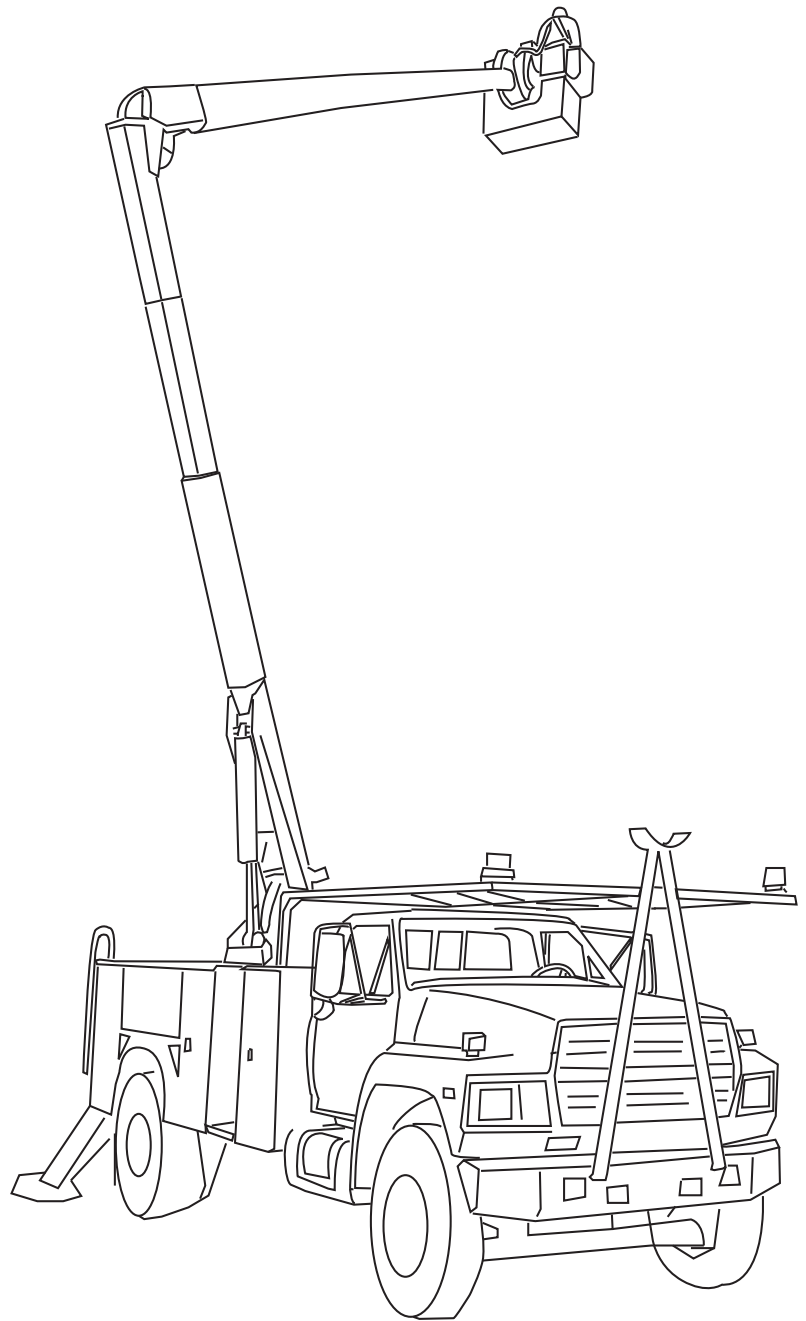


Aerial Lift Safety

For the Landscaping and
Horticultural Services Industry



KSTATE Research and
Kansas State University Extension

*“Knowledge
for Life”*

Aerial Lift Safety

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Disclaimer

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The information in this publication has been compiled from a variety of sources believed to be reliable and to represent the best current opinion on the subject. However, neither K-State Research and Extension nor its authors guarantee accuracy or completeness of any information contained in this publication, and neither K-State Research and Extension nor its authors shall be responsible for any errors, omissions, or damages arising out of the use of this information. Additional safety measures may be required under particular circumstances.

What's Inside?

This booklet teaches important safety practices to follow when operating aerial lift devices.

Safety tips, along with real accident reports, have been combined to give you a better understanding of the risks associated with this type of work.

Use this booklet in conjunction with hands-on safety training and the equipment operator's manual.

Did You Know?

Aerial lift devices are commonly referred to as bucket trucks, lift trucks or cherry pickers.

An aerial lift is any lift device that has an articulating and/or extensible boom.

Only qualified employees are authorized to operate aerial lift devices. To become qualified to operate the equipment you must:

1. Know all safety rules for each job site.
2. Read and understand the equipment's operator manual.
3. Understand OSHA regulations pertaining to the equipment and job.
4. Have hands-on training with the aerial equipment.
5. Know employee rescue procedures in case of an emergency.

Lesson 1

Objectives

1. Name the most common types of accidents involving aerial lift devices.
2. Interpret the meaning of common warning signs and labels.
3. Identify appropriate protective equipment.

Take Control of Your Own Safety

Greatest Dangers

Failure to observe safety precautions when operating an aerial lift device can result in serious injury or death. The most commonly reported serious accidents are:

1. Lift Overturns

Aerial lifts can overturn, causing serious injury or death.

Accident Report

Employee Killed and One Injured as Lift Overturns

Summary of OSHA Accident Inspection 101439917

Two employees were in the bucket of an aerial lift and failed to set the outriggers. As the truck began to overturn, the bucket fell. One employee was killed and the other sustained a broken leg.



Always set the outriggers to stabilize the lift.

2. Falls from Lift

You can be seriously injured or killed if you fall from a lift.

Accident Report

Employee Falls from Bucket of Aerial Lift

Summary of OSHA Accident Inspection 110070489

A tree trimmer was working from the bucket of an aerial lift. He was not using fall protection equipment. When the truck shifted forward, the employee was thrown from the aerial lift and killed.



Always use a safety harness or belt and a lanyard when working in an aerial lift.

3. Contacting Power Lines

You can be seriously injured or killed if you come into contact with an electric line.

Accident Report

Employee Electrocuted

Summary of OSHA Accident Inspection 300490208

An employee was cutting branches from the bucket of an aerial lift. He was working very close to an overhead power line when his forehead touched the line and he was electrocuted.



Always keep a safe distance from power lines. Refer to page 22 for more information.

4. Boom Collapse

The boom on a lift can collapse if it has had poor maintenance or is damaged. Employees can be seriously injured or killed during a collapse.

Accident Report Employee and Boom Fall

Summary of OSHA Accident Inspection 111961413

An employee was operating an aerial lift when the boom fell from the truck, causing the employee to fall with it. Nine of the bolts that secured the boom to the truck were rusty, indicating old breaks, and had sheared off. The employee suffered head, leg and internal injuries.



Always perform a pre-start inspection. Refer to page 9 for more information.

Help Yourself

Safe work habits are important. Here are three actions you can take to be safe on the job site.

1. Learn All You Can.

To prevent accidents with aerial lifts, read and follow directions in the equipment operator's manual. Pay attention to safety instructions in the manual and to warning labels you see on the equipment. If you have questions, stop and ask your supervisor before you continue.

2. Concentrate on Working Safely.

Sometimes you may be tempted to take risky shortcuts. Remember that an accident can leave you permanently injured or cut your life short. For your safety and the safety of those around you, do not take unnecessary risks. No deadline is so pressing you can't take the time to do your work safely.

3. Additional Precautions

Do not operate machinery if you are tired or have taken drugs or alcohol. If you are on medication, discuss with your doctor or pharmacist if you are capable of safely operating machinery.


Choose safety

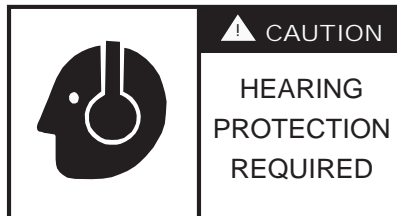
Safety Messages and Signs

Manufacturers put important safety messages on equipment and in the operator's manual. It is critical to read, understand and follow all safety messages.

The triangle shape is the symbol for caution. The exclamation mark in the center means *Pay Attention*. In some instances, the triangle-shaped sign will show a picture. Other times, words explain why the sign is used.

Many safety messages use the words *Caution*, *Warning* and *Danger* to get your attention. Following are safety messages and their meanings. Each of these signs will have a written message, and perhaps a picture, about an unsafe condition.

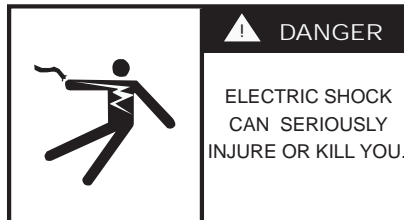
CAUTION means you need to be careful. Follow the directions on the sign or you could get hurt.



WARNING is more serious and means you need to follow the directions on the sign or you could be badly hurt or killed.



DANGER is the most serious safety message. If you don't follow the directions, you will be seriously injured or killed.



Images displayed in the caution, warning and danger boxes have been recreated from images taken with permission from ASAE S441.4, FEB04, Safety Signs.

Protective Equipment

Certain equipment is necessary to protect you while operating an aerial lift. The following protective equipment may be required.

Hard Hat

Wear a hard hat to protect your head from impact. Type I hats are for top impact and Type II are worn for front, back, top and side impact. Choose a hat according to the type of work being performed. If you will be working around electrical lines, the hard hat should be rated class E to protect you from high voltages.

Gloves

Gloves may be worn to protect your hands from puncture wounds and cuts.

Sturdy, Non-Slip Boots

Wear boots to keep a steady balance and reduce the risk of slipping and falling.

Fall Protection

A body belt or safety harness is required to keep you from falling to the ground. In addition, a lanyard must be connected to the belt or harness and attached to an anchor point on the bucket/platform. Note: The use of a safety harness is recommended. When using a body belt, limit the length of the lanyard to two feet.

Close-Fitting Clothes and No Jewelry

Loose shirt sleeves, pant legs or jewelry can catch in the equipment's moving parts or on electrical lines, resulting in injury; therefore, close-fitting clothes should be worn. Pull back long hair.

When Operating a Chainsaw You Must Wear:

Leg Protection

Leg protection made of a cut-resistant material should be worn. It should cover the entire thigh to the top of each boot.

Goggles or Safety Glasses

Goggles or safety glasses must be worn at all times to protect your eyes from foreign objects.

Face Shield

A face shield should be worn to protect your face from the kickback of the machine and debris.

Hearing protection.

Two common types of hearing protection are muffs and plugs. Ear muffs should seal around your ears to properly muffle loud noises. Wash reusable ear plugs with warm, soapy water after each use in order to prevent infection. Discard disposable ear plugs after each use.

Why Hearing Protection?

Over time, you will lose your hearing if you are exposed to loud noises without protection.

When to Wear Hearing Protection

OSHA Standard 1910.95 (i) (1) requires hearing protection to be worn when sound levels exceed certain limits (generally, a daily average of 85 or 90 decibels, depending on the circumstances). These levels can be measured with a sound level meter. A hearing conservation program requiring hearing tests and other precautions may also be necessary. Check with the equipment operator's manual, as well as your supervisor, for suggestions on hearing protection for each piece of equipment and instructions on how to wear it properly.

Hearing Protection Rules of Thumb

Hearing protection may be needed if:

- ▶ You have to raise your voice significantly to be heard by someone three feet away.
- ▶ After leaving a noisy area, your ears feel plugged or you hear a mild ringing or whooshing noise that goes away after an hour or two.
- ▶ When you start your car in the morning, the radio is so loud from the evening before that you have to turn it down.



Quiz Yourself

Circle the correct answer.

Answers can be found on page 34.

1. What are the most commonly reported causes of serious injury and death from operating aerial lift devices?
 - a. Heat stroke and lightning strike.
 - b. Carbon monoxide poisoning and burns.
 - c. Overturns, falls, electrocution and boom collapse.

Select the correct answer for the following sentences from the list below.

- a. Face shield and safety glasses
 - b. Caution
 - c. Alcohol
 - d. Supervisor
2. If you have questions, stop and ask your _____ before you continue.
 3. The triangle shape is the symbol for _____.
 4. _____ should always be worn when using a chainsaw.
 5. Never operate any type of equipment under the influence of _____ or drugs.

Prepare for Safe Operation

Pre-Start Inspection

An inspection of the aerial lift device is important before beginning work each day. Use the checklist on the next page as a guide for daily, visual inspections. Alert your supervisor if you find anything wrong during your daily pre-start inspection. Refer to the operator's manual for additional items that are not covered in this book.

Worksite

Survey the site for drop offs and embankments. Be aware of all side and overhead obstructions, especially power lines. Ensure all other vehicles and unauthorized personnel are out of the area. Know the location of coworkers before beginning.

Machine Placement

Choose ground that is solid and level to prevent the lift from sinking or overturning. Check your operator's manual for the greatest slope your equipment can be safely operated on.

Tires

Check tire pressure and look for signs of damage. Make sure lug bolts are tight to keep the wheels from slipping off.

Outriggers

Check the outriggers and all connectors for damaged or missing parts.

Boom

Check the boom for structural damage such as scratches, cracks and damaged bolts and fasteners, which are all signs of weakness. If your lift is insulated, ensure the insulated parts are dry and clean of oil and grease. A wet and/or dirty boom can decrease the effectiveness of the insulation.

Controls

Check the upper controls and ground controls for proper operation, according the manufacturer's directions.

Hydraulic System

Check the hydraulic system for leaks. If you suspect a leak, have it repaired by a qualified mechanic. Also check the hydraulic fluid level.

Brakes

Test service and parking brakes according to the operator's manual.

Safety Devices

Ensure all safety guards are in place. Check lights, backup alarm, interlock devices and intercom (if applicable) for proper operation, according to the operator's manual.

Lesson 2

Objectives

1. Indicate parts to be inspected before operation.
2. Recognize safe start up, shutdown and operating procedures.
3. Identify guidelines for working near traffic.

Pre-Start Checklist

Work Site

- All other vehicles out of the way?
- Area clear of unauthorized people?
- Safe distance from ditches, drop offs and embankments?
- Safe distance from overhead obstructions and power lines?

Machine Placement

- Level surface?
- Solid surface? If not, outrigger pads used?
- Surface slope is not greater than manufacturer's recommendations?

Tires

- Proper inflation?
- No visible damage?
- Lug bolts tight?

Outriggers

- No damage?
- No missing parts?

Boom

- No structural damage?
- No cracks or damaged connectors?
- Clean and dry?

Controls

- Tested according to manufacturer's directions?

Hydraulic System

- Fluid level ok?
- No leaks?

Brakes

- Tested according to manufacturer's directions?

Safety Devices

- All guards in place?
- Lights, alarms and interlocks tested?

10 - Aerial Lift Safety

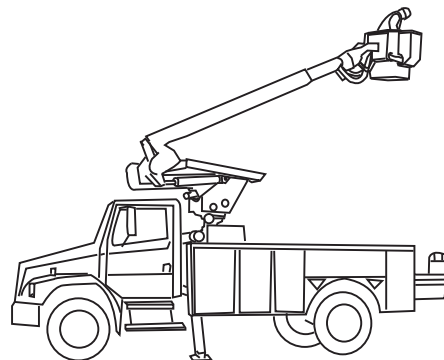
Communication

- ▶ Know what jobs each employee will be performing and where they will be when the lift is in use.
- ▶ Discuss hand, flag and horn signals that will be used.
- ▶ Speak loudly or use an intercom (if applicable) when you're in the lift so that those on the ground know what is going on.

Safe Start Up and Shut Down

Start Up Safety Procedures

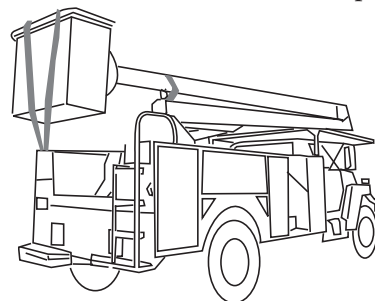
1. Ensure the vehicle is positioned on level ground.
2. Set the parking brake.
3. Chock the wheels.
4. Engage the power supply.
5. Set the outriggers. When working on soft ground, place outrigger pads beneath outriggers to prevent sinking, according to the instructions found in the operator's manual.
6. Ensure the vehicle is stable before entering the bucket/platform and raising or lowering the boom.
7. Check the operator's manual for additional procedures.



Stand away from outriggers as they are lowered to avoid being crushed.

Safe Shut Down Procedures

1. Slowly lower the boom to rest on its supports.
2. Secure the boom according to the operator's manual.
3. Raise the outriggers.
4. Shut off the power supply.
5. Depress the parking brake.
6. Remove the outrigger pads (if applicable) and wheel chocks.
7. Remove the key.
8. Check the operator's manual for additional procedures.



Ensure boom is secured and remove all tools from bucket before preparing for highway travel.

General Operating Procedures

- ▶ Never modify any part of the lift without permission from the manufacturer.
- ▶ Refer to the operator's manual for the location of your equipment's crush points.
- ▶ Schedule insulating dielectric tests for the lift according to the operator's manual (if applicable).
- ▶ Two operators should always be present; one in the bucket/platform and one on the ground.
- ▶ Never allow unauthorized users around the lift or jobsite.
- ▶ STOP working if something malfunctions.
- ▶ Lifts should never be operated in snow, ice or high winds.
- ▶ Do not move the vehicle without properly securing the boom.
- ▶ Never move a truck with an elevated boom and/or a worker in the bucket/platform.
- ▶ Once an employee is elevated in the bucket, the lower controls should only be used with the permission of the elevated worker or in case of an emergency.
- ▶ When raising and lowering the boom:
 - Avoid jerking the controls. Always raise and lower slowly.
 - Watch out for obstacles such as tree limbs, power lines, etc.
 - Don't get crushed between the bucket and an adjacent object.

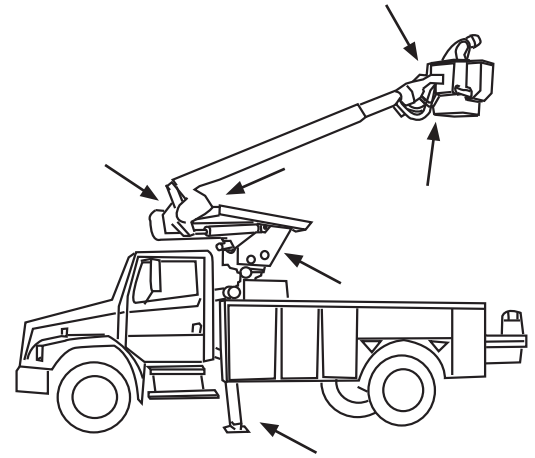
Safe Fueling Procedures

Gasoline and other fuels are flammable. Follow safe fueling procedures to help reduce the risk of fuel ignition.

- ▶ Use only approved fuel containers and store in a well-ventilated area, away from direct sunlight.
- ▶ Never smoke or have an open flame near fuel
- ▶ Touch the fuel nozzle to the machine before removing the fuel cap to prevent a static spark from igniting the fuel.
- ▶ Keep the nozzle or funnel in contact with the fuel tank while filling.
- ▶ Wipe up all spills immediately, before starting the engine.
- ▶ Never clean your hands with gasoline. Use a nonflammable solvent instead.

Potential Crush Points

There are several crush points on your aerial lift where you could be seriously injured or killed. Refer to your operator's manual for the location of crush points on your specific machine.



To Properly Fill Fuel Containers:

1. Set the container on the ground.
2. Touch the nozzle to the container before removing the container lid.
3. Keep the nozzle in contact with the container while filling.
4. Don't fill to the brim. Leave room for expansion. Portable containers and gas tanks should be filled 3/4 full.
5. To reduce the chance of static sparks, do not fill containers in the bed of a pickup or in a car.

Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, tasteless gas that can poison and kill. Symptoms of CO poisoning include headache, nausea, weakness, dizziness, and the loss of consciousness. To avoid CO poisoning, operate all equipment outdoors.

Maintenance Precautions

- ▶ If you must work on equipment indoors, make sure there is adequate ventilation to prevent exposure to CO.
- ▶ Never work below a vehicle that is supported only by jacks; always use an approved support device.
- ▶ Do not perform maintenance beneath the boom or other raised parts unless supported by an approved support device in case of hydraulic failure.
- ▶ Never replace an insulated hose with an electrically conductive hose.

Working Near Traffic

When working near roadways, try to schedule jobs so you are not working in heavily traveled areas during morning and evening rush hours and at times of low light.

Use a flagger and highly visible warning cones to alert oncoming traffic when working near a public roadway. Place flaggers and cones far enough ahead of the work site so drivers have time to slow down and not run into equipment. Keep the boom and bucket away from traffic lanes.

If you will be working 60 minutes or less, a vehicle with activated high-intensity rotating lights may be used in place of a sign, cones and barricades.

The equipment operator and flagger should wear highly visible, reflective clothing.

Driving in Traffic

- ▶ Remove all tools from the bucket so they are not ejected into traffic or do not damage the bucket or liner during transport.
- ▶ Ensure the boom is secured.
- ▶ Raise and secure the outriggers.
- ▶ Ensure all lights are working properly, especially when driving after dusk.
- ▶ Check the operator's manual for the height of the aerial lift. You must know this information when driving under bridges and underpasses.

Quiz Yourself

Select the correct answer from the list below.

Answers can be found on page 35.

- a. Operator's manual
- b. Highly reflective
- c. Leaks
- d. Level
- e. Two

1. Position the aerial lift on ground that is _____.
2. When working near a roadway, always wear _____, brightly colored clothing.
3. Check the _____ for instructions on how to properly test boom controls.
4. Never operate a lift alone. _____ operators should always be present.
5. High pressure fluid _____ can penetrate your skin, causing injury.

Lesson 3

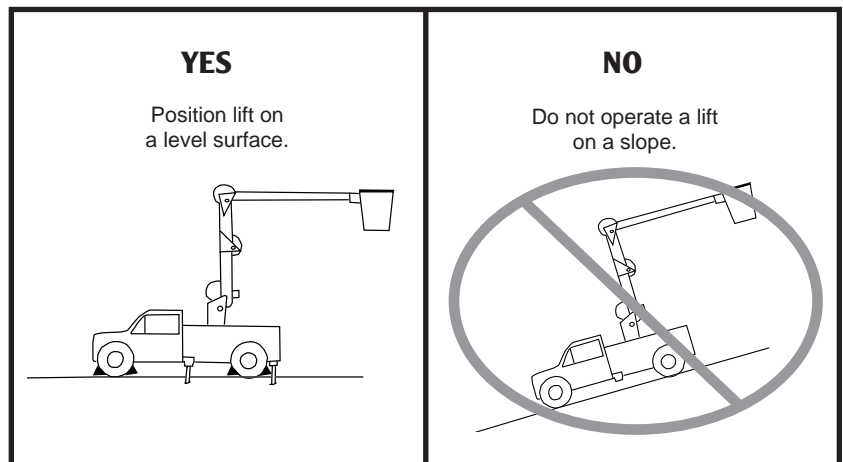
Objective

1. Identify safe operating procedures to prevent a lift overturn.

Preventing Lift Overturns

When an aerial lift becomes unstable or out of balance, it can overturn. Check the area where you are positioning the lift, noting all land elevation changes. Once you have assessed the area, observe the following precautions to avoid overturning.

- ▶ Always position the vehicle on a flat, solid surface.
- ▶ Do not operate a lift in snow, ice or high winds.
- ▶ Check the operator's manual for the greatest slope the vehicle can safely be used on.
- ▶ Never drive the vehicle with the lift elevated.
- ▶ Always set the brakes before engaging the power supply or lowering outriggers.
- ▶ Chock all wheels of the vehicle to prevent it from rolling or sliding.
- ▶ Use outriggers on solid surfaces.
 - If ground is soft, use outrigger pads beneath the outriggers for support, according to the operator's manual.
 - If the ground is too soft for the use of outrigger pads, contact your supervisor before proceeding.



Accident Report

Employee Injured When Lift Overturns

Summary of OSHA Accident Inspection 115595266

A tree trimmer was working from an aerial lift when the unit overturned. The employee had failed to set the front outriggers. He fractured his upper jaw and sustained severe cuts to his head.



Always set the outriggers to stabilize the lift.

- ▶ Never exceed the load limits given by the manufacturer. These can be found on data plates in and around the bucket and in the operator's manual.
- ▶ When maneuvering the boom, avoid jerking the controls with sudden starts and stops.
- ▶ Minimize reach by positioning the lift as close to the work as possible while still allowing necessary clearances for safe operation.

Accident Report

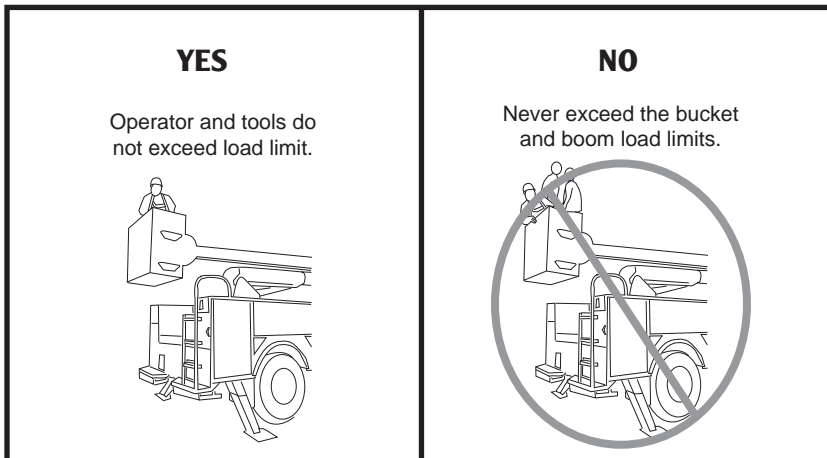
Employee Pinned Beneath the Bucket When Lift Overturns

Summary of OSHA Accident Inspection 104389390

An employee was operating an aerial lift when it overturned and pinned him to the ground beneath the bucket. The ground was too soft for operation and the outriggers slid off the pads and into the ground, causing the lift to overturn.



Do not proceed if the ground is too soft for operation.



Lifting Loads

- ▶ Do not pick up loads unless the lift is specifically rated and designed to handle the load. You may cause the lift to overturn or the lift may be damaged by the stress.
- ▶ Before lifting a load, check the operator's manual for the maximum lifting capacity when the boom is at different angles.
- ▶ Do not tie loads to the boom; use the lifting device outlined by your operator's manual.
- ▶ Only lift loads when the lift is positioned on level ground.
- ▶ Ensure the load is balanced.
- ▶ Do not lift at an angle.
- ▶ Move controls slowly; avoid jerking.
- ▶ Allow extra overhead clearance when raising and lowering loads because the load may jerk unexpectedly when the load moves.

Quiz Yourself

Select the correct answer from the list below.

Answers can be found on page 36.

- a. Outrigger pads
 - b. Flat
 - c. Operator's manual
 - d. Lowering
 - e. Chock
1. _____ the equipment's tires after setting the parking brake.
 2. Avoid jerking the controls when raising and _____ the boom.
 3. If the lift is positioned on soft ground, place _____ beneath the outriggers to keep the equipment from sinking, according to the operator's manual.
 4. Check the _____ for the greatest slope the vehicle can operate on.
 5. Ensure the lift is positioned on a _____, solid surface before operating.

Preventing Falls from Aerial Lifts

Secure Yourself in the Bucket

1. Enter the bucket with your hard hat on and latch the bucket door behind you (if applicable).
2. Put on your safety belt or harness.
3. Attach one end of the lanyard to the safety belt or harness and the other to the anchor point specified in the operator's manual. Never tie the lanyard to an adjacent structure or you may be pulled out of the bucket when the boom moves.

Accident Report

Employee Falls from Bucket of Aerial Lift

OSHA Accident Inspection 119957934

An employee was trimming a pine tree when he fell about 30 feet from an aerial bucket. He sustained a fractured skull, wrist, ribs and ankle.



Always wear fall protection equipment when working in an aerial lift device.

Accident Report

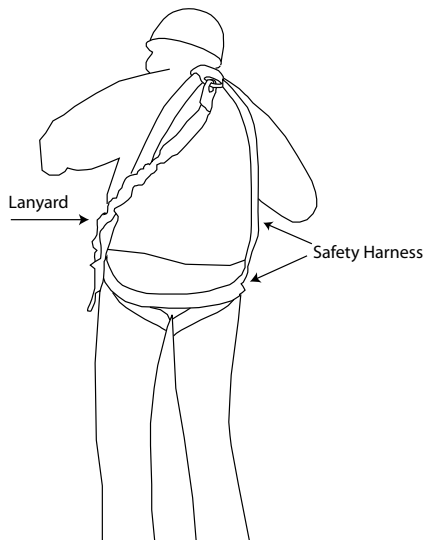
Employee Ejected from Lift Bucket

Summary of OSHA Accident Inspection 123175911

A tree trimmer cut the top off of a pine tree. As it fell, it hit the boom, causing the employee to be catapulted from the bucket. He was not wearing the safety belt that was attached to the bucket. He died of massive bodily injuries.



Remember to wear and attach fall protection equipment.



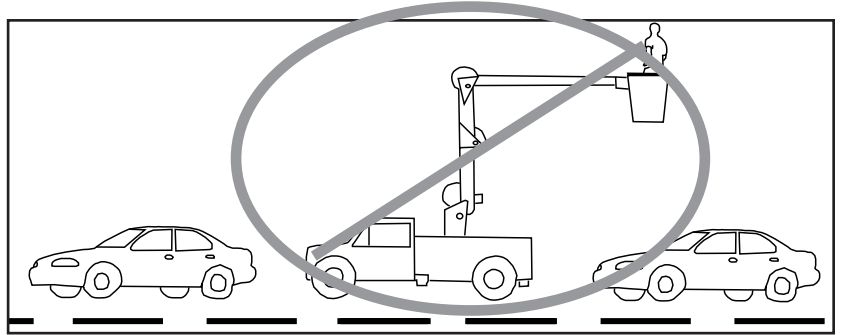
Lesson 4

Objectives

1. Identify steps to secure yourself in the bucket of the lift.
2. Recognize safe operating procedures to avoid falling from an aerial lift.
3. Indicate how to avoid being struck by objects that fall from the lift.

Prevent Falls

- ▶ The weight of the operator and tools should never exceed the load limits set by the manufacturer.
- ▶ Keep both feet on the floor of the bucket.
- ▶ Never use a ladder inside the bucket. The ladder will likely fall as you are climbing.
- ▶ Do not lean over the bucket or reach too far or you may lose your balance.
- ▶ Never ride in the bucket of an aerial lift while the vehicle is in motion.



NEVER ride in the bucket of a moving aerial lift.

Avoid Being Struck by Falling Objects

- ▶ Keep all coworkers and unauthorized persons out from underneath a raised boom.
- ▶ Ensure that material being cut from the tree does not fall in the bucket, on the boom, or on a coworker below.
- ▶ Do not drop debris after it has been cut. Use a rope to slowly lower it to the ground.

Accident Report

Employee Killed When Struck by Falling Limb

Summary of OSHA Accident Inspection 300645199

An employee was stacking limbs that were being cut by a worker in an aerial lift. The lift operator dropped a large limb to the ground. The employee, who was not wearing a hard hat, walked beneath the lift and was struck on the head by the limb and killed. The lift worker was not aware the employee was underneath the bucket.



Always know where your coworkers are before lowering anything to the ground.

Quiz Yourself

Select the correct answer from the list below.

Answers can be found on page 37.

- a. Ride
- b. Fall protection equipment
- c. Latch
- d. Lowering
- e. Ladder

1. Never use a _____ in the bucket of an aerial lift.
2. Avoid jerking the controls when raising and _____ the boom.
3. Do not _____ in the bucket when the vehicle is moving.
4. _____ the bucket's door upon entry (if applicable).
5. Ensure _____ is securely attached before raising or lowering the boom.

Lesson 5

Objectives

1. Differentiate between qualified and unqualified line-clearance tree trimmers.
2. Recognize electrical hazards.
3. Identify safe working distances around power lines.

Avoiding Contact with Power Lines

Qualified vs. Unqualified

Only qualified line-clearance tree trimmers are allowed within 10 feet of energized power lines. According to OSHA, qualified employees are “those who are knowledgeable in the construction and operation of electric power generation, transmission, or distribution equipment involved, along with the associated hazards.”

To become a qualified line-clearance tree trimmer, you will need additional training that is beyond the scope of this book.

Qualified and unqualified employees are required to keep the minimum approach distances found in the tables in the next section.

General Precautions

You must use extreme caution when operating aerial lifts and tree trimming equipment around electrical lines.

- ▶ Plan ahead to have power lines de-energized or shielded.
- ▶ Never use a non-insulated lift device around power lines.
- ▶ Always ensure the vehicle is grounded. Refer to your equipment’s operator’s manual for electrical grounding instructions.
- ▶ Check your operator’s manual to determine the maximum voltage to which your equipment is rated.
- ▶ Keep far enough away from the power lines to allow for sway of the boom and sway of the lines. Refer to page 22 for more information.
- ▶ Never drill holes in the bucket’s platform or liner; this will decrease the effectiveness of the insulation.
- ▶ Boom insulation will not protect you if you pass between two wires or if the boom insulating material is damaged.
- ▶ Workers on the ground are not to touch the aerial lift when it is in use around power lines.

Electric shock or electrocution will occur when:

- ⚡ You physically touch the line with any part of your body, clothing or equipment. Example:
 - ▶ You touch a power line with your body.

Accident Report Employee Electrocuted

Summary of OSHA Accident Inspection 3228319
A tree trimmer, who was not wearing a hard hat, was operating an aerial lift. As he raised the boom upward, his head contacted an overhead power line. The employee was electrocuted.



Wear protective equipment and always keep a safe distance from power lines.

Electric shock or electrocution will occur when:

- 🚗 Your body, clothing or equipment touch another object in contact with a power line. Example:
 - ▶ The equipment you are using touches a power line.

Accident Report
Employee on Ground Electrocuted

OSHA Accident Inspection 2452605

An employee was in an aerial lift trimming trees above an overhead power line. He moved the lift so that its boom contacted the line, energizing the aerial lift truck. Another employee, who was leaning against the truck was electrocuted.



Keep coworkers away from the lift device while in operation.

Electric shock or electrocution will occur when:

- 🚗 The ground around a downed power line becomes electrified. This means you can be electrocuted even when you do not actually touch the power line. Example:
 - ▶ You are standing near a downed power line.

Accident Report
Employee Electrocuted by Electrified Ground

Summary of OSHA Accident Inspection 301183893

A crew was cutting down a tree when it fell into a power line, breaking it. The line arced and bounced around. An employee ran in front of the company truck and was electrocuted because the ground was electrified. His coworkers dragged him from the area, called for help, and performed CPR. The employee died 45 minutes after the accident.



You can be electrocuted if the ground around you becomes electrified.

Electric shock or electrocution will occur when:

- 🚗 Electricity jumps (arcs) from a power line to an object that is nearby. This means you can be electrocuted even when you do not actually touch the power line. Example:
 - ▶ You use a pole pruner near a power line and electricity arcs from the line to the pruner.

In the Event of an Accident

Never approach the vehicle until you are absolutely certain it is not energized.

If the vehicle is energized, call 911 and wait for the power company to shut off the power before approaching vehicle.

Minimum Approach Distances

Always assume that electrical lines are energized and work beyond the following minimum distances to avoid contact. When you must work closer than the minimum distances, contact the power company to have the lines de-energized or shielded.

Minimum approach distances not only apply to employees and aerial devices, but also to all tools and equipment.

Minimum Approach Distances for Unqualified Employees

Nominal Voltage kV Phase to Phase ¹	Distance	
	ft-in	m
0.0 to 1.0	10-00	3.05
1.1 to 15.0	10-00	3.05
15.1 to 36.0	10-00	3.05
36.1 to 50.0	10-00	3.05
50.1 to 72.5	10-09	3.28
72.6 to 121.0	12-04	3.76
138.0 to 145.0	13-02	4.00
161.0 to 169.0	14-00	4.24
230.0 to 242.0	16-05	4.97
345.0 to 362.0	20-05	6.17
500.0 to 550.0	26-08	8.05
785.0 to 800.0	35-00	10.55

¹Exceeds phase to ground.

Chart taken from ANSI Z133.1-2000. Used with permission.

Minimum Approach Distances for Qualified Employees

Nominal Voltage kV Phase to Phase	Includes 1910.269 elevation factor, sea level 5000 to ft ¹		Includes 1910.269 elevation factor, 5001-10,000 ft ¹		Includes 1910.269 elevation factor, 10,0001-14,000 ft ¹	
	ft-in	m	ft-in	m	ft-in	m
0.05 to 1.0	Avoid Contact		Avoid Contact		Avoid Contact	
1.1 to 15.0	2-04	0.71	2-08	0.81	2-10	0.86
15.1 to 36.0	2-09	0.84	3-02	0.97	3-05	1.04
36.1 to 46.0	3-00	0.92	3-05	1.04	3-09	1.14
46.1 to 72.5	3-09	1.14	4-03	1.30	4-07	1.40
72.6 to 121.0	4-06	1.37	5-02	1.58	5-07	1.70
138.0 to 145.0	5-02	1.58	5-11	1.80	6-05	1.96
161.0 to 169.0	6-00	1.83	6-10	2.08	7-05	2.26
230.0 to 242.0	7-11	2.41	9-00	2.75	9-09	2.97
345.0 to 362.0	13-02	4.02	15-00	4.58	16-03	4.96
500.0 to 550.0	19-00	5.80	21-09	6.63	23-06	7.17
765.0 to 800.0	27-04	8.34	31-03	9.53	33-10	10.32

¹Exceeds phase to ground; elevation factor per 29 CFR 1910.269.

Chart taken from ANSI Z133.1-2000. Used with permission.

For future reference, please take a moment and circle the chart you are required to follow.

Quiz Yourself

Select the correct answer from the list below.

Answers can be found on page 37.

- a. Touch
 - b. Equipment
 - c. Voltage
 - d. Unqualified
-
1. _____ line clearance tree trimmers must work AT LEAST 10 feet away from all 50 kV power lines.
 2. You can be shocked by arcing electricity even if you do not _____ a power line.
 3. Minimum approach distances apply not only to employees, but to all _____ as well.
 4. Check the equipment's operator's manual to determine the maximum _____ to which your equipment is rated.

Lesson 6

Objectives

1. Identify environmental hazards.
2. Recognize treatment and first aid for exposure to environmental hazards.

Environmental Hazards

Heat Stress

You can become seriously ill or die if you do not take the proper precautions while working in high temperatures and humidity. Heat can reduce physical performance, as well as mental alertness, causing more accidents.

Heat Facts

- ▶ You are more likely to suffer from a heat related illness on humid days.
- ▶ If you are not used to working in the heat, you are more likely to suffer from a heat related illness. It can take your body anywhere from five days to two weeks to be acclimated to working in the heat. It is recommended that new workers who begin in hot, humid weather, start out by working half of the normal time and workload on the first day and then build up to a complete day by the end of the week.
- ▶ You are more vulnerable to heat illness if you have suffered from it in the past.
- ▶ During the course of the day, you can produce as much as two or three gallons of sweat. Replenish this fluid by drinking liquids so that you do not suffer from a heat related illness.

What to Do If Someone's Suffering from a Heat Illness

- ▶ If someone feels overheated, move them into a cooler, preferably air conditioned area. Watch the person and seek medical attention if needed.
- ▶ Fan the person in order to increase cooling.
- ▶ Have the person drink plenty of fluids.
- ▶ If the person goes into convulsions or shows symptoms of heat stroke, call 911 immediately and take steps such as soaking their clothes with cool water to cool them.

Avoid Heat Related Illnesses

It is important to keep yourself hydrated and cool while working outside.

- ▶ Drink water often throughout the day; don't wait until you're thirsty to get a drink. At least a quart of water per hour is recommended. Sports drinks can also be consumed to replace electrolytes lost through dehydration.
- ▶ Stay away from soda, coffee, tea and alcoholic drinks that dehydrate the body.
- ▶ Avoid large meals before working in the heat.
- ▶ Some prescriptions can make you more susceptible to heat illnesses. Check with your doctor or pharmacist to see if any medicine you are taking could affect you while working in the heat.
- ▶ Wear lightweight fabric, such as cotton, to help keep your body cool.
- ▶ Plan to do the heaviest work at the coolest part of the day. This is usually between 6 a.m. and 10 a.m.
- ▶ Take frequent, short breaks in shaded areas to cool down.
- ▶ Do not take salt tablets, unless recommended by your doctor. Most people receive enough salt in their diet to account for the salt that is lost through sweating.

Sun Exposure

Prolonged exposure to sunlight causes skin cancer, cataracts and other serious illnesses.

- ▶ Choose a sunscreen that is marked broad-spectrum. This will protect you from both UVA and UVB rays. Ensure the Sun Protection Factor (SPF) is at least 15.
- ▶ Wear a hat or sun visor, sunglasses, and lightweight long-sleeve shirts and pants on sunny days to help control body temperature and block the sun.

Heat Exhaustion Symptoms

Heat exhaustion is a serious illness and needs to be treated immediately before a heat stroke occurs. If you or a coworker experience any of the following symptoms, cool off immediately and drink plenty of water.

- Dizziness
- Light headedness
- Headache
- Feeling weak, fatigued
- Clammy and moist skin

Heat Stroke Symptoms

Heat stroke is a medical emergency that can cause death. If anyone experiences the following symptoms of heat stroke, call 911 immediately.

- Hot, dry, red skin (not sweaty)
- Disorientation
- Confusion
- Body temperature greater than 105° F
- Convulsing
- Unconsciousness

Lightning Facts

- ⚡ A person that is struck by lightning **DOES NOT** retain an electric charge that can shock you.
- ⚡ Lightning can spread as far as 60 feet after striking the ground.
- ⚡ Lightning can travel at speeds of 100,000 mph.
- ⚡ The temperature of a bolt of lightning can be as high as 50,000° F.
- ⚡ Lightning **CAN** strike the same place twice.

Lightning Precautions

Lightning strikes injure and kill hundreds of people each year. Follow these precautions to stay safe when the weather turns bad.

- ▶ As soon as you hear thunder, shut off and put away equipment and move indoors out of the storm. When you are able to hear thunder, you are able to be struck by lightning. Lightning can strike even when it's not raining.
- ▶ The cab of an enclosed vehicle provides some protection from lightning but a sturdy building provides the best protection.
- ▶ Listen to the radio for weather updates and storm warnings.

If You Can't Take Cover Inside

- ▶ Get to a low space. Lightning strikes the tallest objects.
- ▶ Crouch down on the balls of your feet. Place your hands on your knees and lower your head between your knees.
- ▶ Minimize contact with the ground.
- ▶ Do not lie flat on the ground. This will make you a larger target.

Keep Away From ...

- ▶ Large, lone trees and towers, fences, telephone poles and power lines.
- ▶ Rivers, lakes, pools and other bodies of water.
- ▶ Metal objects, tools, equipment, wire fences and umbrellas.

If Someone is Struck by Lightning

- ▶ Call 911.
- ▶ Check to see if they're breathing. Rescue breathing or CPR may be required.
- ▶ Check for burns on their body.
- ▶ Move the victim inside, out of the storm.
- ▶ *Note: Most lightning-strike victims survive with immediate treatment and rescue breathing or CPR.*

Treating Cuts and Burns

Minor cuts and burns can be treated on the job site.

Seek medical attention if:

- ▶ Cuts are severely bleeding, more than one-half inch long and one-quarter inch deep, or the result of a puncture wound.
- ▶ Burn area covers more than one-fifth of the body with blisters, blisters occur on the hands, feet, face or genitalia, or if the skin is blackened or charred.
- ▶ A cut or burn becomes infected.

Treating Cuts

- ▶ Clean the area thoroughly.
- ▶ Remove any debris that may be in the wound.
- ▶ Apply pressure to the wound using gauze or a clean, absorbent cloth until the bleeding stops. If blood seeps through the cloth, do not remove it, continue adding more gauze or cloth over the previous one.
- ▶ Apply an antibiotic ointment and cover with a bandage or clean gauze.
- ▶ Allow wound to heal and keep dirt from creating infection by changing the bandage or gauze frequently.
- ▶ If a limb has been amputated, elevate while applying direct pressure and call 911.

Treating Burns

- ▶ Cool the burn by placing it under cool running water or in a container of cool water for at least 15 minutes.
- ▶ Cover the area with gauze or a clean cloth.
- ▶ Allow burn to heal and keep dirt from creating infection by changing the gauze frequently.
- ▶ If blisters occur, do not break them. Cover with gauze and allow them to break on their own.

First Aid Kit Contents

The following is a list of minimum requirements for workplace first aid kits as outlined by ANSI Standard Z308.1-2003*.

- ▶ absorbent compress
- ▶ adhesive bandages
- ▶ adhesive tape
- ▶ individual-use antiseptic applications
- ▶ individual-use burn treatment applications
- ▶ latex-free medical exam gloves
- ▶ sterile pads
- ▶ triangular bandage

*ANSI Z308.1-2003 is published by the International Safety Equipment Association, Arlington, VA www.safetysiteequipment.org. Used with permission.

When working in groups of two or more, at least two qualified line clearance tree trimmers are required to have had First Aid and CPR training. This training must be completed within three months of employment.

What to Do If Someone's Suffering from a Cold-Induced Injury or Illness

- ♦ Move the person out of the cold and into an area that is warm and dry.
- ♦ Remove wet and tight clothing and cover the person with a blanket.
- ♦ Never rub the affected area. This will cause further skin and tissue damage.
- ♦ Seek medical attention immediately.

Cold Induced Injuries and Illnesses

Prolonged exposure to freezing temperatures can result in cold-induced injuries and illnesses that can seriously injure or kill you.

Cold temperatures reduce mental alertness and cause fatigue and exhaustion that can lead to accidents.

Frostbite

Frostbite occurs when parts of the body become so cold that the skin and tissue freezes. Frostbite normally occurs on ears, nose, fingers, hands, toes and feet or other parts of the body that are left uncovered in below-freezing temperatures. Frostbitten skin becomes numb and turns a pale white color.

Hypothermia

Hypothermia occurs when a person's body temperature drops to or below 95° F. Common symptoms include bluish-colored skin, uncontrollable shivering and drowsiness or fatigue.

Avoid Cold-Induced Injuries and Illnesses

- ▶ Layer clothing when working in cold temperatures; you can easily take off layers if you are too warm.
- ▶ Wear a hat and gloves.
- ▶ Keep muscles warm and loose by moving as much as possible.
- ▶ Take frequent, short breaks in warm areas.
- ▶ Perform work at the warmest part of the day, typically in the afternoon.
- ▶ Never work alone.

Insect Stings

Insect stings can be treated without medical attention unless the person suffers an allergic reaction.

The first step to treating an insect sting is to remove the stinger. This can be done by using a straight edge to scrape off the stinger or by using tweezers to pull it out. If you choose to use tweezers to remove the stinger, use extreme caution to not puncture the protruding venom sac.

After the stinger has been removed, a cold pack can be used during the first 24 hours to suppress pain and swelling. Following the first 24 hours, heat should be applied if pain or swelling persist.

Those with severe allergies to insect stings should consult a physician about carrying a prescription medical kit. The kit contains medicine and instructions to be used if the person is stung. If the kit is used, the victim still must receive medical attention. Call for help or take them to the nearest hospital.

Snake Bites

If you are bitten by a snake, seek medical attention immediately and try to describe the size and color of the snake to the doctor. This can help the doctor determine whether or not the snake was poisonous.

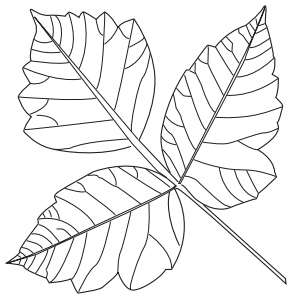
Never cut, suck or apply cold packs to snake bites.

Mammals

Be aware of animals such as squirrels or bats that may be in trees or bushes and startle you during work. Also, be cautious of animals such as rats, skunks and raccoons that could be rabid.

Poison Ivy, Oak and Sumac

- ▶ Wash the affected area and all clothing and tools that may have touched the plant.
- ▶ Avoid scratching the area if possible, to prevent infection.
- ▶ Hot and cold compresses can be used to suppress itching.
- ▶ Consult a doctor if the rash is on the face, inside the mouth or covers a large portion of the body.



Poison Ivy
Leaves are usually
found in clusters of three.

Quiz Yourself

Select the correct answer for sentences 1-6 from the list below.

Answers can be found on page 38.

- a. Meals
- b. Humid
- c. Thirsty
- d. Pressure
- e. Lower
- f. 15

1. You are more likely to suffer from heat illness on _____ days.
2. Avoid large _____ before working in the heat.
3. Drink water frequently to stay hydrated. Don't wait until you're _____.
4. If you can't take cover from lightning inside, get to a _____ space.
5. If you or a coworker are cut, apply direct _____ to the wound.
6. Cool a minor burn by placing it under cool, running water or in a container of cool water for at least _____ minutes.

Select the correct answer for the following sentences from the list below.

- a. Immediately
 - b. Stinger
 - c. Wash
 - d. Frostbitten
 - e. Lower
7. Never rub a body part that has been _____.
 8. The first step to treating an insect sting is to remove the _____.
 9. If you contact poison ivy, oak or sumac, _____ the affected area as well as all clothing and tools.
 10. Hypothermia occurs when body temperature drops to 95° F or _____.
 11. If a person with a known allergy to insects is stung, call for help _____.

Conclusion

Developing safe work habits before, during and after machinery operation, helps you avoid accidents on the job.

You have been presented with checklists, safety tips and exercises designed to help you avoid the most commonly reported causes of mower and trimmer operation injuries and deaths, as well as other important safety precautions to consider. Use this information to keep your work experience safe.

Quiz Yourself

Answers can be found on pages 39 and 40.

Circle the correct answer.

1. What are the four most commonly reported causes of serious injury and death from operating aerial lifts?
 - a. Cuts, scrapes, burns, CO poisoning.
 - b. Lift overturns, falls, contacting power lines, boom collapse.
 - c. Heat illness, lightning strike, fatigue, sun exposure.

2. The _____ sign is the most serious safety message. If you don't follow the directions, you will be seriously injured or killed.
 - a. Caution
 - b. Warning
 - c. Danger

3. A _____ should be worn to protect your head from falling objects.
 - a. Baseball cap
 - b. Hard hat
 - c. Face shield

4. A pre-start inspection to check the worksite and equipment should be performed _____.
 - a. Daily
 - b. Weekly
 - c. Monthly

5. Never modify any part of the lift without permission from the _____.
 - a. Mechanic
 - b. Supervisor
 - c. Manufacturer

Quiz continues on next page.....

Select the correct answer from the list below.

- a. Outriggers
 - b. Beyond
 - c. Cooler
 - d. Ride
 - e. Highly reflective
6. Wear _____, brightly colored clothing when working around traffic.
 7. Always set the _____ and chock the wheels to help stabilize the lift.
 8. Never _____ in the bucket while the vehicle is in motion.
 9. When working near power lines, always work _____ the minimum distance requirements.
 10. If someone feels overheated, move them to a _____ place and seek medical attention if needed.

Quiz Yourself

Solutions

Lesson 1

Circle the correct answer.

1. What are the most commonly reported causes of serious injury and death from operating aerial lift devices?
 - a. Heat stroke and lightning strike.
 - b. Carbon monoxide poisoning and burns.
 - c. Overturns, falls, electrocution and boom collapse.

Select the correct answer for the following sentences from the list below.

- a. Face shield and safety glasses
 - b. Caution
 - c. Alcohol
 - d. Supervisor
2. If you have questions, stop and ask your **d** before you continue.
 3. The triangle shape is the symbol for **b** .
 4. **a** should always be worn when using a chainsaw.
 5. Never operate any type of equipment under the influence of **c** or drugs.

Lesson 2

Select the correct answer from the list below.

- a. Operator's manual
- b. Highly reflective
- c. Leaks
- d. Level
- e. Two

1. Position the aerial lift on ground that is **d** .
2. When working near a roadway, always wear **b** , brightly colored clothing.
3. Check the **a** for instructions on how to properly test boom controls.
4. Never operate a lift alone. **e** operators should always be present.
5. High pressure fluid **c** can penetrate your skin, causing injury.

Lesson 3

Select the correct answer from the list below.

- a. Outrigger pads
- b. Flat
- c. Operator's manual
- d. Lowering
- e. Chock

1. _____**e**_____ the equipment's tires after setting the parking brake.
2. Avoid jerking the controls when raising and _____**d**_____ the boom.
3. If the lift is positioned on soft ground, place _____**a**_____ beneath the outriggers to keep the equipment from sinking, according to the operator's manual.
4. Check the _____**c**_____ for the greatest slope the vehicle can operate on.
5. Ensure the lift is positioned on a _____**b**_____, solid surface before operating.

Lesson 4

Select the correct answer from the list below.

- a. Ride
- b. Fall protection equipment
- c. Latch
- d. Lowering
- e. Ladder

1. Never use a **e** in the bucket of an aerial lift.
2. Avoid jerking the controls when raising and **d** the boom.
3. Do not **a** in the bucket when the vehicle is moving.
4. **c** the bucket's door upon entry (if applicable).
5. Ensure **b** is securely attached before raising or lowering the boom.

Lesson 5

Select the correct answer from the list below.

- a. Touch
- b. Equipment
- c. Voltage
- d. Unqualified

1. **d** line clearance tree trimmers must work AT LEAST 10 feet away from all 50 kV power lines.
2. You can be shocked by arcing electricity even if you do not **a** a power line.
3. Minimum approach distances apply not only to employees, but to all **b** as well.
4. Check the equipment's operator's manual to determine the maximum **c** to which your equipment is rated.

Lesson 6

Select the correct answer for sentences 1-6 from the list below.

- a. Meals
- b. Humid
- c. Thirsty
- d. Pressure
- e. Lower
- f. 15

1. You are more likely to suffer from heat illness on b days.
2. Avoid large a before working in the heat.
3. Drink water frequently to stay hydrated. Don't wait until you're c .
4. If you can't take cover from lightning inside, get to a e space.
5. If you or a coworker are cut, apply direct d to the wound.
6. Cool a minor burn by placing it under cool, running water or in a container of cool water for at least f minutes.

Select the correct answer for the following sentences from the list below.

- a. Immediately
- b. Stinger
- c. Wash
- d. Frostbitten
- e. Lower

7. Never rub a body part that has been d .
8. The first step to treating an insect sting is to remove the b .
9. If you contact poison ivy, oak or sumac, c the affected area as well as all clothing and tools.
10. Hypothermia occurs when body temperature drops to 95° F or e .
11. If a person with a known allergy to insects is stung, call for help a .

Conclusion

Circle the correct answer.

1. What are the three most commonly reported causes of serious injury and death from operating aerial lifts?
 - a. Cuts, scrapes, burns, CO poisoning.
 - b. Lift overturns, falls, contacting power lines, boom collapse.
 - c. Heat illness, lightning strike, fatigue, sun exposure.
2. The _____ sign is the most serious safety message. If you don't follow the directions, you will be seriously injured or killed.
 - a. Caution
 - b. Warning
 - c. Danger
3. A _____ should be worn to protect your head from falling objects.
 - a. Baseball cap
 - b. Hard hat
 - c. Face shield
4. A pre-start inspection to check the worksite and equipment should be performed _____.
 - a. Daily
 - b. Weekly
 - c. Monthly
5. Never modify any part of the lift without permission from the _____.
 - a. Mechanic
 - b. Supervisor
 - c. Manufacturer

Quiz continues on next page.....

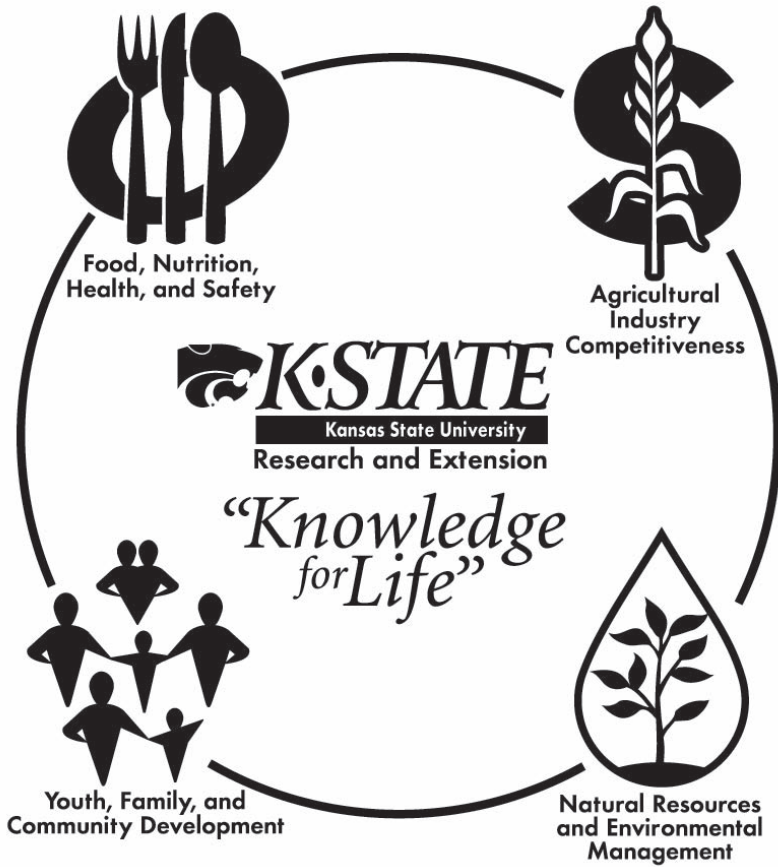
Select the correct answer from the list below.

- a. Outriggers
 - b. Beyond
 - c. Cooler
 - d. Ride
 - e. Highly reflective
6. Wear **e**, brightly colored clothing when working around traffic.
7. Always set the **a** and chock the wheels to help stabilize the lift.
8. Never **d** in the bucket while the vehicle is in motion.
9. When working near power lines, always work **b** the minimum distance requirements.
10. If someone feels overheated, move them to a **c** place and seek medical attention if needed.

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