

Tree Trimming Safety

For the Landscaping and
Horticultural Services Industry



K-STATE
Research and Extension

*Knowledge
for Life*

Tree Trimming Safety

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What's Inside?

This booklet teaches important safety practices to be followed when manually trimming trees.

Safety tips, along with real accident reports, have been combined to help you protect yourself from the hazards involved in this type of work.

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

Lesson 1

Objectives

1. Name the most common types of tree trimming accidents.
2. Interpret the meaning of common warning signs and labels.
3. Identify appropriate protective equipment.
4. Indicate hazards to be assessed before beginning operation.

Take Control of Your Own Safety Greatest Dangers

The most common types of serious tree trimming accidents are:

1. Electrocutation

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

Accident Report

Employee Electrocuted When Branch Falls on Line

Summary OSHA Accident Inspection 1099688358

An employee was trimming a tree that was near an overhead power line. The employee misjudged the distance, cut the branch, and it fell on the line. The employee, who was still holding onto the branch, was electrocuted.



***Always keep a safe distance from power lines.
Refer to page 12 for more information.***

2. Falling From Trees

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

Accident Report

Employee Falls After Disconnecting Both Lanyards

Summary of OSHA Accident Inspection 126621820

While working in a tree, an employee disconnected one lanyard to move around some limbs. After climbing approximately 60 feet up the tree, he disconnected the second lanyard before reconnecting the first. The employee fell and died of head injuries.



Always make sure all safety lines are connected.

3. Being Struck by Trees or Limbs

You can be seriously injured or killed if you are struck by falling trees or limbs.

Accident Report

Employee Struck by Falling Limb

Summary of OSHA Accident Inspection 125616698

An employee was felling trees in a forested area when a limb fell from an adjacent tree and struck him on the head. The employee was killed.



Always wear a hard hat and do a pre-start inspection before beginning work.

Help Yourself

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

1. Learn All You Can.

To prevent tree trimming accidents, read and follow directions that come with all climbing and trimming equipment. While reading, pay attention to safety instructions and look for warning labels 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 or climb trees 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 climbing and operating machinery safely.



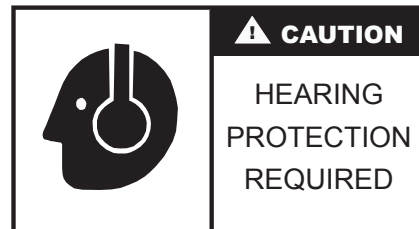
Safety Messages and Signs

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

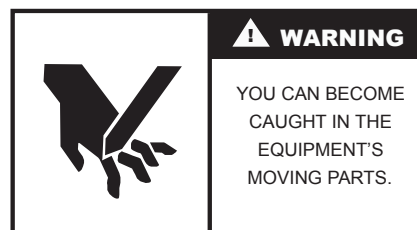
 The triangle shape is the symbol for caution. The exclamation mark in the center means *Pay Attention*. In some instances, the triangle-shaped sign will show a picture. Other times, words explain why the sign is used.

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 a possibly 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 S441.3, FEB1999 (R2005), Safety Signs.

Protective Equipment

Certain equipment is necessary to protect you while trimming trees. The following protective equipment is required.

Hard Hat

A hard hat should be worn to protect your head from falling limbs.

Gloves

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

Sturdy, Non-Slip Boots

Wear boots to keep a firm footing on the ground and reduce the risk of slipping and falling.

Climbing Equipment

Safety harnesses, belts, ropes, lanyards, slings and carabiners appropriate to the job are used to keep you secured in the tree.

When Operating a Chain saw You Must Wear:

Leg Protection

Leg protection must be worn when performing ground operations. The material should be cut-resistant and 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 kick-back of the machine and debris.

Hearing Protection

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

When to Wear Hearing Protection

OSHA Standard 1910.95 (i) (l) 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 dosimeter. 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.



Pre-Start Checklist

Tree

- Trunk free of cracks, splits or cankers.
- No nests, hives or other signs of animal life.
- No signs of poison ivy or oak.

Equipment

- Belts and harnesses free of cracks, cuts and broken stitching.
- Clips, buckles and rivets not loose or broken.
- Ropes and lanyards are dry and show no signs of fraying, intense wear or sun damage.
- Snap catches and carabiners close securely and are the appropriate size for the D-rings in use.
- Other personal protective equipment used as needed, such as hearing and eye protection.

Location

- Warning signs and rumble strips are being used, when necessary, if the site is near a roadway.
- Cones and flaggers are used to divert traffic, when necessary.

Should you find any hazards while climbing, descend the tree immediately following the inspection, and take appropriate action to solve the problem.

Pre-Start Inspection

A hazard briefing must be performed before the start of each job. During this briefing, you and your supervisor should analyze the potential dangers of performing the job. Based on the analysis, choose a plan of attack and proper equipment that will help you carry out the job safely.

Tree

Ensure the trunk is stable by looking for cracks, splits and cankers. Look for any dead and rotten branches. Watch for any nests, hives, or other signs that animals may be in the tree. Look for poison ivy or oak growing on or around the tree.

Accident Report

Employee Suffers Infection

Summary of OSHA Accident Inspection 119705770

An employee was trimming trees when his arm came in contact with poison oak. He suffered an allergic reaction and infection set in his arm before transferring to his leg. He was hospitalized for treatment.



Be on the lookout for poison ivy and oak during your prestart hazard inspection.

Equipment

Check belts and harnesses for any cracks, cuts or broken stitching. Ensure that all clips, buckles and rivets are not loose or broken. Check ropes and lanyards for signs of fraying and intense wear. Do not use a rope that is wet, has been driven over or has been stored in the sun. These factors will weaken the elasticity and strength of the rope. Check snap catches and carabiners to make sure they will close securely and are the appropriate size for the D-ring on your harness or belt.

Location

If working near roadways, use warning signs and rumble strips, when necessary, to alert motorists that employees are in the area. Use cones and flaggers (wearing highly-reflective vests) to divert traffic away from the area where work is being performed.

Quiz Yourself

Answers can be found on page 36.

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

- a. Danger
- b. Cut-resistant
- c. Alcohol
- d. Triangle
- e. Electrocutation

1. Do not operate machinery if you are under the influence of drugs or _____.
2. _____, falls from trees and being struck by trees or limbs are the three most commonly reported causes of serious tree trimming accidents.
3. The _____ shape is the symbol for caution.
4. Leg protection consisting of _____ material is required when operating a chain saw during ground operations.
5. _____ is the most serious safety message.

Lesson 2

Objectives

1. Differentiate between qualified and unqualified line-clearance tree trimmers.
2. Recognize electrical hazards.
3. Identify minimum distance requirements.

Avoid Shock and Electrocutation

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 distances found in the tables in the next section.

Electrical Hazards

You must use extreme caution when working around electrical lines. Electrocutation can occur by direct contact, indirect contact or electrical arcing.

Electric shock or electrocutation will occur when:

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

Accident Report

Employee Leans Backward Into Power Line

Summary of OSHA Accident Inspection 119596658

While descending a tree, an employee leaned back into a power line. He remained in contact with the 7.2-kilovolt power line for about 30 seconds before being thrown free. His supervisor performed CPR until emergency medical services arrived. The employee died of electrocutation.



Always keep a safe distance from power lines.

Refer to page 12 for more information.

**If using an insulated boom or bucket truck,
check the operator’s manual to determine
it’s maximum effective voltage.
Do not exceed this limit.**

Electric shock or electrocution will occur when:

- ⚠️ Your body, clothing or equipment touch any material that is in contact with a power line. Example:
 - ▶ The equipment you are holding touches a power line.

Accident Report

Employee Shocked When Saw Touches Line

Summary of OSHA Accident Inspection 123168965

An employee was trimming trees from the bucket of an aerial lift. The employee received an electric shock when his saw contacted a 13.2-kilovolt overhead power line.



Remember to keep all equipment outside the distances found on page 12.

Accident Report

Employee Electrocuted

Summary of OSHA Accident Inspection 123561540

A tree trimmer was cutting a branch when a gust of wind blew the branch into contact with a 35-kilovolt power line. The trimmer, who was touching the branch and tree was electrocuted.



Be cautious of sudden wind changes.

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. Examples:
 - ▶ 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 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.

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, but also to all equipment, including ladders and aerial devices.

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 can be found in ANSI Z133.1-2006.

Quiz Yourself

Answers can be found on page 37.

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

- a. Arc
- b. Qualified
- c. Minimum
- d. Equipment

1. You must follow the _____ approach distances unless power lines have been de-energized or shielded.
2. Electricity can _____; meaning you can be electrocuted even when you are near, but not touching the power line.
3. Additional training, that is beyond the scope of this book, is required to become a _____ line clearance tree trimmer.
4. Minimum approach distances also apply to _____.

Choose One:

- I am a _____ line-clearance tree trimmer.
- a. unqualified
 - b. qualified

Lesson 3

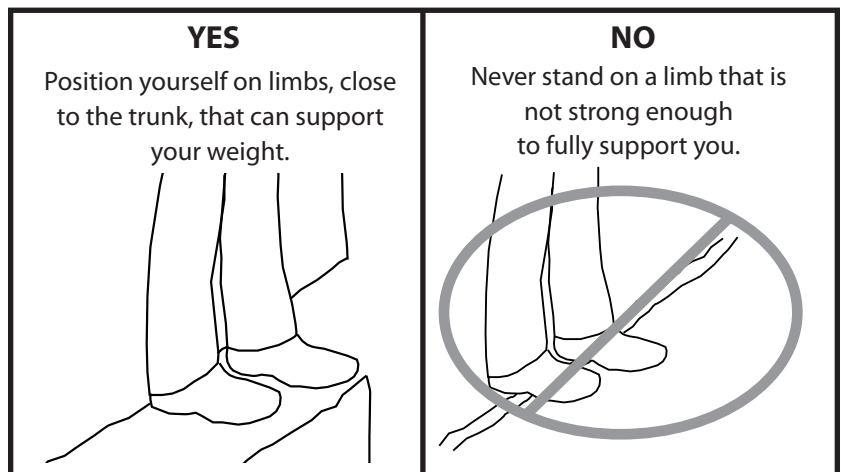
Objectives

1. Recognize precautions to prevent falling from trees.
2. Identify climbing knots.

Preventing Falls from Trees

Avoid Injury from Falling

- ▶ Always climb trees using ropes or harnesses and use additional anchor points whenever possible. Do not free-climb.
- ▶ Never anchor or tie yourself to the limb you are cutting on.
- ▶ Always tie ladders into the tree.
- ▶ Do not cut your safety lines. Keep all ropes and harnesses away from chain saws and other cutting equipment.
- ▶ Use extra caution when working on slopes.
- ▶ Use an aerial device to trim trees that are not safe to climb.
- ▶ Remove cut limbs from the tree so that you don't accidentally use them for support when you descend.
- ▶ Do not climb when the tree is wet, icy or snow-covered or when the weather is extremely windy.
- ▶ Never turn your back on a tree being felled.
- ▶ When working above concrete or a paved surface, watch out for branches that might bounce back and strike you or your equipment.



Accident Report

Employee Falls From Ladder

Summary of OSHA Accident Inspection 200450096

An employee who was trimming trees put a ladder in the bed of a pickup to use it as a height extender. There were no support attachments on the ladder and the base section did not have secure footing. The employee fell off the ladder, approximately 14 feet, broke his neck and died.



Never use a ladder in a pickup bed for added height.

Knots

Below are some knots commonly used for climbing. For a more complete list of knots and explanations on how and when to use them refer to:

Arborists Certification Study Guide, International Society of Arboriculture. www.isa-arbor.com

Tree Climber's Guide, International Society of Arboriculture. www.isa-arbor.com

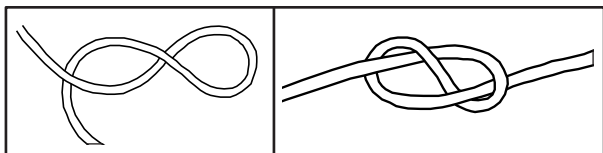
National Tree Climbing Guide, United States Department of Agriculture's National Tree Climbing Program. www.fs.fed.us/treeclimbing/

Figure Eight Knot

The figure eight knot can be used for a variety of purposes. Examples include but are not limited to:

- ▶ a stopper knot at the end of hitches and rappel lines
- ▶ to tie two pieces of rope together
- ▶ to attach lanyards

Follow the steps below to tie a figure eight knot.

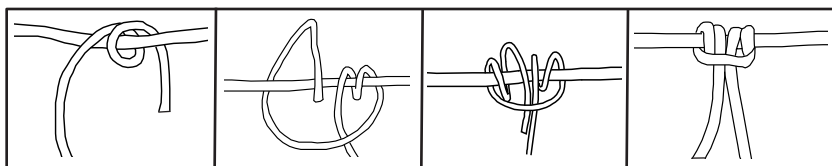


Prusik Knot

The Prusik is a friction knot. This means the knot can slide easily without tension. Examples include but are not limited to:

- ▶ attach climbing equipment to rappel lines
- ▶ create adjustable lanyards
- ▶ use as an ascending knot

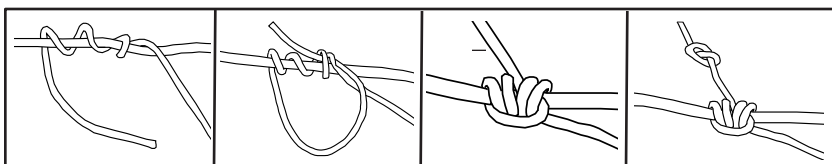
Follow the steps below to tie a Prusik knot.



Blake's Hitch

The Blake's hitch is a modified version of the Prusik knot. It is also a friction knot. After making the hitch, the end should always be tied with a figure eight stopper knot.

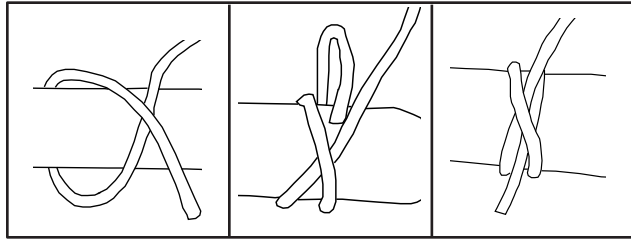
Follow the steps below to tie a Blake's hitch.



Clove Hitch

The clove hitch is a knot that can be used to tie equipment to the end of the rope or to the tree. The clove hitch should never be used as a lifeline.

Follow the steps below to tie a clove hitch.

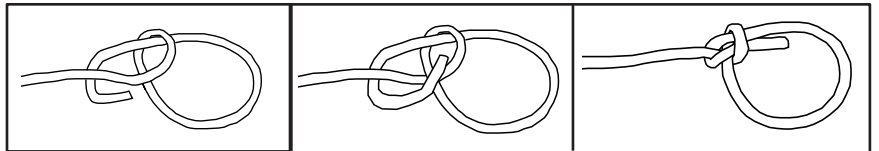


Bowline Knot

The bowline knot is formed at the end of a rope and does not slip or tighten under stress. Examples include but are not limited to:

- ▶ tie a climbing line to a carabiner
- ▶ attach a throw bag to its line

Follow the steps below to tie a Bowline knot.



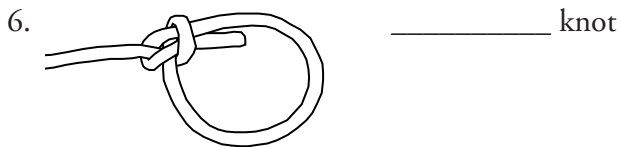
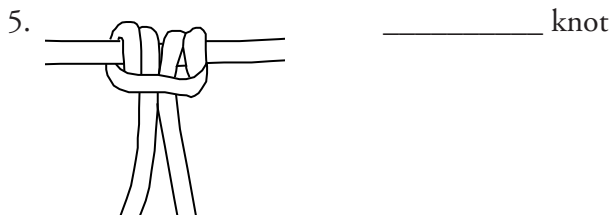
Quiz Yourself

Answers can be found on page 38.

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

- a. Anchor
- b. Bowline
- c. Aerial device
- d. Stopper
- e. Lifeline
- f. Prusik

1. A Blake's hitch should always include a figure eight _____ knot.
2. Use an _____ to trim trees that are too dangerous to climb.
3. Never _____ yourself into the limb you are working on.
4. A clove hitch should never be used as a _____.



Lesson 4

Objectives

1. Recognize ways to avoid being struck by trees and limbs.
2. Develop safe chain saw operating procedures.
3. Identify tree felling danger zones.
4. Compare different felling techniques.

Avoid Being Struck by Trees or Limbs

Prevent Injury from Trees and Limbs

- ▶ Limbs that cannot be dropped safely should be lowered with a rope.
- ▶ Do not leave cut branches in a tree. Drop or lower them safely to the ground.
- ▶ Do not turn your back on a tree where branches are being cut or a tree is being felled.
- ▶ Follow a two-tree rule when felling. No one (other than the feller) should be within two tree lengths of the tree being felled.
- ▶ Maintain a greater distance when trimming or felling on a slope where logs could roll or slide.
- ▶ Always be aware of your surroundings. Talk with coworkers to ensure you know what kind of work they are doing and where.

Accident Report

Falling Tree Strikes Employee on Head

Summary of OSHA Accident Inspection 111100657

An employee turned his back to a tree that was being trimmed. A limb struck the employee on the back of the head and killed him.



Never turn your back to a tree being trimmed.

Accident Report

Limb Rebounds; Saw Strikes Employee

OSHA Accident Inspection 125907865

An employee was using a chain saw to cut a 3 inch diameter branch. After he had made the final cut, the branch fell and bounced after hitting a concrete walk. The cut limb struck the employee in the face and the chain saw struck his right arm. He suffered deep cuts as well as nerve and tendon damage.



Slowly lower limbs with a rope when working above a hard surface.

Using a Chain saw

General Instructions:

- ▶ Read the chain saw's operator's manual before attempting to operate equipment.
- ▶ Always be alert. Chain saw work is strenuous and fatiguing.
- ▶ When carrying a chain saw, always turn the engine off.
- ▶ Do not refuel the chain saw with the engine running. Shut it off and wait at least 5 minutes for it to cool down. Wipe up any spills immediately.
- ▶ Never smoke while refueling.
- ▶ Never work alone. Make sure someone is close by for help in case of an emergency.
- ▶ Keep hands and feet away from the wood that is being cut.
- ▶ Ensure your chain is sharp. Dull chains are hard to use.
- ▶ Make sure the chain tension is correct. Refer to the operator's manual for instruction. If the chain is too loose, it could come off during operation and if it is too tight, it could damage the saw.
- ▶ Never operate the saw above your chest. Reaching above your chest makes the saw hard to control.

Accident Report

Employee Cut by Chain saw

Summary of OSHA Accident Inspection 120134390

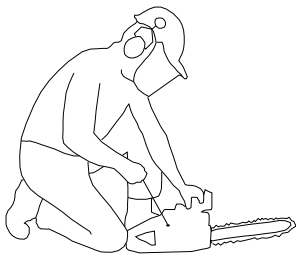
An employee was standing on a slope cutting a log into pieces. He slipped on the damp ground and hit his upper left arm with the chain saw. The arm was severely cut and the employee was hospitalized.



Always stand on a solid, flat, dry surface when operating a chain saw.

YES

Start a chain saw on the ground.



NO

Never start a chain saw against your body.



Kickback is a common cause of injury associated with chain saws. Kickback occurs when the chain around the end of the bar contacts a hard object (such as a knothole) or when the teeth of the saw are pinched in the wood. This kicks the saw backward and upward, rapidly, where it can strike you.

To reduce kickback:

- ▶ Do not cut with the upper section of the bar. Insert the saw fully.
- ▶ When cutting, always stand at an angle, with a firm balance on the ground or branch, so that if the saw kicks back, it will avoid your neck and head.
- ▶ Make sure your saw has an anti-kickback device. Chain saws manufactured after 1995 have one or more devices already installed on the machine. For saws older than 1995, a retrofit kit may be available.

Accident Report

Employee Killed When Chain saw Kicks Back

Summary of OSHA Accident Inspection 120169669

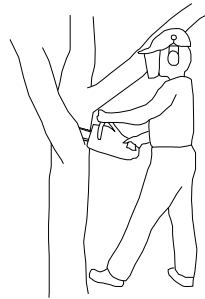
An employee was trimming trees and cutting downed limbs. The tip of his chain saw struck a limb and kicked back, striking him across the neck. He died due to a severe cut to his throat.



Always insert the blade fully to reduce kickback.

YES

Insert the blade fully to reduce kickback.



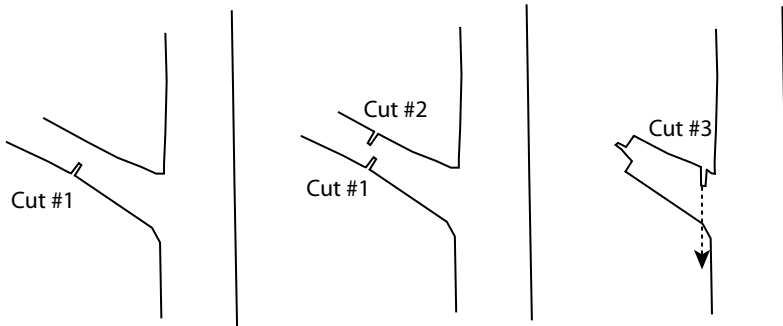
NO

Do not cut with the tip of the blade.



Trimming Branches

To safely trim branches, use three cuts to remove the branch completely.



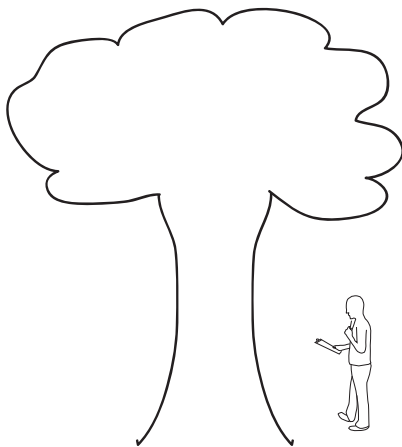
Felling Techniques

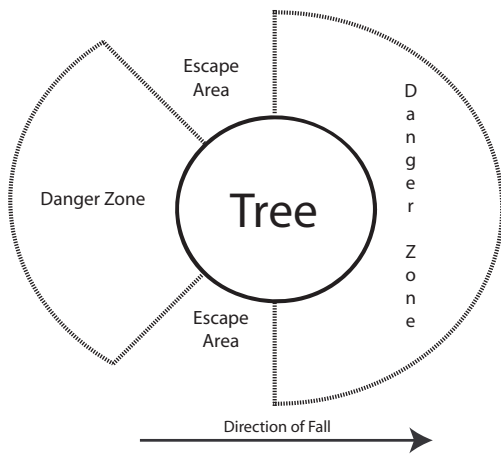
When a tree must be removed, there are several things to consider before cutting.

1. Ensure coworkers and all others maintain a two-tree length distance. If the tree is going to fall downhill, increase the distance depending on the slope.
2. Look for any fences, buildings or power lines and avoid felling toward them.
3. Work only in good weather. Never work in strong winds, lightning, rain or any time when visibility is low.

Inspect the Tree

- ▶ Is the tree leaning in one direction? This will play a major role in the direction the tree will fall.
- ▶ Check the trunk (where the cuts are going to be made) for knot holes, cracks or signs of rot that could hinder the felling operation.
- ▶ Ensure the tree has no interlocking branches or vines from another tree. If it does, they must be separated prior to felling. Also, survey the crown of the tree for any material that may break loose as the tree falls.
- ▶ Trim any low branches that are in your way.





Locate the Escape Areas

Before you begin to cut, you must determine your escape area. This is the area you will go to immediately after the back cut has been made and the tree is beginning to fall.

To locate the escape areas, you must first determine the danger zones. Two danger zones can be identified and must be avoided to prevent serious injury or death. The first danger zone is located in a semi-circle, from half the diameter of the tree toward the direction of the fall. The second danger zone is one-quarter of the diameter of the tree and located in the opposite direction of the intended fall. Fellers **MUST** avoid these two danger zones.

The escape areas are then located between the danger zones. Always retreat to one of these areas as the tree is beginning to fall.

Accident Report

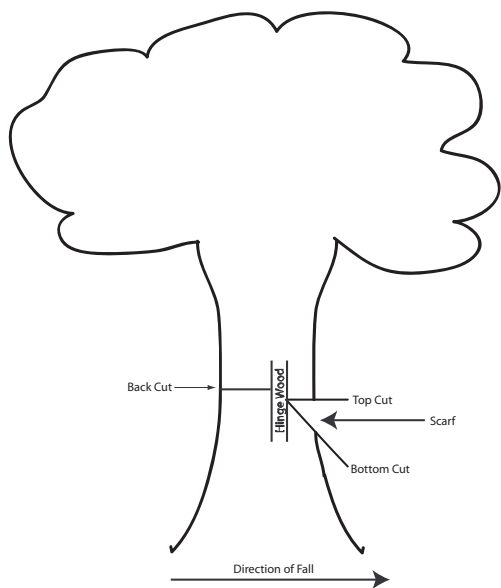
Employee Struck by Falling Tree

Summary of OSHA Accident Inspection 114147440

An employee was working on the ground, cutting down a tree. When the tree fell, it struck him on the head, killing him.



Move to one of the two escape areas after making the back cut.



Make the Cut

There are three key parts to a successful felling.

1. Scarf. The scarf is a notch that is cut out of the tree by making a top and bottom cut. There are three commonly used notches that can make a good scarf and we will discuss them later in this chapter. The scarf is important because it controls the direction of the fall.
2. Hinge wood. The hinge wood is a piece of the tree, equal to $\frac{1}{10}$ of the tree's diameter, that is left uncut. It serves as a hinge, after the final cut has been made, to push the tree in the intended direction of fall.
3. Backcut. The backcut is the final cut and helps clear the wood up to the hinge wood so the tree can easily fall.

Types of Notches

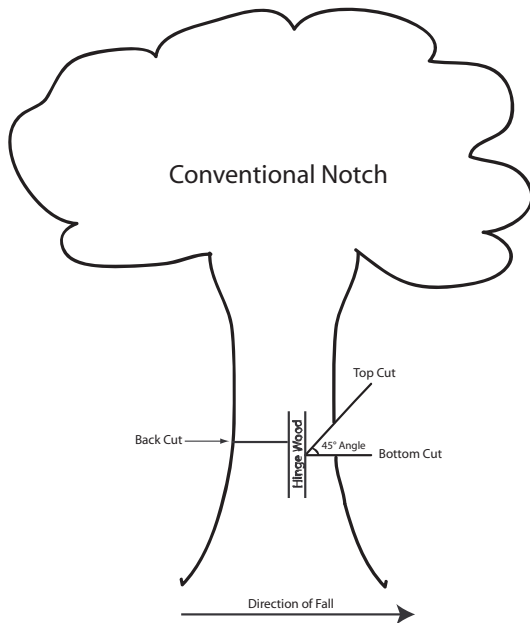
Note: The notches can be made at any height on the tree, but always start high enough to allow room to complete all three cuts.

Conventional Notch

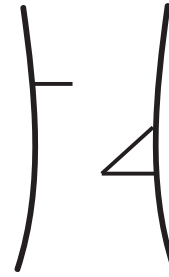
Top Cut: Cut downward at a 45° angle to a point that is ¼ to ⅓ the tree's diameter.

Bottom Cut: Cut straight across the tree until you reach the end point of the top cut.

Back Cut: Start the cut 1 inch above the notched corner on the opposite side of the tree. Cut straight across, until you reach the hinge wood.



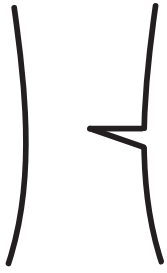
Common Cutting Mistake



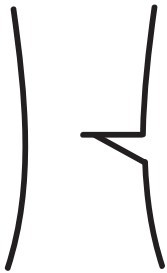
Back cut is too high.
Creates poor hinge.

For more information on logging operations visit www.osha.gov

Common Cutting Mistakes



Bottom cut is not steep enough to form a 45° angle.



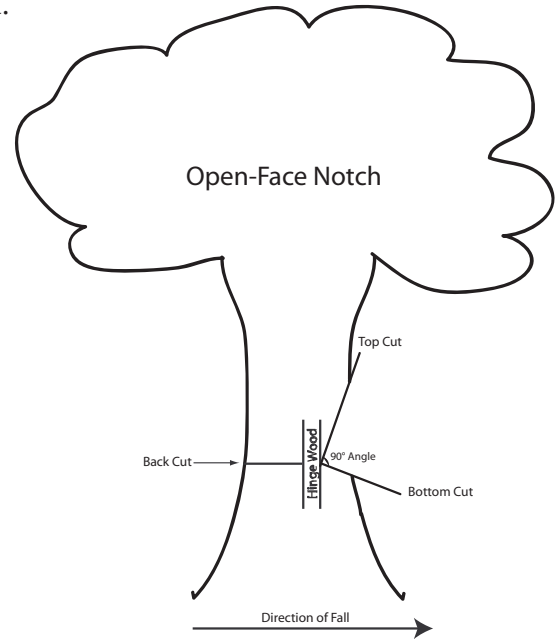
Endpoints do not meet.
Dutchman's notch.

Open-Face Notch

Top Cut: Cut downward at a 70° angle to a point that is ¼ to ⅓ the tree's diameter.

Bottom Cut: Cut upward at a 20° angle until you reach the end point of the top cut.

Back Cut: On the opposite side of the tree, cut straight across, at the same height of the notched corner, until you reach the hinge wood.

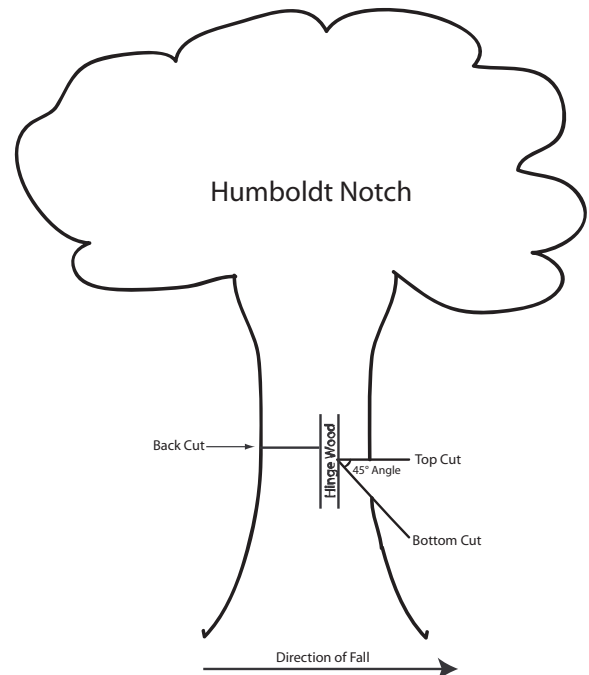


Humboldt Notch

Top Cut: Cut straight across to a point that is ¼ to ⅓ of the tree's diameter.

Bottom Cut: Cut upward at a 45° angle until you reach the end point of the top cut.

Back Cut: Start out 1 inch above the notched corner on the opposite side of the tree. Cut straight across until you reach the hinge wood.

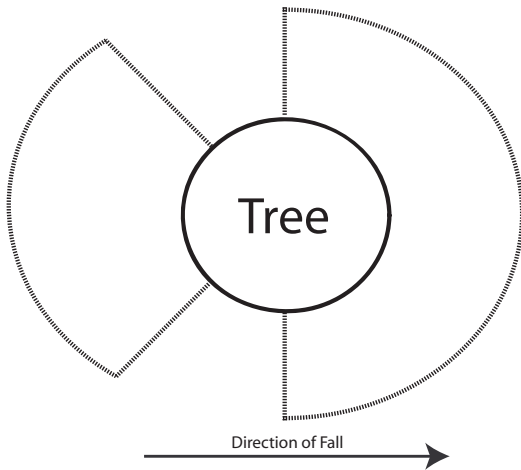


Quiz Yourself

Select the correct answer for the following sentences from the list below. **Answers can be found on page 39.**

- a. Back
- b. Off
- c. Above
- d. Ground
- e. Branches
- f. Hinge wood
- g. Open-face

1. Never operate a chain saw _____ your chest.
2. _____ is a piece of wood equal to $\frac{1}{10}$ the tree's diameter that is left uncut.
3. When carrying a chain saw, always turn the engine _____.
4. Always start a chain saw on the _____.
5. The _____ notch forms a 90° angle.
6. Never turn your _____ to a tree being felled.
7. Circle the two escape areas.



Lesson 5

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 5 days to 2 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 to three gallons of sweat. Replenish this fluid by drinking liquids so that you do not suffer from a heat related illness.

Accident Report

Employee Dies of Heat Stroke

Summary of OSHA Accident Inspection 014444699

An employee was dragging tree branches and feeding them into the chipper. Shortly before noon, the temperature had risen into the 80s. The employee became overheated and collapsed. He was taken to the hospital where he was pronounced dead due to heat stroke.



Take frequent, short breaks and drink plenty of water to keep yourself cool and hydrated.

What to Do for a Heat Illness

- ▶ If someone feels overheated, move him or her 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 to cool them down such as soaking their clothing in cool water.

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 light-weight fabric, such as cotton, to help keep your body cool.
- ▶ Wear a hat or sun visor on sunny days to help control body temperature.
- ▶ 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
- Lightheadedness
- Headache
- Feeling weak, fatigued
- Clammy and moist skin

Heat Stroke Symptoms

Heat stroke is a medical emergency that can become fatal. 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 the body.
- ▶ Move the victim inside, out of the storm.
- ▶ **Note: Most lightning-strike victims survive with immediate treatment and rescue breathing or CPR.**

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.

Cold-Induced Injury or Illness

Treatment Tips

- ◆ 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.

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.

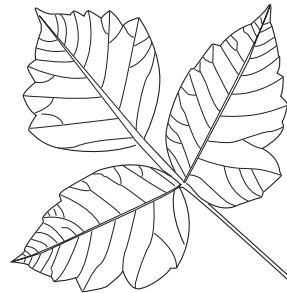
Never cut, suck or apply cold packs to snake bites.

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.

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.

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.safetyequipment.org. Used with permission.

Quiz Yourself

Answers can be found on page 40.

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

- a. Tallest
- b. Immediately
- c. Heat exhaustion
- d. Stinger
- e. Direct pressure
- f. Wash
- g. Water
- h. Frostbitten
- i. Breaks
- j. Lower

1. Stop a cut from bleeding by applying _____.
2. Dizziness, lightheadedness, headache and fatigue are all symptoms of _____.
3. It is important to take frequent, short _____ when working outside.
4. To keep hydrated when working outside, you should drink _____ frequently throughout the day.
5. Lightning strikes the _____ objects.
6. Never rub a body part that has been _____.
7. The first step to treating an insect sting is to remove the _____.
8. If you contact poison ivy, oak or sumac, _____ the affected area as well as all clothing and tools.
9. Hypothermia occurs when body temperature drops to 95° or _____.
10. If a person with a known allergy to insects is stung, call for help _____.

Conclusion

Tree trimming accidents can seriously injure or kill you. You have been presented with checklists, safety tips and exercises designed to help you avoid the most commonly reported causes of tree trimming injuries and deaths, as well as other important safety precautions to consider. Use this information to keep your work experience safe.

Quiz Yourself

Circle the correct answer.

Answers can be found on page 41.

1. What are the most commonly reported causes of serious injury and death from tree trimming operations?
 - a. Scrapes, cuts and burns
 - b. Dehydration and fatigue
 - c. Falling, electrocution and struck by trees or limbs

2. _____ should be worn when operating a chain saw.
 - a. Orange vest
 - b. Lightweight jacket and ball cap
 - c. Leg protection, safety glasses, face shield and hearing protection

3. Only _____ line-clearance tree trimmers are allowed within 10 feet of electrical lines.
 - a. Certified
 - b. Qualified
 - c. Unqualified

4. If you must work inside minimum distance requirements, contact the _____ to have the power lines de-energized or shielded.
 - a. Supervisor
 - b. Plumber
 - c. Power company

5. Always tie _____ into the tree.
 - a. Ladders
 - b. Pole pruners
 - c. Hard hats

Quiz continues on next page.....

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

- a. Coolest
 - b. Two-tree
 - c. Thunder
 - d. Escape areas
 - e. Tip
6. Follow the _____ rule when felling trees.
 7. When using a chain saw, do not cut with the _____ of the saw blade.
 8. Retreat to one of the two _____ as a tree is falling.
 9. The heaviest work in summer should be done at the _____ part of the day.
 10. If you can hear _____ then you are able to be struck by lightning.

Quiz Yourself

Solutions

Lesson 1

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

- a. Danger
- b. Cut-resistant
- c. Alcohol
- d. Triangle
- e. Electrocutation

1. Do not operate machinery if you are under the influence of drugs or **c**.
2. **e**, falls from trees and being struck by trees or limbs are the three most commonly reported causes of serious tree trimming accidents.
3. The **d** shape is the symbol for caution.
4. Leg protection consisting of **b** material is required when operating a chain saw.
5. **a** is the most serious safety message.

Lesson 2

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

- a. Arc
- b. Qualified
- c. Minimum
- d. Equipment

1. You must follow the **c** approach distances until it is certain lines have been de-energized or shielded.
2. Electricity can **a**; meaning you can be electrocuted even when you are near, but not touching the power line.
3. Additional training, that is beyond the scope of this book, is required to become a **b** line clearance tree trimmer.
4. Minimum approach distances also apply to **d**.

Choose One:

I am a _____ line-clearance tree trimmer.

- a. unqualified
- b. qualified.

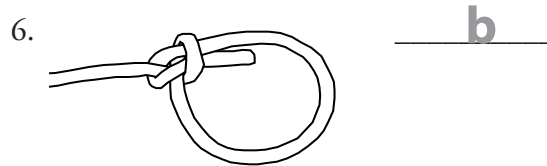
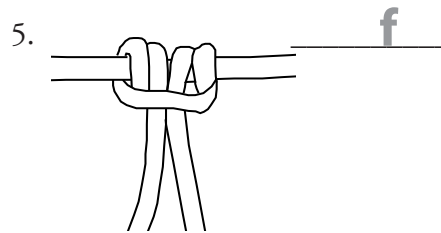
(Answer will depend upon qualification of employee.)

Lesson 3

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

- a. Anchor
- b. Bowline
- c. Aerial device
- d. Stopper
- e. Lifeline
- f. Prusik

1. A Blake's hitch should always include a figure eight **d** knot.
2. Use an **c** to trim trees that are too dangerous to climb.
3. Never **a** yourself into the tree you are working on.
4. A clove hitch should never be used as a **e**.

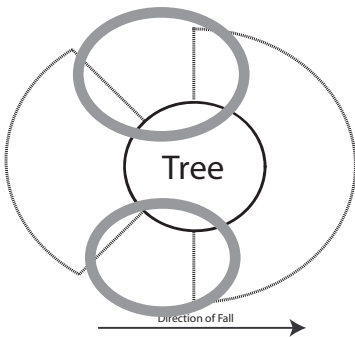


Lesson 4

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

- a. Back
- b. Off
- c. Above
- d. Ground
- e. Branches
- f. Hinge wood
- g. Open-face

1. Never operate a chain saw **c** your chest.
2. **f** is a piece of wood equal to 1/10th the tree's diameter that is left uncut.
3. When carrying a chain saw, always turn the engine **b**.
4. Always start a chain saw on the **d**.
5. The **g** notch forms a 90° angle.
6. Never turn your **a** to a tree being felled.
7. Circle the two escape areas.



Lesson 5

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

- a. Tallest
- b. Immediately
- c. Heat exhaustion
- d. Stinger
- e. Direct pressure
- f. Wash
- g. Water
- h. Frostbitten
- i. Breaks
- j. Lower

1. Stop a cut from bleeding by applying e.
2. Dizziness, lightheadedness, headache and fatigue are all symptoms of c.
3. It is important to take frequent, short i when working outside.
4. To keep hydrated when working outside, I should drink g frequently throughout the day.
5. Lightning strikes the a objects.
6. Never rub a body part that has been h.
7. The first step to treating an insect sting is to remove the d.
8. If you contact poison ivy, oak or sumac, f the affected area as well as all clothing and tools.
9. Hypothermia occurs when body temperature drops to 95° or j.
10. If a person with a known allergy to insects is stung, call for help b.

Conclusion

Circle the correct answer.

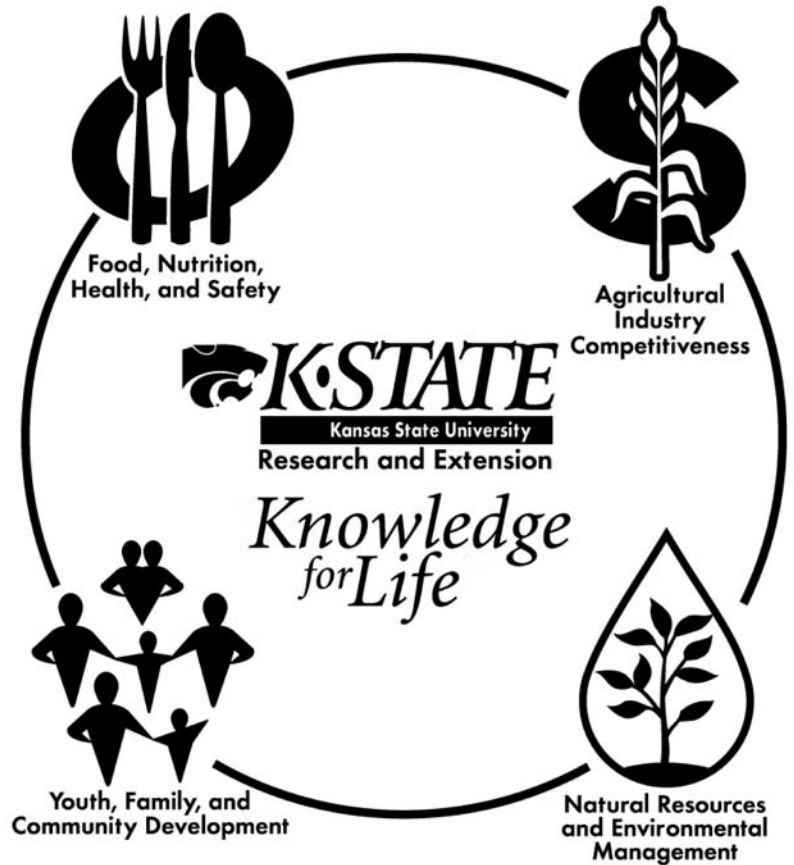
1. What are the most commonly reported causes of serious injury and death from operating tree-trimming operations?
 - a. Scrapes, cuts and burns
 - b. Dehydration and fatigue
 - c. Falling, electrocution and struck by trees or limbs
2. _____ should be worn when operating a chain saw.
 - a. Orange vest
 - b. Lightweight jacket and ball cap
 - c. Leg protection, safety glasses, face shield and hearing protection
3. Only _____ line-clearance tree trimmers are allowed within 10 feet of electrical lines.
 - a. Certified
 - b. Qualified
 - c. Unqualified
4. If you must work inside minimum distance requirements, contact the _____ to have the lines de-energized or shielded.
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 - b. Plumber
 - c. Power company
5. Always tie _____ into the tree.
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 - c. Hard hats

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

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6. Follow the **b** rule when felling trees.
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 9. The heaviest work in summer should be done at the **a** part of the day.
 10. If you can hear **c** then you are able to be struck by lightning.

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