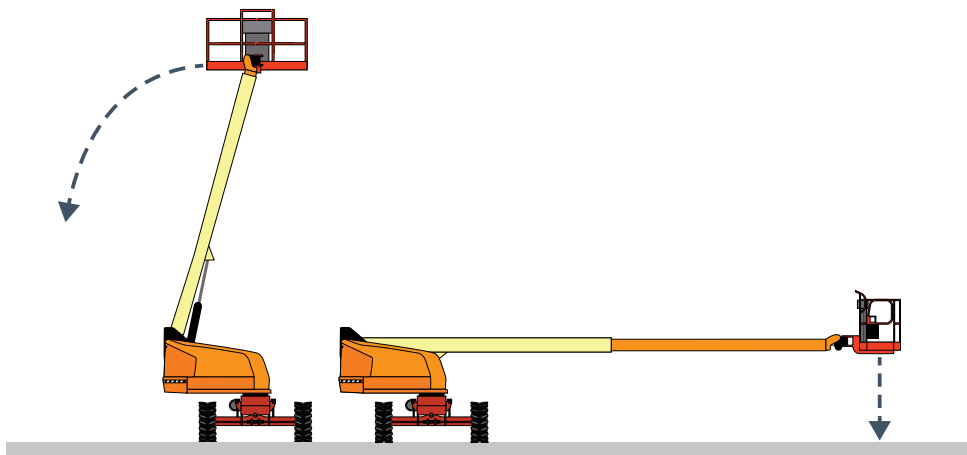


Figure 4.7. A boom lift is susceptible to tipping when the turntable is perpendicular to the wheelbase and the weight of the boom and the platform are concentrated on one side of the stability area.

Platform Capacity

Due to the challenge of maintaining stability while working at height, lift manufacturers have specific limitations on the **maximum load capacity** (also called **maximum work load**) a boom lift or scissor lift support on its platform. This information can be found on a lift's decals (Figure 4.8) and in its operator's manual.

Some lifts have a single, maximum **unrestricted load capacity**, no matter where the platform is positioned (Figure 4.8A). On other models, a manufacturer will specify both an unrestricted load capacity and a **restricted load capacity**, which depend on the position of the platform (Figures 4.8B, 4.8C, and 4.9).

Never exceed a lift's maximum capacity—always err on the side of overestimating the weight of a load. Keep all equipment within the confines of the platform.

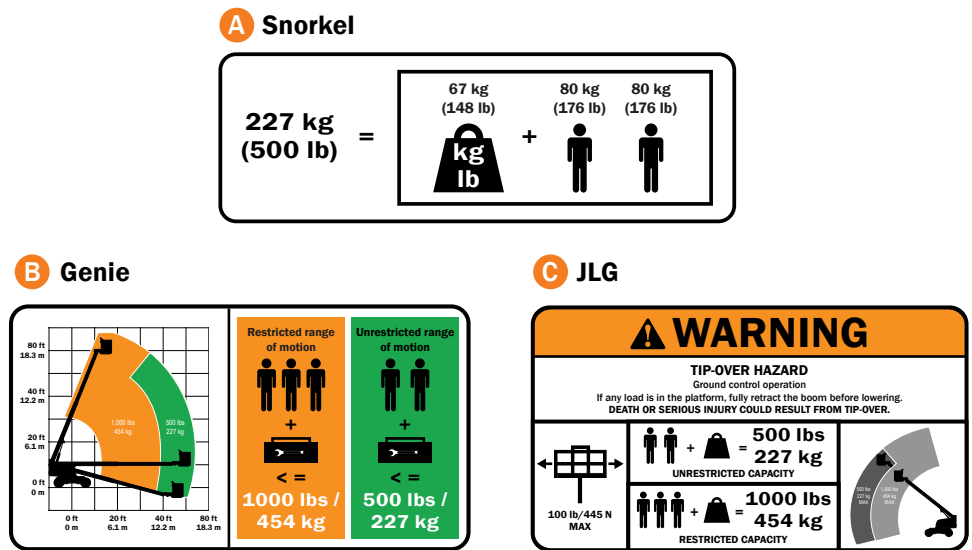


Figure 4.8. Maximum load capacity decals for three 60-foot boom lift models. Note that the Snorkel decal (A) lists a single unrestricted load capacity of 500 lbs., while the Genie and JLG decals (B and C) indicate both unrestricted and restricted load capacities.



Lifts with the same model number may have different capacity restrictions based on the year they were built. Make sure that the operator's manual includes the serial number on the machine's information plate.

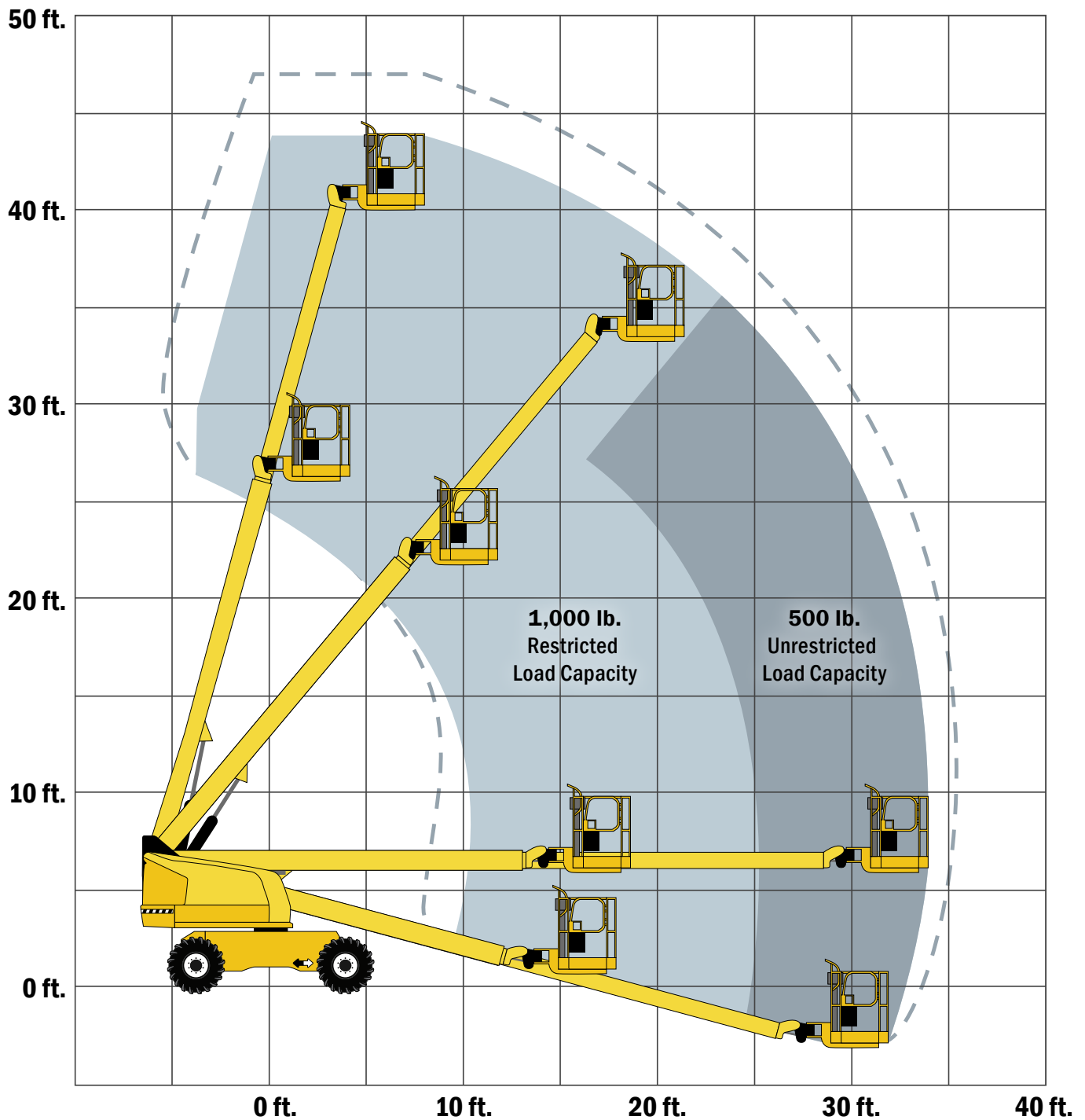


Figure 4.9. This lift has an unrestricted load capacity of 500 lb. and a restricted load capacity of 1,000 lb. When the load is 500 lb. or less, the platform can be positioned anywhere in the shaded areas. When the load is between 500 and 1,000 lb., the platform is restricted to the lighter shaded area.



Notes



Scene 5

Operation and Driving

Before Operating a Lift

Maintaining stability while maneuvering a heavy machine can be dangerous if not done properly. This scene presents safety considerations for operating and driving boom and scissor lifts.

Do not operate a lift unless:

- You are trained and authorized by your employer to operate a lift
- You have taken the time to complete the pre-use inspection (Scene 3)
- You are familiar with its warning labels, controls, and operator instructions

In addition to following manufacturer recommendations regarding safe lift operation, be aware of your employer's policies and procedures. Some employers may require authorization for lifts and lift work over a certain height.



Before working with a lift, do a quick check that it is a match for your job in terms of height, reach, capacity, engine type, and/or tire type.



General Operating Safety

- Have a means of communication between you and personnel on the ground.
- As with any motorized vehicle, stay focused while driving. Stop the lift before using a radio or cell phone.
- Position the platform with the boom over the drive wheels whenever possible.
- Warn personnel of your intended movement with the horn and/or verbally.
- When there is vehicle or pedestrian traffic, secure the work area around the lift with flags, cones, caution tape, or other means of traffic control.
- Look in the direction of travel when driving or moving the platform.
- If you cannot see the ground or your surroundings clearly while you are in the platform, work with a spotter on the ground, ensuring that the spotter is at a safe distance.
- A ground spotter (or other ground personnel) should know how to access and use the ground controls in the case of an emergency.
- Never modify or override any safety controls or features.
- Obey traffic signs.
- Do not engage in stunt driving or horseplay.

Emergency Procedures

Anyone in the platform of a lift should be familiar with emergency procedures in the event that the platform cannot be lowered or moved, the lift becomes unstable, or the operator is injured or incapacitated.

Emergency procedures vary by employer and could include:

- Assistance from a ground operator
- The lift's manual descent system
- Deployment of a self-rescue system
- The use of another lift
- Contacting emergency personnel



Never enter or exit a lift's platform by climbing the boom or the scissor arms.



Figure 5.1. PFPE is required in boom lifts (left). Attach lanyards only to authorized anchor points (right). Attach only one lanyard per anchor point.

PFPE and PPE

All occupants in the platform of a boom lift must wear a full-body harness with a fall restraint or fall arrest lanyard of the appropriate length connected to an authorized anchor point (Figure 5.1). PFPE is not required for occupants in the platform of a scissor lift; however, local regulations or your employer may recommend or require it.

In addition to PFPE, be sure to use any PPE that is required for the task at hand while working on the platform.

Platform Safety

- Enter or exit the platform through the platform opening only, using the ladder or steps, facing the platform, and maintaining three points of contact.
- Enter or exit a platform when it is fully lowered in the stowed position.
- Never jump off of a platform when exiting.
- Never stand on the guardrails or toeboards—keep both feet on the platform floor.
- Never position ladders, planks, boxes, or other items in the platform in order to gain additional reach.
- Tie off only to approved anchor points, not the guardrails.
- Never tie off to anything outside of the platform.



Get in the habit of checking which arrow color on the chassis points in the direction you want the machine to move *before* selecting the arrow color on the platform controls.

Driving the Lift

Directional Arrows

Many lifts have colored arrows on the chassis that correspond to matching arrows on the platform control panel. Selecting one arrow color with the platform controls will cause the machine to move in the direction of the same arrow color on the chassis (Figure 5.2). However, there may be times when the colors of the arrows on the platform control panel and the colors of the arrows on the chassis will not be pointing in the same direction. *Regardless of the position of the arrows on the control panel, the machine will always move in the direction indicated by the arrow colors on the chassis.*

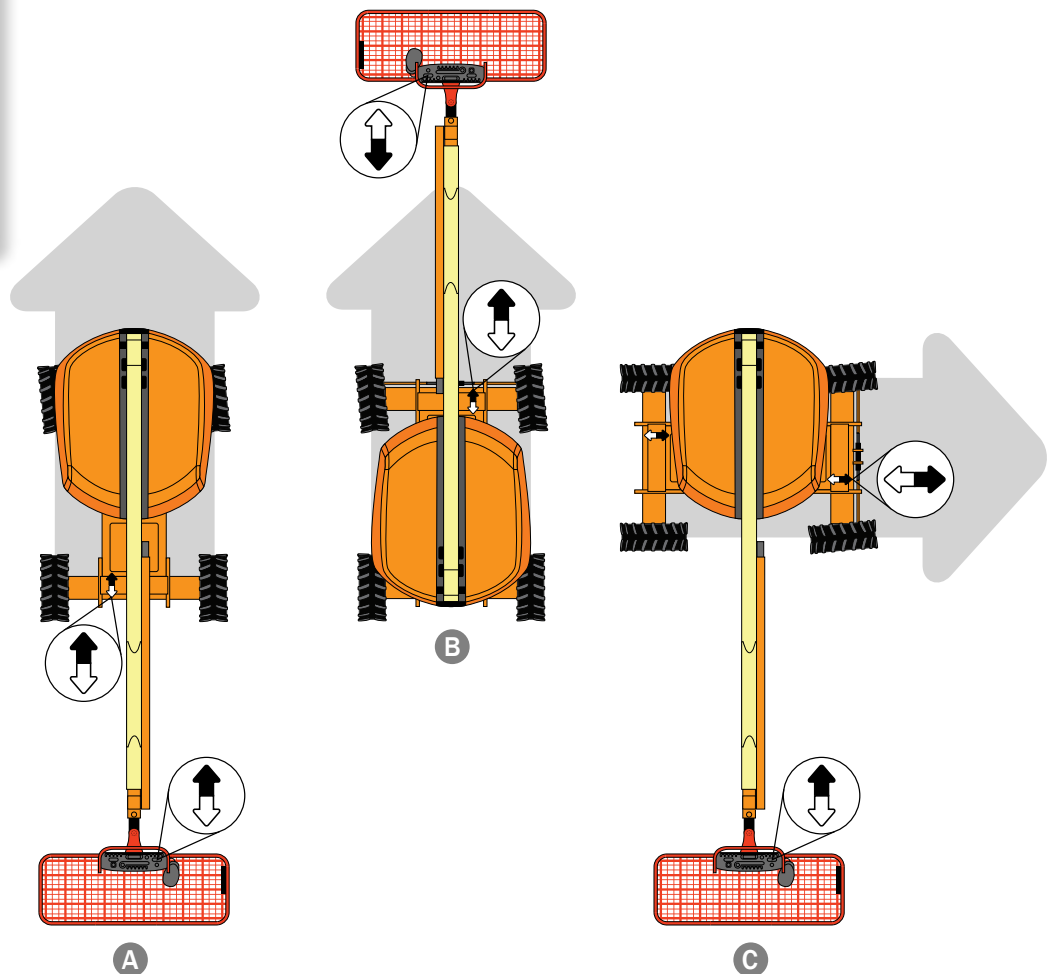


Figure 5.2. (A) Boom over drive axle. The arrows on the platform controls and the chassis are aligned—when the black arrow is selected on the platform, the machine will move forward. (B) Boom over steer axle. The arrows on the platform and the chassis are reversed—when the black arrow is selected on the platform, the machine will move backward. (C) Boom perpendicular to the chassis. The machine will move sideways—in this case, when the black arrow is selected on the platform, the machine will move to the right.

Drive Controls

- Never “slam” a control level to the opposite position—always return a lever to neutral before moving it to the next position.
- Drive with a slow, even motion to avoid sudden stops and jerks.

Driving While Elevated

Lifts should be driven with the platform in the lowest recommended driving position (Figure 5.3 A). Driving while elevated (Figure 5.3 B) is allowed if the following conditions are met:

- The driving surface is firm, smooth, and level, without any holes or debris
- The operator has a clear view of the travel path
- The lift is operated at a speed determined by the manufacturer
- The operator has the employer’s approval to do so

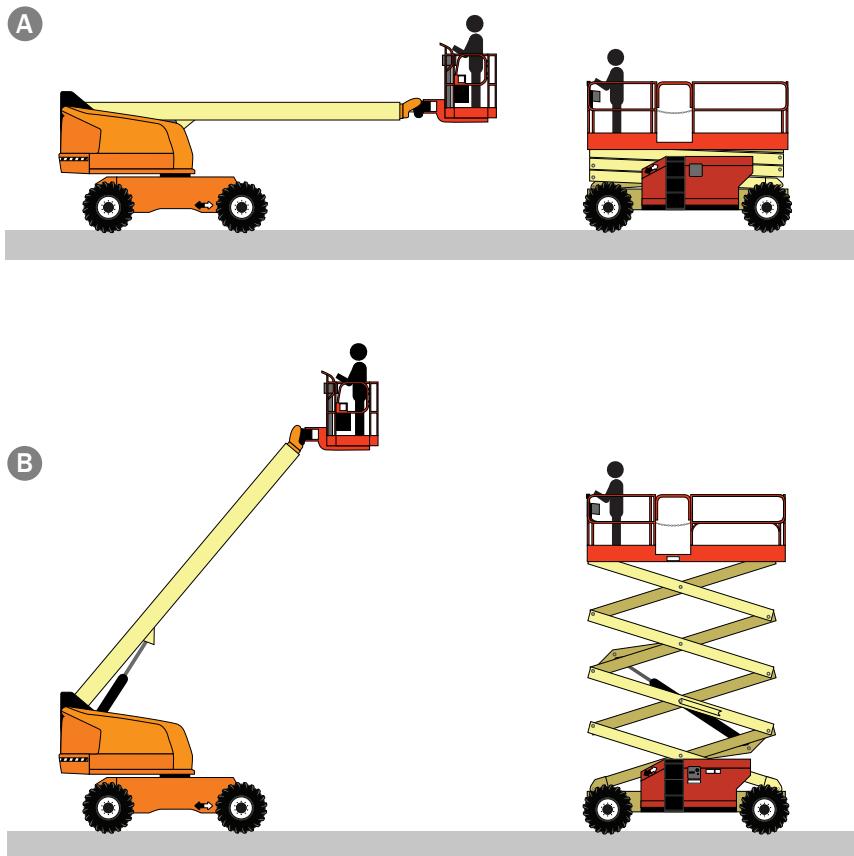


Figure 5.3. Lifts being operated in the recommended driving position (A), and in an elevated position (B).

Some employers may not allow boom lifts or scissor lifts to be driven while elevated.



Some lift models may prevent the operator from driving at high speed in hazardous situations.

Stopping

Be aware that using a passive brake at high speeds can cause a sudden, abrupt stop. Switch to low speed before stopping.

Drive Speed

Use caution and do not use high speed when driving:

- In reverse
- With the platform elevated
- With any part of the machine within 6 ft. of any obstruction
- On a grade or side slope (see Scene 6)

Structures and Obstacles

- Never rest the platform or the boom on any outside structure.
- Never tie off to any structure or point outside of the platform.
- When possible, do not use the drive function to position the lift closer to a structure—extend or raise the platform instead.

Maintaining Stability

- Never overload the platform of a lift.
- Use the machine's outriggers or extending axles, when applicable.
- Pay attention to changes in the environment due to weather or wind.
- Lifts are designed for positioning personnel and equipment—do not use a lift as a crane, forklift, or tow truck.

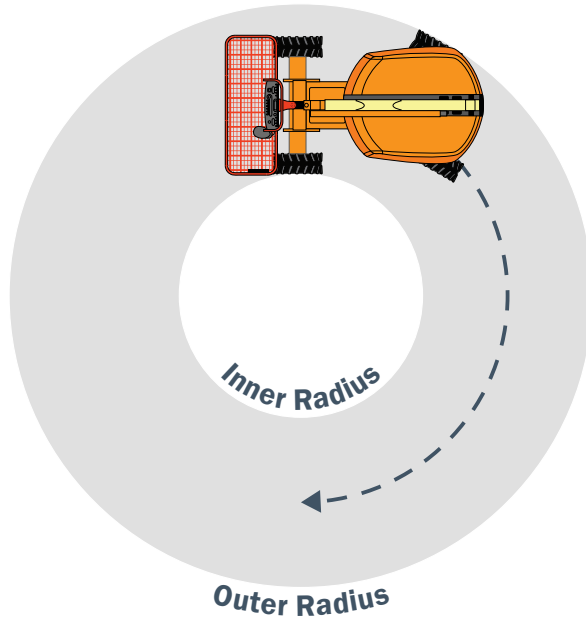
Safety Devices

Do not override any safety features in order to increase reach or add more weight to the platform.

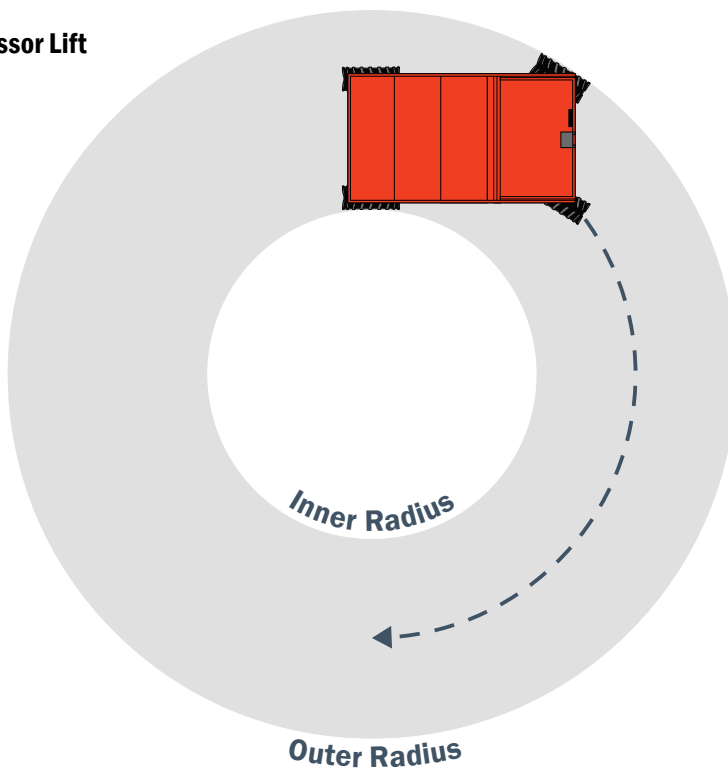
Making Turns

The space needed to turn a lift around varies by type and model. Be sure you have enough room to do a three-point turn or U-turn (Figure 5.4) before entering an area with space restrictions. Consult the operator's manual for turning radius dimensions.

Boom Lift



Scissor Lift



Never turn a lift while on an incline.

Figure 5.4. Check the operator's manual for inner and outer turning radius specs to be sure there is enough ground space to turn a lift around. Note that on a boom lift (top), the platform may sometimes extend past the diameter of the outer turning radius—always be aware of side and overhead obstructions when turning.



Notes

Scene 6

Working on a Grade

Although boom lifts and scissor lifts are designed to be operated on level surfaces, they can be driven over low inclines under certain conditions. If it is necessary to work on an incline, the lift itself must be made level. This can be achieved with leveling outriggers (if equipped), or, on some boom lift models, with wood cribbing (page 50). A lift that cannot be made level cannot operate on an incline.

Inclines: Grade vs. Angle

Grade (also called **slope**) is a way of describing an incline. It is a ratio of vertical distance (rise) to horizontal distance (run), and is expressed as a percentage. A 45° angle is the equivalent of a 100% grade (Figure 6.1).

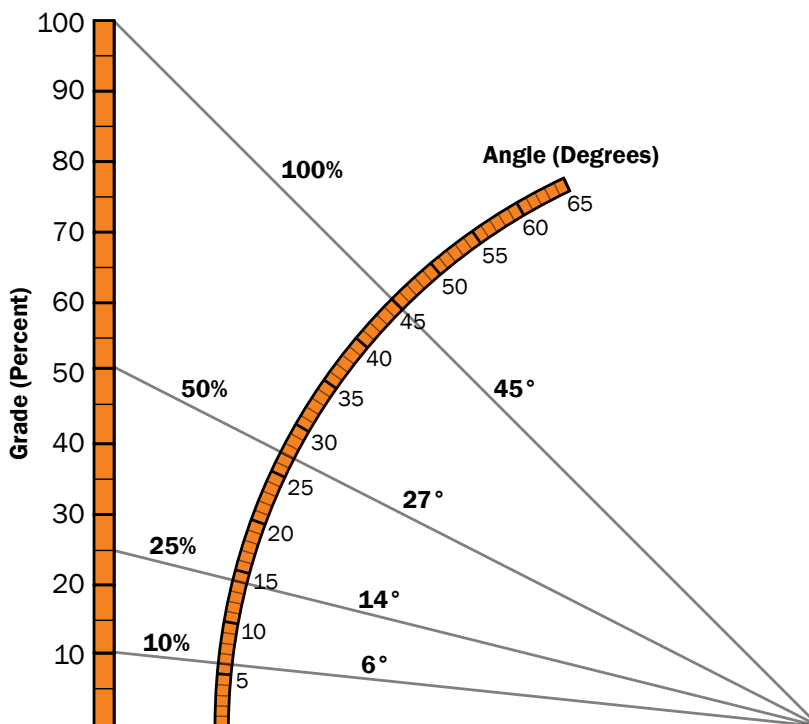


Figure 6.1. Grade percentages.



Gradeability and Side Slope Ratings

A **gradeability** rating refers to the highest grade a lift can safely climb. A **side slope** rating is the highest incline a lift can safely travel across (perpendicular to a grade), and is generally lower than the gradeability rating. Both types of ratings vary by lift type, model, and manufacturer (Figures 6.2 and 6.3). Check the lift's safety labels or operator's manual for specifics.

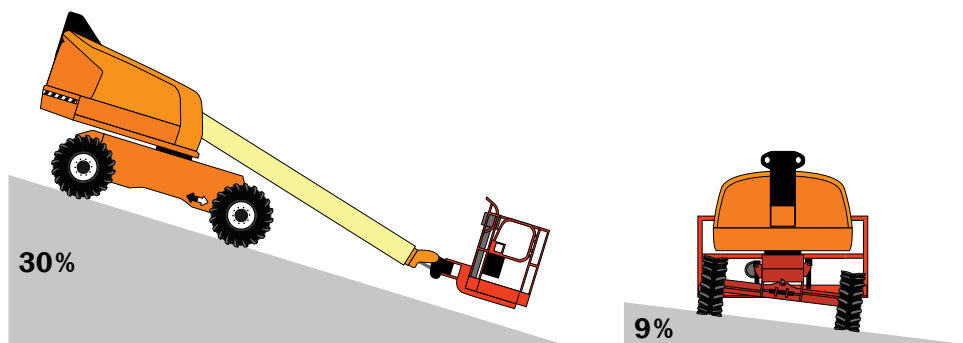


Figure 6.2. This boom lift has a gradeability rating of 30% and a side slope rating of 9%.

Exceeding a lift's gradeability or side slope rating can result in a tip-over.

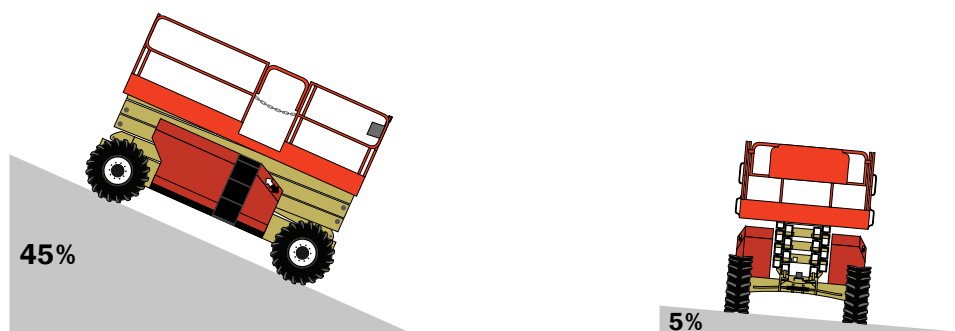


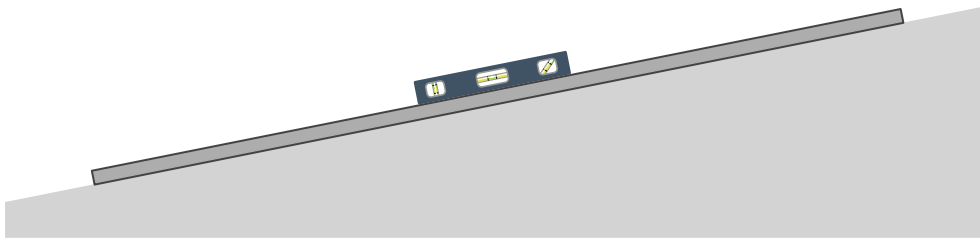
Figure 6.3. This scissor lift has a gradeability rating of 45% and a side slope rating of 5%.

A lift must be at low speed and in its lowest driving position when traveling on a grade or side slope. If the lift must be stopped on a grade, use wheel chocks to prevent creeping. Do not raise the platform, even if the machine is stopped, until returning to a level surface.

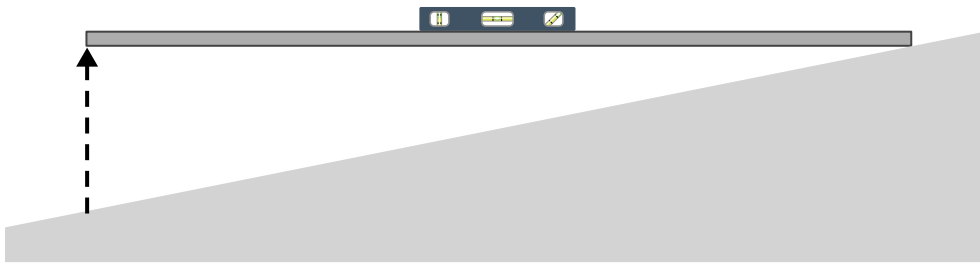
Determining Grade Percentage (Rise Over Run)

To determine the grade of an incline at a work location, you will need:

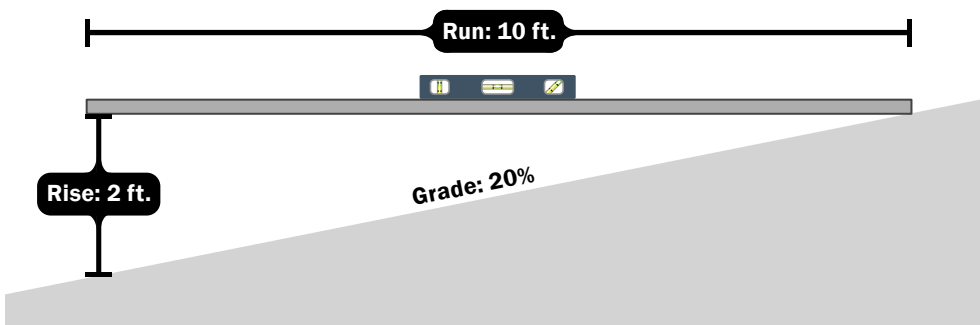
- A straight beam or pipe at least 3 ft. long
- A tape measure
- A level



- 1 Lay the beam on the incline. Place a level on the beam.



- 2 Lift the beam until it is level.



- 3 Measure the length of the beam (run) and the distance from the end of the beam to the ground (rise). Divide the rise measurement by the run measurement and multiply the result by 100. The result is the grade percentage. Refer to the operator's manual to determine whether the grade is allowable for the lift being used.

Determining Grade Percentage

Formula:

$$\frac{\text{Rise}}{\text{Run}} \times 100 = \text{Grade \%}$$

Example:

$$\frac{2}{10} \times 100 = 20\%$$

Cribbing (Boom Lifts Only)

Two manufacturers—Genie and JLG—have given boom lift operators permission to use wood **cribbing** to level a lift that is on a grade (Figure 6.4). JLG also allows cribbing to be used to level a boom lift on a side slope (Figure 6.5).

The option to use cribbing is limited to specific models only, and construction specifications vary between the two manufacturers (see Table 6.1).

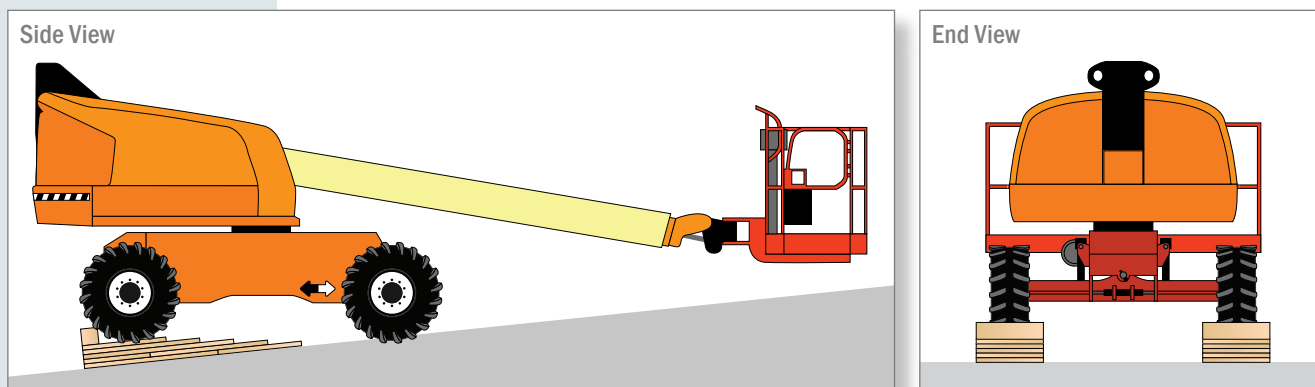


Figure 6.4. End cribbing on a grade (Genie and JLG). Two front tires or two back tires are supported on separate cribbing blocks. Do not crib one tire only.

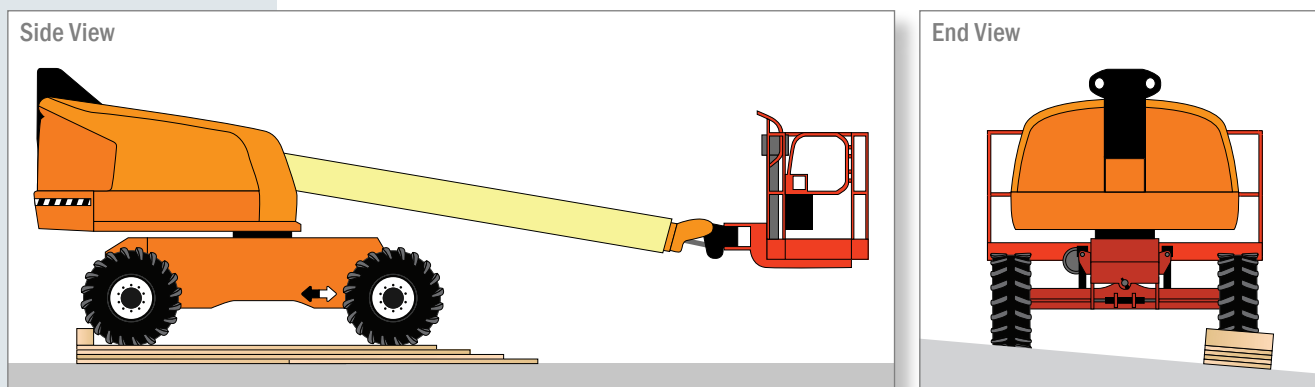


Figure 6.5. Side cribbing on a side slope (allowed by JLG only). Two side tires are supported on a single cribbing block. Do not crib one tire only. End cribbing blocks are not allowed to be used for side cribbing.



Cribbing cannot be used to level scissor lifts.

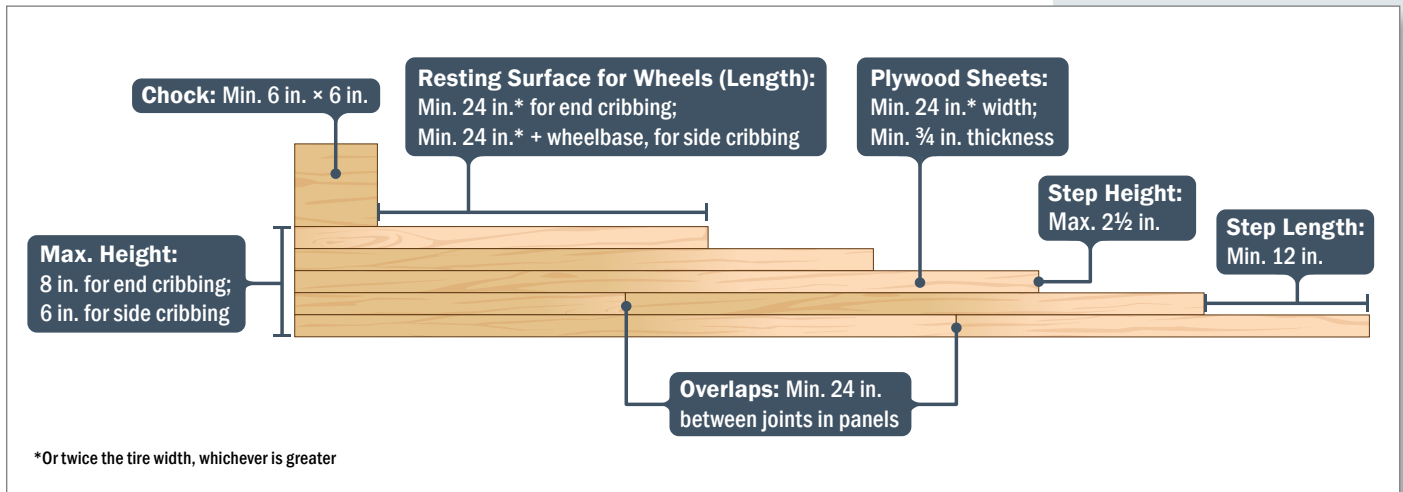


Figure 6.6. Cribbing specifications for JLG boom lifts.

When using cribbing:

- Follow the exact construction specifications provided by the manufacturer. See Figure 6.6 for JLG's specifications.
- Only crib on a surface that is firm enough to support the weight of the machine, its load, and the cribbing itself.
- Do not use cribbing over a hole or a bump.
- Drive onto the cribbing blocks slowly with the platform in the lowered position.
- Do not make any turns on cribbing blocks.
- Do not raise the platform until the machine is leveled on the cribbing blocks.
- Pay attention to wind speed while on cribbing (see Table 6.1).

Both manufacturers require that any lift that is used on cribbing be equipped with a lock-out switch (Figure 6.7), which disables the drive and steer functions while the machine is on the cribbing, and must be engaged before raising the platform. If a machine does not have a lock-out switch, one must be installed by an approved vendor.

For more details on cribbing, refer to the Genie and JLG cribbing manuals under the online course Resources tab.



Figure 6.7. Lock-out switch.



Table 6.1. Cribbing Specifications for JLG and Genie Boom Lifts

	Genie	JLG
Manual name/Part number[†]	Operator's Manual Supplement: Cribbing Instructions Part No. 82943GT (Feb. 2018) [†]	Supplemental Manual for Cribbing of Approved JLG Products Part No. 3128168 (May 2022) [†]
Approved models	S-40, S-45, S-60, S-60HC, S-60X, S-60 TRAX, S-65, S-65 TRAX, S-80, S-80X, S-85, Z-45/25 RT*, Z-45/25J RT*, Z-51/30*, Z-60/34, Z-60/37 DC, Z-60/37 FE, Z-62/40, Z-80/60, Z-34/22 IC	340AJ, 40H, 400S, 460SJ, 450A, 450AJ, 600A, 600AJ, 600S, 600SJ, 660SJ, 80HX, 800A, 800AJ, 800S, 860SJ, 1100S, 1100SJ, 1200SJP, 1250AJP, 1350SJP, 1500AJP, 1500SJ, 1850SJ
Maximum allowable grade for end cribbing	10% (6°)	9% (5°)
Maximum allowable grade for side cribbing	Not permitted	9% (5°)
Maximum allowable height for end cribbing	8 inches	8 inches
Maximum allowable height for side cribbing	Not permitted	6 inches
Maximum allowable wind speed when platform is raised while machine is cribbed	15 mph	28 mph**
Plywood specifications	APA-certified plywood sheets	APA-certified plywood sheets
Minimum plywood thickness	¾ inch	¾ inch
Minimum plywood width	24 inches (30 inches for TRAX models)	24 inches or twice the tire width, whichever is larger
Minimum resting surface for wheels	24 inches × 24 inches (30 inches × 62 inches for TRAX models)	24 inches square or twice the tire width square, whichever is larger (end cribbing); wheelbase + 24 inches or twice the tire width, whichever is larger (side cribbing)
Minimum chock size	6 inches × 6 inches	6 inches × 6 inches
Constructing and securing layers	Ramp must be constructed in a series of steps of at least 12 inches in length, with a minimum 24-inch overlap between joints. Use 6d ring shank nails, placed a minimum of 8 inches OC edge and 12 inches OC face. Use 8d ring shank nails for plywood over 1½ inches thick.	Ramp must be constructed in a series of steps of at least 12 inches in length, with a minimum 24-inch overlap between joints. Use 6d ring shank nails, placed a minimum of 8 inches OC edge and 8 inches OC face. Use 8d ring shank nails for plywood over 1½ inches thick.

[†]Manuals are updated periodically—check with genielift.com or jlg.com for the most recent edition.

*Specific serial numbers only; see manual for details.

**Use the industry wind speed limit of 25 mph for JLG lifts.



Scene 7

Other Procedures

This scene covers general safety considerations for re-energizing, parking, and stowing lifts. Contact your safety representative for specifics on these procedures.

Re-Energizing a Lift

Refueling or recharging a lift must be done by authorized personnel and must adhere to the manufacturer's specifications.

Refueling

- Do not smoke (including e-cigarettes).
- Turn the engine off and make sure the engine is cool before beginning any refueling procedures.
- Turn off cell phones and radios.
- Be sure the machine is in a well-ventilated area.
- Ensure you are using the correct type of fuel for the lift (gasoline or diesel).
- Never refuel during an electrical storm or near a potential electrical source.



Changing a Propane Cylinder

- Contact with propane can cause freeze burns—wear proper PPE.
- Change cylinders in a well-ventilated area, away from sources of ignition.
- Do not drop, throw, roll, or drag a propane cylinder.
- Be sure that the new cylinder is properly positioned so that the pressure relief valve is at the top of the tank.
- Do not use metal tools when changing a cylinder.
- Never use a lighter or a flame to check for a leak.

Recharging Batteries

- Charge batteries (Figure 7.1) in a well-ventilated area.
- Avoid contact with battery acids—follow employer or manufacturer recommendations for proper PPE.



Figure 7.1. Rechargeable batteries in a scissor lift.



Figure 7.2. Lifts should be in the lowest stowed position when not in use.

Parking and Stowing the Lift

- Drive the machine to a well-protected area.
- Lower the platform to its lowest stowed position (Figure 7.2). On a boom lift, ensure that the boom is over the rear wheels.
- Shut down the emergency stop at the platform controls and ground controls.
- Turn the ignition off and secure the keys.
- Chock the wheels if parked on an incline.
- Check that the propane tank is closed.
- Check that all manuals are stored in the weatherproof compartment.
- If necessary, cover the platform controls to protect the machinery and decals against adverse conditions.
- Ensure that the lift is not blocking any exits, fire lanes, fire extinguishers, roadways, or equipment.



Notes

Appendix A

References and Resources

Links to Supplemental Manuals

Genie Operator's Manual Supplement: Cribbing Instructions (Part No. 82943GT). [Link](#)

JLG Supplemental Manual for Cribbing of Approved JLG Products (Part No. 3128168). [Link](#)

Related Industry Safety Bulletins

CSATF safety bulletins can be found online at: www.csatf.org/production-affairs-safety/safety-bulletins/

[Safety Bulletin #22](#), *Guidelines for the Use of Scissor Lifts (Elevating Work Platforms) and Aerial Boom Lifts (Extensible Boom Lifts)*

[Safety Bulletin #22A](#), *Power Line Distance Requirements*

Cal/OSHA Regulations (CCR Title 8)

Elevating Work Platforms and Aerial Devices, CCR Title 8, §3637-3648.

Federal OSHA Regulations (CFR Title 29)

Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms, CFR Title 29, §1910.67. The control of hazardous energy (lockout/tagout).

Walking-Working Surfaces, CFR Title 29, §1910.23. Ladders; §1910.28. Duty to have fall protection and falling object protection.

Walking-Working Surfaces, CFR Title 29, §1910.29. Fall protection systems and falling object protection-criteria and practices.

Standards

American National Standard for Boom-Supported Elevating Work Platforms, ANSI A92.5-2006 (R2014)

American National Standard for Self-Propelled Elevating Work Platforms, ANSI A92.6-2006 (R2014)

Additional Resources

Aerial Lifts. OSHA Fact Sheet. Occupational Safety and Health Administration.
www.osha.gov/sites/default/files/publications/aerial-lifts-factsheet.pdf

A Guide to Scaffold Use in the Construction Industry. OSHA Small Business Safety Management Series. Occupational Safety and Health Administration. www.osha.gov/Publications/OSHA3150.pdf

Working Safely with Scissor Lifts. OSHA Hazard Alert. Occupational Safety and Health Administration.
www.osha.gov/sites/default/files/publications/OSHA3842.pdf



Notes



Industry Safety Resources

Safety Bulletins

Safety bulletins are researched, written, and distributed by the Industry Wide Labor-Management Safety Committee for use by the motion picture and television industry. The Industry Wide Labor-Management Safety Committee is composed of guild, union, and management representatives active in industry safety and health programs.

These safety bulletins are guidelines recommended by the safety committee. They are not binding laws or regulations. State, federal, and/or local regulations, where applicable, override these guidelines. Modifications in these guidelines should be made, as circumstances warrant, to ensure the safety of the cast and crew.

The committee and these safety bulletins are representative of the commitment of both labor and management to safe practices in the motion picture and television industry. The members of the committee and all those who contributed to its work have devoted a great deal of time and effort to these guidelines because of the importance of safety to our industry.

Current safety bulletins are available on the CSATF website:

<http://www.csatf.org/bulletintro.shtml>

24-Hour Industry Safety Hotline

The 24-hour industry safety hotline number directs callers to an automated system that will assist them in reaching the desired Studio Safety Hotline.

888-7-SAFELY

A list of the Studio Safety Hotlines can also be found on the CSATF website:

<http://www.csatf.org/studio-safety-hotlines.pdf>

**Safety is everyone's
responsibility.**