



LADDERS

Introduction

A ladder is a simple tool. Two rails, rungs and some hardware hold it together. A license is not required to operate a ladder. There is no complex wiring or complicated control panel.

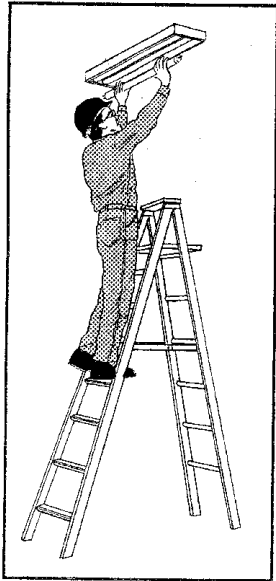
Unfortunately, according to published reports, there are 300 deaths and 65,000 disabling injuries each year to people on ladders. These incidents are due to improper use and lack of respect for the potential hazards.

Ladder accidents can be prevented by respecting potential hazards and taking the right steps to work safely from a ladder. This program will teach you safe work practices for ladders, including:

- Selecting the Proper Ladder for the Job
- Inspecting for Defects
- Setting Up for Optimum Stability
- Safely Working From the Ladder
- Climbing Fixed Ladders
- Proper Maintenance and Storage

Ladder Selection

Using the correct ladder for the job requires an understanding of both the work site and the ladders available to you. When selecting a ladder, you need to know the physical demands of the job and potential hazards at the job site.



Physical Demands

- How much weight will be applied ?
- What length of ladder is needed?
- How will it be able to be positioned?

Potential Hazards

- Electrical Hazards
- Congested Area
- Uneven Surface
- Overhead Obstructions

Ladder Classification

There are a wide variety of ladders designed for different jobs. The three most common materials for portable ladders are fiberglass, wood and aluminum. These can be straight, extension, trestle or self-supporting stepladders.

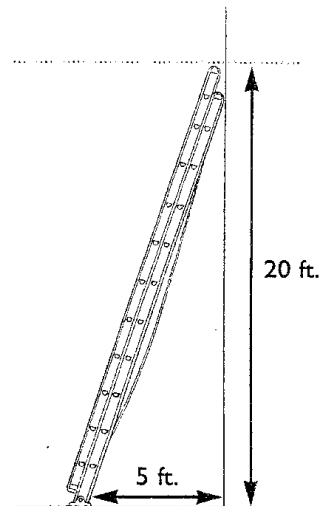
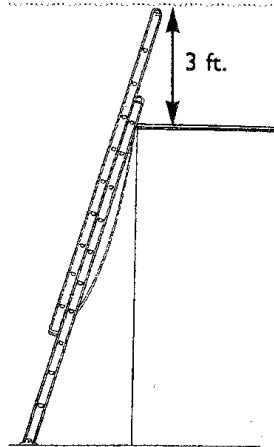
Selecting the Proper Ladder Length

Using the formula below, you'll learn how to select the right height of an extension ladder for the job you need to perform. Choosing the correct length is important because using a ladder that is too long or too short is unsafe.

A ladder is too long if you have to extend forward beyond an arm's length to reach the area you are working on. A ladder is too short if you have to stand any higher than the second step from the top of a stepladder or the third step from the top of an extension ladder. In either case, overextending could cause you to lose your balance and fall.

The One-Quarter Rule (4-to-1 ratio)

The bottom of the ladder must be one foot away from the wall for every four feet of the building's height to the point where the ladder rests against it. The further distance the ladder is from the base of the building, the longer the ladder must be to reach the same height.



When Climbing onto the Structure

The ladder must extend 3 feet beyond the roof line if you are to climb onto the structure.

Ladder Selection (continued)

Duty Rating

All ladders have a duty rating based on the maximum weight capacity. They are divided into four categories:

Category	Rating	Weight Limit
Type IA	Heavy Duty Industrial	300 lb.
Type I	Heavy Duty	250 lb.
Type II	Medium Duty	225 lb.
Type III	Light Duty	200 lb.

Weight Capacity

Exceeding the weight capacity could cause structural damage to the ladder and injury to yourself. Before selecting a ladder, add the total amount of weight that will be applied to it.

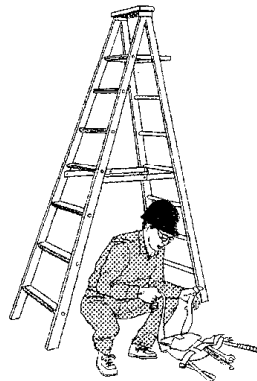
Your Weight

Weight of Personal Protective
Equipment

Weight of Tool Belt

Weight of Supplies or Other
+ Tools Brought up the Ladder

Total Weight

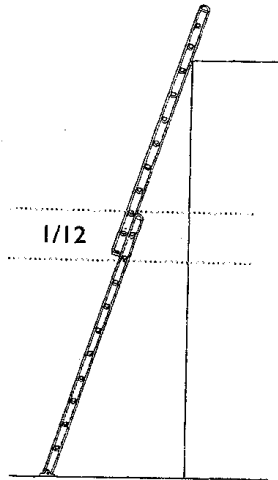


Never exceed the weight capacity of the ladder. Tools and supplies should be brought up with a towline. Do not confuse the length of the ladder with its duty rating. Longer ladders don't necessarily mean higher duty ratings. Always check the side label for a ladder's duty rating before using it.

Review

1. What are the weight capacities of ladders you use at your facility?

Ladder Selection (continued)



Fly and Base Overlap

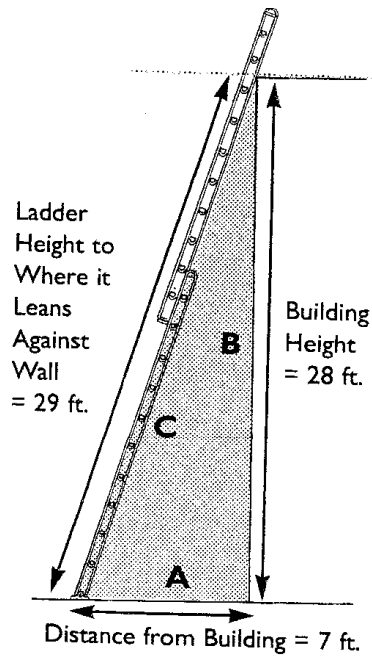
The fly and base sections must overlap approximately 1/12 of the total working height of the ladder.

Example #1

Let's try a sample problem. In this example, you need to climb onto the roof of a 28-foot structure. Using the factors mentioned above, we can figure the length of ladder needed to perform the job.

1. First, we need to know how far the ladder's base must be from the building. Using the 4-to-1 ratio, just divide 28 (the height of the building at the point the ladder rests against it) by four. We know then that the ladder must be seven feet away from the structure.

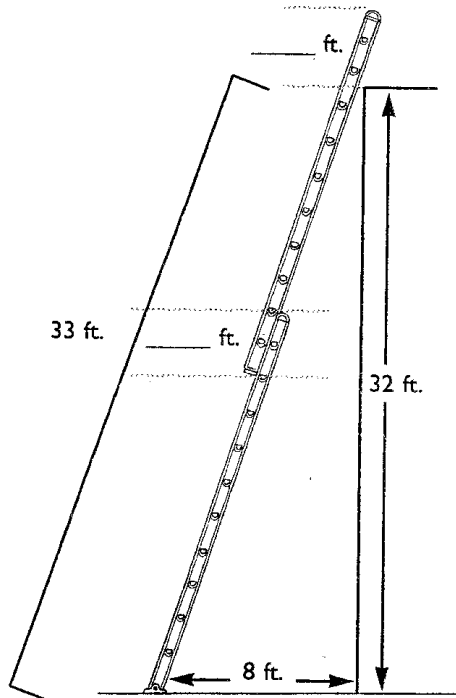
2. Using the formula $A^2 + B^2 = C^2$, we can figure out the length of the ladder from its base to the point where it leans against the building.



Ladder Selection (continued)

Example #2

Using the information you've just learned in the first example, what length of extension ladder is needed to climb onto a 32-foot structure?

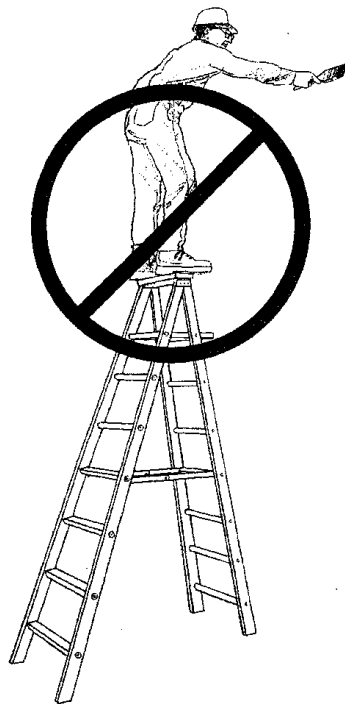


Knowing that the ladder must be a few feet longer to cover the angle created by the 4-to-1 ratio, what is the minimum size ladder needed to reach a 32-foot structure?

Hint: Add roof extension and then the overlap requirement.

The ladder must be a minimum of _____ feet long.

In general, you must use an extension ladder that is longer than what the job requires. Yet, too much ladder may be hard to position. Therefore, it is necessary to understand the factors involved when selecting the correct size.



■ Because of the angle, the farther down you go on an extension ladder, the farther away from the wall you will be. For example, a painter can work down to a point before being forced to overreach through the ladder to the wall. At that point, it is important to get a smaller stepladder that will bring you closer to your work.

■ With any ladder, you must figure the ladder length and the highest standing level of the ladder.

■ Never stand any higher than the third step from the top of an extension ladder or the second step from the top of a stepladder.

Ladder Selection (continued)

Environmental Factors

The environment the ladder is to be set up in may also determine what type of ladder is used.

Which type of ladder would you choose if there are electrical hazards nearby? (Circle the best answer)

- A. Aluminum
- B. Fiberglass
- C. All Wood

Always look for electrical hazards when inspecting the site where you will use a ladder. Never use metal ladders near energized electrical equipment. They could cause serious injuries because of electricity's ability to flow through metal and into your body. Wood ladders may also be dangerous if they contain metal reinforcements or oil, grease or dirt which could be conductive.

Unless you are a trained, "qualified" person, a minimum safe approach distance of at least 10 feet must be maintained from all exposed energized electrical equipment. This 10 feet includes both you and the ladder.

What steps would you take to protect yourself on a ladder if there is a high traffic area? (Circle the best answer)

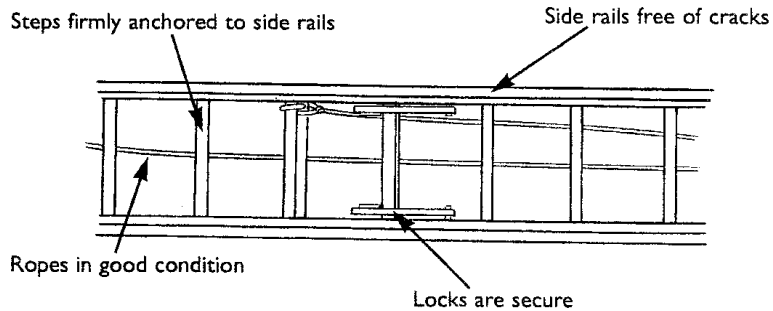
- A. Wear a harness
- B. Wear a hard hat
- C. Cordon off the area around the ladder

What accessory would you use if the ground is uneven? (Circle the best answer)

- A. A ladder leveler
- B. Rubber feet
- C. Boxes or boards to even the ground

Inspection

After you have selected the proper ladder for the job, it should be inspected for defects before it is brought to the site or put in use. The inspection should cover the following areas:

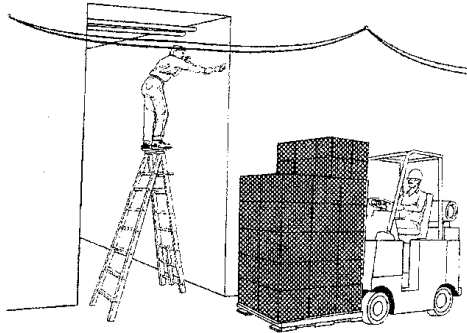


- Are the steps firmly anchored to the side rails?
- Is all hardware secured? Are there any hinges loose or missing?
- Are there broken parts sticking out that could cause scrapes or cuts?
- Are the side rails free of cracks?
- Do the locks secure the base and fly sections of an extension ladder properly?
- Are the ropes for raising the fly section in good condition?

A ladder may be used by different workers in different situations. Do not assume that it is always treated with care. Take the time to inspect it thoroughly before use.

Preparation

Before setting up the ladder, make sure the area does not have any potential hazards.



- Block off the area around the ladder to prevent people or machinery from bumping the ladder.
- If you are working near a doorway, make sure you lock, guard or block the door.
- If you are working around a blind corner, place a sign that would be visible to approaching co-workers.
- Before raising the ladder, make sure it is free from oil, grease or any substance that may cause slipping.
- Wear safety shoes with non-slip soles and clean them before climbing.
- Hard hats should be worn by the climber and spotters to protect against potential bumps or falling objects.

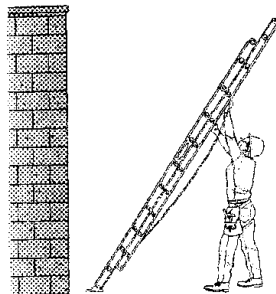
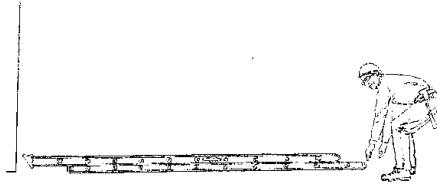
Review

1. What unsafe conditions or acts can you identify in the example below?

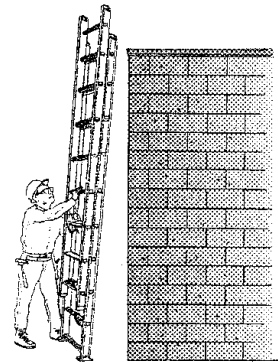
Setup

Properly setting up a ladder greatly reduces the chances of an accident. The main objective is to safely stabilize the ladder. Proper setup of an extension ladder includes:

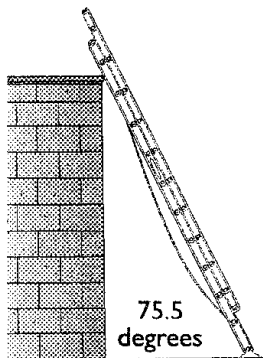
1. Lay the ladder vertical to the structure with the bottom of the ladder at the base of the foundation and the fly section facing out toward you.



2. Raise the ladder by walking it up with your hands, rung by rung.



3. Slightly pull the base away from the foundation, raise the fly section and lock the rungs.



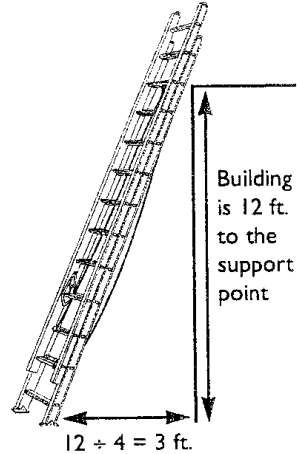
4. Pull out further until you achieve the proper angle. The ladder should be erected at a pitch of 75.5 degrees from the horizontal. This is accomplished if the ladder is one foot away from the wall for every four feet to the upper support point. Lean the ladder against the structure.

Many ladders have a safe angle guide on the side. The long leg of the L should be straight up and down, with the short leg being parallel to the ground. Make sure the ladder has solid footing with the shoes in the proper position.

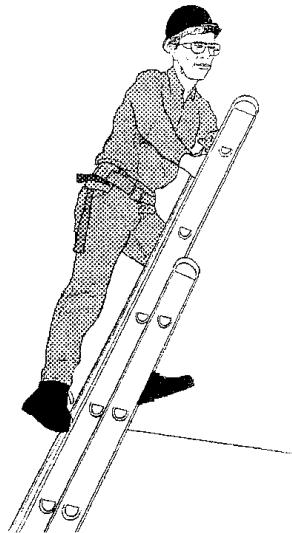
The 4-to-1 Ratio

The 4-to-1 Ratio applies to the distance the ladder's base must be from the foundation. This is figured by dividing the length of the structure from the ground to the top support point (where the ladder rests against the building) by four. It does not include the three foot extension beyond the roof line.

If the top support is at 12 feet, but the ladder extends to 15 feet, the ladder's base should be three feet from the foundation.



The 4-to-1 Ratio is important because the angle it creates utilizes the ladder's strength and gives you optimum balance when climbing.



The 3-Foot Rule

Extending the ladder three feet beyond the roof prevents you from tipping the ladder by stepping on one of the top steps.

Never step over the top of the ladder.

Step sideways onto the roof.

Setup (continued)

Self-Supporting Ladders

Self-supporting ladders or stepladders should be set up so that all four legs are on solid ground and the spreaders are locked. Do not use a self-supporting ladder as a straight ladder by leaning it against a structure.

Footing Support

Place the ladder on a firm, even surface whenever possible. If the ladder must be placed on uneven ground, use a ladder leveler. These attach to the ladder rails and can be adjusted to balance the ladder. Never use boards or boxes to level out the ladder or to achieve additional height.

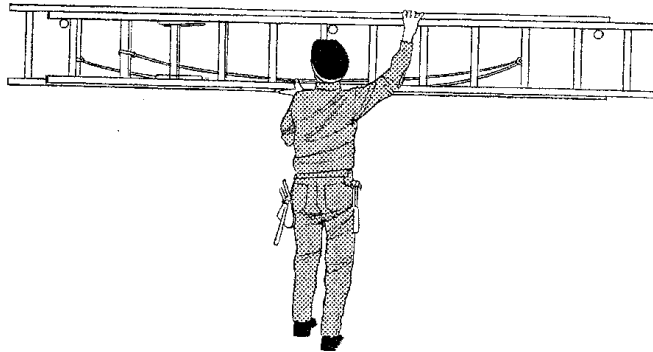
The feet of an extension ladder should be flat on a hard surface and in the spiked position on soft ground or grass. Rubber feet can be attached to a wood ladder to prevent slipping on a concrete surface.

Securing the Ladder

An extension ladder should be tied off at the top, middle and bottom to prevent ladder movement or slipping. The structure that you tie the ladder to must be capable of supporting the ladder. A second person should act as a spotter and hold the ladder at the bottom. Tie off at the bottom of the overlap section to prevent slippage. The top must extend three feet beyond the roof line if you are climbing onto the structure.

Maintenance & Storage

Proper storage and maintenance will extend the life of a ladder and ensure its safety.



- Extension ladders should be hung horizontally and supported every six feet.
- All ladders should be stored in a well-ventilated area away from extreme heat or cold.
- Do not store items on top of a ladder or block access to a ladder.
- Clean and lubricate the ladder's moving parts and keep the rungs and steps free of oil and dirt.
- Wood ladders can be treated with a protective coating but must not be painted. The paint will cover up defects.
- When transporting a ladder on a vehicle, make sure both ends are secure to prevent road shock that could damage the ladder.

Review

1. Where and how are ladders stored in your facility?
