



Ladders

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This chapter provides required knowledge items for the following NFPA Standard 1001 Job Performance Requirements:

FFI 5.3.6

FFI 5.3.10

This chapter contains Skill Drills. When you see this icon, refer to your Skill Drill book for step-by-step instructions.



OBJECTIVES

Upon completion of this chapter, you should be able to do the following:

- Describe the purpose of fire service ladders
- Describe basic ladder terminology
- Describe and identify the basic types of fire service ladders
- Describe and identify common methods of ladder construction
- Describe the basic techniques for the inspection & cleaning of ladders
- Describe the general safety specifications of using ladders
- Describe the methods used to determine the correct angle for ladder placement
- Describe the correct placement of a ladder
- Describe and demonstrate the methods of securing a ladder
- Describe safety checks that should be accomplished prior to climbing a ladder
- Describe the method for advancing dry and charged lines up a ladder
- Describe and demonstrate the methods of securing oneself to a ladder
- Describe and demonstrate the proper methods of safely working from a ladder
- Describe the proper method for assisting or rescuing victims down a ladder
- Describe ladder placement for ventilation, rescue, hose advancement
- Describe the six ladder carries
- Describe the three types of ladder raises

INTRODUCTION

Ladders have been around since the beginning of the fire service. They've been updated, but their dynamics remain unchanged. Ladders offer firefighters upper-floor access to fire buildings, and they enable firefighters to perform rescues and other actions described in this chapter.

For firefighters to be successful in portable ladder operations, they must understand ladder safety. The following pages expose firefighters to terminology and practical

information. Failure to understand and learn this information before stepping on the fireground could be harmful.

TYPES OF LADDERS

Apparatus-mounted ladders

Many apparatus are equipped with permanently mounted ladders that provide firefighters elevated access for vital firefighting tactics. Most can also provide elevated master streams. To rise and operate properly, the ladders must be stabilized with hydraulic jacks and tormentors. These apparatus are commonly called aerial ladders. **Mid-ship apparatus** are aerial devices mounted just behind an apparatus's cab or mid-frame with the ladder tip extending toward the rear of the apparatus. **Rear-mount apparatus** are aerial devices mounted at the rear of an apparatus with the ladder's tip/bucket mounted over the cab of the apparatus. Firefighters use the following types of apparatus-mounted ladders:

Aerial ladder. The **aerial ladder** is a firefighting apparatus that has a permanent, mounted, telescoping ladder usually constructed of steel, aluminum, or a combination of metal alloys, and that is operated via a hydraulic fluid and lift system in conjunction with steel cables and pulleys (fig. 13-1). These ladders vary in size and reach heights of 100 ft (30 m) or more. A ladder may have a pre-piped waterway and fixed monitor nozzle or a ladder pipe system that must be attached to the tip of the ladder with the hose running down the rungs to provide an elevated master stream. Some aerial ladders, commonly called tillers, are constructed in a tractor-trailer-type design. They are recognizable with a tillerman driving the rear of the apparatus. These apparatus are commonly used in areas with narrow roadways and alleys.

Tower ladder. The **tower ladder's** original design came from the telescoping sections of a crane and is still used today. Engineers adapted this to include a bucket or basket attached to the end of the boom with a pre-piped waterway and monitor nozzle. Engineers created a heavier-duty aerial ladder with a bucket and pre-piped waterway attached to it, commonly referred to as a **ladder tower**. Today, whether it is a boom-type or ladder-type assembly, it is a tower ladder. A main difference of tower and aerial ladders is that firefighters can work out of a tower ladder bucket, and they stand on a small rung of an aerial ladder (figs. 13-2 and 13-3).



Fig. 13-1. An extended aerial ladder. (Courtesy of Bobby Saulters)



Fig. 13-2 and 13-3. Tower ladders

Articulating ladder. The **articulating ladder** may incorporate the use of boom, tube, or ladder construction with an articulating joint that allows one section to be placed above, behind, or over an object. At the end of the boom, a bucket is attached with a pre-piped monitor nozzle for master stream operations. Newer apparatus have replaced many older-type apparatus, commonly called *snorkels*. One of today's engineering marvels has equipped these articulating arms or booms to the end of an aerial ladder (fig. 13-4).



Fig. 13–4. Apparatus with an articulating boom. (Courtesy of Jeff Goldberg)

Quint. The **quint** is a fire department vehicle equipped with a permanently mounted fire pump, water tank, hose storage area, and aerial device with a permanently mounted waterway and complement of portable ladders. Many of these apparatus are constructed on a short frame assembly and resemble an engine company apparatus with a mounted aerial device. They can also be constructed on larger ladder company apparatus. In numerous fire departments with limited manpower or resources, this apparatus performs more than one function and is a fireground asset (fig. 13–5).



Fig. 13–5. Quint

Portable ladders

Straight ladder. The **straight ladder** is a lightweight, single-section ladder with a fixed length, usually 12–20 ft (3.7–6 m), commonly called a **wall ladder**. A drawback with this ladder is that its length can't be adjusted. Normally, these ladders can reach only windows and roofs on certain one- and two-story structures.

Roof ladder. The **roof ladder** is a form of a straight ladder also commonly called a **hook ladder** because of curved metal hooks permanently attached to its tip. When these spring-loaded hooks deploy, they allow the ladder to bite into the ridge of a roof, which provides a stable platform for a firefighter working on a steep roof (fig. 13–6).



Fig. 13–6. Roof ladder with hooks deployed

Extension ladder. The **extension ladder** is adjustable with two or more sections. This ladder is more practical than a straight ladder because it offers a range of heights (fig. 13–7). An extension ladder has a **bed section** and one or two **fly sections** that rise as a firefighter operates the halyard. As the fly section rises, the ladder's **locks**, also called **dogs**, travel over each rung and make clicking noises. When the ladder locks into a rung just after the “click” of the lock, the fly and bed section rungs align. In an extension ladder with one fly, the ladder rises in 14-in. (356 mm) increments. With a two-section fly, the ladder rises in 28-in. (711 mm) increments. This occurs because both flies rise as a firefighter pulls the halyard. Some larger extension ladders are equipped with **tormentor poles** to maximize stability during raising and lowering. These ladders are commonly called **Bangor ladders** or **pole ladders**.

Folding ladder. The **folding ladder** is narrow, collapsible, and folds into itself for transportation through small, narrow spaces. It is also called an **attic**, **scissor**, **suitcase**, or **closet ladder**. It provides inside access to attic hatchways, some of which are commonly inside closets. One also can be used for: removing occupants of a stalled elevator through the roof hatch and out of the hoist way shaft; confined-space rescues; and climbing to a bulkhead structure to vent a skylight (fig. 13–8).

A-frame ladder. The **A-frame ladder**, also called a **combination ladder**, that when closed resembles a small extension ladder. The main difference, however, is that it does not have any halyard or pulleys. It has two pins and two receiver brackets mounted at the ladder's tip. Most of these ladders have two stationary ladder locks that hook onto a rung to keep them closed or locked together



Fig. 13–7. An extension ladder and a roof ladder



Fig. 13–8. Folding ladder

when extended manually. This ladder can be used in the A-frame position or as a small extension ladder. Because of its size, it can be transported conveniently throughout a structure (fig. 13–9).



Fig. 13–9. A-frame ladder

Fresno ladder. The **Fresno ladder** is a narrow extension ladder with no halyard or pulleys. This ladder also provides access in narrow areas. It rises manually when the fly section is pushed up and locks in position as the spring-loaded dogs pass over the rungs. It is commonly called a **two-section attic ladder**.

Pompier ladder. Also called a **scaling ladder**, the **Pompier ladder** is historic in the fire service. It is no longer recognized by the National Fire Protection Association, but some fire departments and training facilities still use it to increase a firefighter's trust in tools and equipment. In the early years of the fire service, this ladder enabled many dramatic rescues. Its construction includes one center beam with rungs attached to each side. A large, solid, forged hook at the top of the beam was used for breaking windows and then could be hooked onto a window's ledge. Then, a firefighter could climb the ladder and proceed up the side of a building floor by floor, if needed (fig. 13–10).

Miscellaneous ladders. Many fire departments carry portable ladders such as the collapsible combination ladder on their apparatus, while others carry various sizes of the common stepladder. Although a stepladder in the open position resembles an A-frame ladder, a regular stepladder cannot convert to an extension ladder. It is common to find many types of collapsible and telescoping portable ladders on ladder company apparatus (fig. 13–11).



Fig. 13–10. Pompier ladder



Fig. 13–11. Combination ladder

STRUCTURAL COMPONENTS

FFI 5.3.6 The main structural components of portable fire service ladders are aluminum, fiberglass, wood, or a combination of these materials. In addition, lightweight metal assemblies and parts allow ladders to function properly. Most fire departments rely on lightweight aluminum and fiberglass ladders in lieu of heavy wooden ladders with many maintenance requirements. Wood and fiberglass ladders are often referred to as **nonconductive** ladders, meaning they do not conduct electricity. Any damp or wet ladder, however—even wood and fiberglass—can conduct electricity.

Although there are many types of ladders, almost all have the same structural components. Firefighters must know and understand ladder names and parts to operate safely and efficiently on the fireground.

- **Beam:** the main structural component of a ladder that supports a firefighter's weight and transfers it from the rungs to the ground. The beams run the long sides of the ladder and support the rungs at 14-in. (36 cm) intervals. There are a few types of beam construction used in the fire service:
 - **Trussed beam:** a trussed-beam ladder has a top and bottom rail joined together with gusset plates, usually at the rung position. It is of open construction and usually made of wood or aluminum. Most have spikes or permanent cleats mounted at the base.
 - **Solid beam:** a solid-beam ladder has side components that are solid core as in wood ladders or constructed with a rectangular tube design as in aluminum ladders.
 - **I-beam:** the beams of these ladders are shaped in an *I*-like configuration, with the rungs attached to the beams. Fiberglass and common homeowner ladders often carry this design.
- **Balance point:** the spot on a ladder where it balances evenly when lifted. It may not be the true center of the ladder's length because other mechanisms attached to the ladder may render the balance point more toward one end (figs. 13–12 and 13–13).

COMPONENTS OF A LADDER



Channel



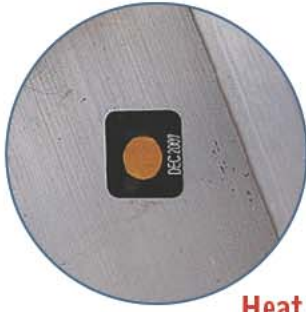
Rungs



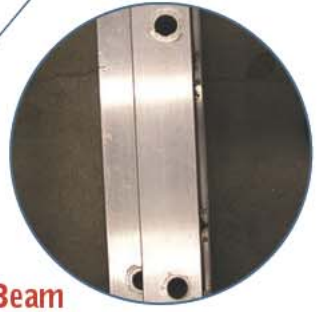
Tip



Fly



Heat Sensor



Beam



Halyard



Pulley



Dogs



Danger



Butt



Bed





Fig. 13–12. A sticker marking the balance point



Fig. 13–13. Holding a ladder at the balance point

- **Bed section:** the bottom section of a ladder that remains in touch with the ground or apparatus. The bed section is normally the widest section because upper or fly sections retract into it. The bed section is normally the only section with a designed foot or butt attached to it.
- **Butt:** also called the **heel** or **base** of the ladder, it is located at the end where it contacts the ground when positioned against a structure. In a truss-construction ladder, spurs or spikes are usually mounted onto the ladder at its base. In other types of ladders, a permanently mounted precast aluminum foot, butt, or shoe attaches to the base. Some ladders have a slip-resistant combination safety shoe, a rubber nonslip pad that attaches to the base with a pivoting hinge. Often, these devices have spurs or teeth forged into an end for use on soft surfaces (fig. 13–14).

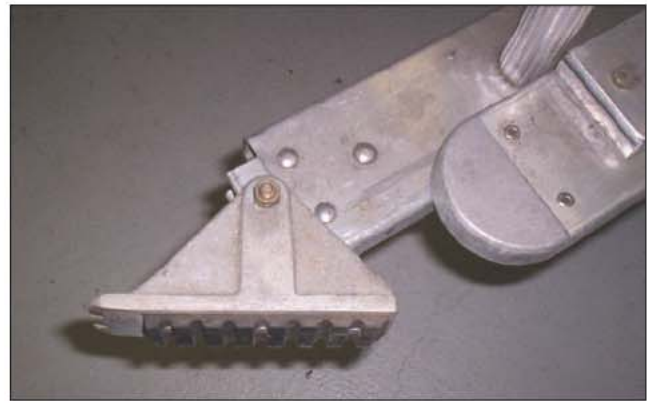


Fig. 13–14. A pivoting combination safety shoe with slip-resistant rubber

- **Channel guide:** a section, channel, or slot in a ladder that supports and interlocks with a corresponding section of a ladder as it is raised.
- **Dogs:** spring-loaded, mechanical locking devices at each end of the beam on the fly section that engage on each rung as an extension ladder is raised. They are also called **pawls**, **rung locks**, and **ladder locks**, and they are usually encased in a protective metal box shield (fig. 13–15).



Fig. 13–15. A locked “dog”

- **Danger/electrical/angle stickers:** stickers attached to each side of the base section of a portable ladder between the fourth and fifth rungs. They warn of electrical hazards overhead, question whether a ladder is in a correct climbing angle, and remind the user of the proper direction the fly section should face (fig. 13–16).



Fig. 13–16. Caution sticker

- **Fly section:** a section of a ladder that can extend from the bed section to gain height and distance. In many applications, if a ladder has more than one fly section, both fly sections move when the ladder is raised. The fly sections are normally narrower to fit into the bed section. The fly attaches to other ladder sections by fitting inside a channel or guide section of the corresponding section of ladder.
- **Halyard:** a manila or nylon rope used to extend or retract the fly section(s) of a ladder out of the bed section. The halyard runs through pulley(s) for ease of raising and lowering. In three-section ladders, a wire cable runs in conjunction with the halyard to assist in raising and lowering the two fly sections.
- **Heat-sensor labels:** usually small, round, heat-sensitive, orange stickers with expiration dates attached below the second rung from the top of each section of a ladder and on each side of the beams. They warn users when a ladder has been exposed to enough heat to damage it. When this occurs, a sticker turns black to warn firefighters that the ladder has been subjected to more than 300°F (149°C). Ladders exposed to high heat must be placed out of service and tested prior to further use (fig. 13–17).



Fig. 13–17. A heat sensor sticker notifies firefighters when the ladder has been exposed to high heat.

- **Pulley:** a small wheel with a grooved channel attached to a ladder by a bracket. The grooved channel allows the halyard to pass through it, reducing friction on the rope and allowing for easy raising of the ladder.
- **Roof hooks:** permanent curved, spring-loaded, metal hooks that secure the tip of a roof ladder to a pitched roof (fig. 13–18).

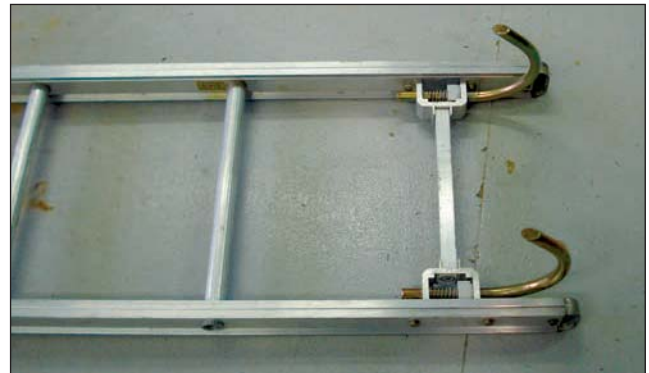


Fig. 13–18. Roof hooks

- **Rungs:** circular, horizontal cross members of a ladder that tie two beams together. The rungs serve as footrests for climbers and transfer one's weight into the beams and then into the ground. In aluminum ladders, rungs may have raised extrusions or tops of rungs may be flat to allow more traction for climbing. There are 14 in. (356 mm) between rungs.
- **Tie-rods:** normally found only on wooden ladders, these metal rods run under rungs and through both beams. They help secure both of the beams together with the rungs.
- **Tip:** the top or top few rungs of a ladder when it is propped over the roofline of a structure.

- **Tormentor poles:** metal poles attached to the bed section of a ladder with a swivel connection. These poles help stabilize the ladder as it is raised and lowered. They also have a single spur at their bottoms to assist in footing the ladder (fig. 13–19).



Figs. 13–19. Tormentor poles used to raise a ladder. (Courtesy of Jerry Naylis)

FIREGROUND NOTE

A 24-foot extension ladder in the closed position is the same length as a 14-foot straight ladder but offers additional lengths.

INSPECTION, MAINTENANCE, AND CLEANING

FFI 5.5.1 Portable ladders are subjected to harsh conditions, including the weight of several firefighters removing a victim, physically venting a window with a ladder, and using a ladder over a burned-out stairway. Firefighters must regularly clean, inspect, and maintain ladders for them to remain in service as beneficial tools.

Inspection

Portable ladders should be visually inspected monthly, after each use, and prior to being placed back on an apparatus. If they are dirty, they should be cleaned

prior to inspection. Caked-on dirt and grime can hide defects on ladders. The National Fire Protection Agency has created standards on portable ladder design, use, maintenance, and testing. Knowing these standards and those of a ladder's manufacturer simplifies inspections. The following are some general guidelines for portable ladder inspection:

- Check the halyard for any fraying, kinking, and cut fibers. Ensure it operates smoothly through the pulleys. Halyards often have to be replaced during the ladder's life.
- Check the rungs to ensure none are bent, loose, cracked, or gouged. Also check their ends where they are pressed into the beams for looseness. If they are welded at the end, check the welds for cracks.
- Check that all rivets, nuts, bolts, and plates are secure.
- Check main beams for straightness or bowing, cracks, splintering, and obvious signs of excessive heat exposure.
- Check that dogs or ladder locks and spring assemblies function properly.
- Check that the ladder's feet or spurs are secure and/or pivot freely. If they have rubber cleats on the bottoms, make sure they are secure. If they are cast aluminum, check that they are not cracked and the nut and bolt are secure.
- Check that the ladder slides smoothly through the guide rails and stops at the ladder stops.
- Check that pulleys are secure in their brackets, operate freely, and are not out of round.
- Check the tips of the ladder. If they have cast aluminum rail caps, search for cracks and ensure the nut and bolt are secured.
- Check that hooks on roof ladders operate freely, ends are sharp, and the hook's shape is not distorted. Also verify that tension springs controlling the hook's movements are well-lubricated and operate properly.
- Check that heat-sensor stickers are in place and haven't been subjected to excessive heat. Also check that they are within their expiration date.

- Check that wire cable halyards are taut and not fraying or kinked. Ensure their cable-tie clips are secure.
- Check all surfaces for gouges, chips, dents, and sharp edges that could injure a firefighter or place the ladder out of service.
- Check that any additional add-on or after-market items (ladder light beacons, adjustable beam legs) are in place and functional.

If any defect or deficiency is noted, a ladder must be placed out of service for repair. Trained firefighters can perform most minor repairs and regular maintenance. Major repairs to a ladder's structural components must be performed by the ladder's manufacturer or at a certified repair center.

Certification/serviceability testing

Annual service and load testing must be performed on all portable ladders to ensure structural soundness for firefighting. Any ladder that has been dropped, overloaded, exposed to high heat, repaired, structurally damaged, or if its serviceability is in question, should be tested. A **horizontal load test** determines serviceability of a ladder by placing weight on a horizontally supported ladder. The amount of deflection or bending determines the ladder's strength and serviceability. Tests are also conducted on roof hooks, ladder locks, and mechanisms of ladders.

Maintenance and cleaning



All firefighters must perform routine maintenance on portable ladders. Regular, preventive maintenance increases the lifespan of a ladder and its parts and can pinpoint a defect prior to a ladder's malfunction or failure. Following the manufacturer's recommendations is the best way to keep a ladder in service. The following are some general guidelines for ladder maintenance:

- Ladders must be cleaned regularly and after each use with water and a mild detergent. Wash ladders with a soft-bristle brush and rinse with fresh water, remembering to flush out any residue inside the rungs. If melted tar covers a ladder, a degreaser or solvent approved by the manufacturer may be necessary.
- After cleaning, lubricate the ladder locks or dogs, slide rails, and the roof hook's spring assemblies and pulleys with lubricants prescribed by the ladder's manufacturer. Normally, this consists of applying

either candle wax or paraffin to the slide rails and friction areas. Other recommended lubricants may be applied to the springs of roof hooks and spring assemblies.

- If the halyard is frayed, kinked, or has cut fibers, or if the wire cable is worn, stretched, or kinked, replacement is necessary.
- If there are any sharp edges on a rail, beam, rung, or foot, it may be necessary to file each down with light-grit sandpaper or a metal file.
- If the ends of the roof hooks become dull, they may be filed to a sharp point and painted.
- Replace any heat-sensor sticker that is falling off and any that have reached their termination date. If a sensor shows that the ladder has been exposed to high heat, place the ladder out of service for testing.
- When a ladder is being inspected, also inspect the ladder brackets that secure the ladder (figs. 13–20 and 13–21).



Fig. 13–20. Ladders must be cleaned after each use.



Fig. 13–21. Lubricating the dogs

Fiberglass ladders

Fiberglass ladder manufacturers recommend other maintenance requirements. After a ladder is washed in a mild soap-and-water solution with a sponge or rag, it may be waxed with regular car wax to restore the surface.

Small nicks and scratches may be lightly sanded and covered with a thin coat of clear epoxy glue. Once it has dried, the epoxy should be sanded smooth. If there are any doubts about the severity of a scratch or dent, the ladder should be placed out of service and tested.

FIREGROUND NOTE

Keeping a maintenance log for each ladder can assist fire departments with record keeping and data.

Wood ladders

Wood ladder maintenance requirements differ from those of aluminum and fiberglass ladders. They may be cleaned with a sponge or rag in a mild soap-and-water solution, but soaking a wood ladder in water damages surface varnish and allows rungs and joints to absorb water and swell the ladder. When a wood ladder dries, it constricts. These actions damage the rungs, rails, and joints and force additional maintenance.

After cleaning the ladder, inspect it for any varnish damage. Varnish on wood ladders helps keep them nonconductive. Remember, wood ladders can conduct electricity, especially if they are wet or damp. In addition, some wood ladders have aluminum rungs, metal tie-rods, and steel roof hooks attached to their ends, all of which conduct electricity. Spot repair any minor scratch, chip, or dent with a light sanding to the bare wood and reapply varnish to the area. Wood ladders may be waxed after being cleaned and inspected.

Wood rails and rungs also expand and contract in response to humidity and temperature changes. The rungs and metal tie-rods must be checked regularly for tightness in wood ladders because they uphold structural integrity of wood ladders.

MARKING LADDERS

Ladders must be marked with their proper numerical length so firefighters can quickly identify them by size. Normally, all ladder manufacturers label both beams of a ladder near the base with permanent, size-designation labels. These labels allow for quick identification, but

viewing them can be difficult when they are stored on an apparatus. To solve that problem, firefighters commonly use paint markers or self-adhesive stickers to display a ladder's size on the base of the ladder's butts for easy identification (fig. 13–22). They also label the ladder's bedded length next to the overall size. With straight ladders, manufacturers commonly attach identification labels at the base and near the tip or roof hooks on both beams.



Fig. 13–22. Stickers display each ladder's size.

Fire departments commonly color code the bases of their ladders to show their sizes. For easy identification, it is also good to put the size of the ladder with the color code. Other departments allow individual companies to color code or paint their company identification colors or numbers on ladders to reflect company ownership. Whichever manner a ladder is marked, it should be large enough to allow easy visibility.

Firefighters also mark the **balance point** of a ladder to permit ease of operations. This proves especially useful when a firefighter must remove a ladder off the back of an apparatus or lift one by himself or herself. Finding this spot is easy. A firefighter can pick up the ladder in the suitcase-carry position and find the spot where the ladder balances itself. At this location, paint a line, stick a piece of colored electrical tape, or label the beam with the company identification numbers. Some balance

points on solid-beam ladders fall directly between a set of rungs, so fire departments paint the inside and outside of both beams. When they remove the ladder from a vertically stored ladder rack, firefighters easily recognize the balance point. This is referred to as **painting the box**. A ladder's rungs must never be completely painted.

The tips of many fire service ladders are often brightly painted or covered with reflective tape to enhance their visibility in smoke and low illumination. Remember, ladders should not be painted entirely to improve their appearance. Painting ladders entirely can hide dangerous defects. For instance, painting an aluminum ladder's entire rung can create a slipping hazard.

Fire departments can purchase small lighting or beaconing devices that attach to the tip of a ladder or end rung to improve the ladder's visibility. When activated, the device sends a strobe light or flashing signal that directs firefighters to the ladder.

Another application in marking straight or roof ladders after locating their balance points is to mark their **hoisting points**. Often on the fireground, a ladder needs to be raised with a piece of rope. Marking the rung two up from the center rung with a small paint mark or piece of electrical tape near the beams or in the center of the rung will assist in placing the rope for the lift.

Engine companies commonly mark their ladders' beams or rails with paint or tape to indicate where the ladders sit in holding brackets on their apparatus. This is beneficial for post-fire operations, and the ladders must be put back in their proper places. Often, ladders on these apparatus interfere with compartment openings or the stretching of hoselines if placed in a wrong position.

OPERATING SAFELY

FFI 5.3.6 Operating ladders safely and properly on the fireground is important for all firefighters. Numerous firefighters have died or have been severely injured as results of ladder mishaps during training and on the fireground. The following are some general safety guidelines for working with ladders:

- When possible, work with another firefighter to reduce the risk of straining or injuring yourself and others. Ladders are cumbersome and heavy. Moving or placing them on the fireground can be difficult.
- Most importantly, look for overhead utility wires before raising any ladder. Most departments use

aluminum ladders, which are good conductors of electricity. Wood and fiberglass ladders also can conduct electricity because they have metal assemblies and get wet. Maintain a minimum distance of 10 ft (3 m) when operating near overhead power lines. Electrical arcs from overhead power lines have hit ladders operating in their vicinity.

- Prior to resting a ladder on a structure with aluminum siding, release the ladder as it makes contact with the structure to avoid being electrocuted. Electrical feed lines have shorted out and charged siding on numerous occasions.
- While making overhead visual inspections, look for tree limbs and branches, overhangs, canopies, and elevated decks and platforms that can affect the extension or placement of a ladder.
- Survey the ground where the ladder will be placed. Look for a solid, level foundation for the ladder's base.
- Resist overreaching when working on a ladder. Instead, reposition the ladder or use a longer tool. Use one of the leg-lock or arm-lock maneuvers whenever working from a ladder.
- Choose the proper ladder for the job. Extension ladders offer variable heights, whereas straight ladders do not adjust.
- Use caution in placing ladders. A ladder placed in front of a lower-floor window or door is not always advisable. Fire may or can erupt out of the window, cutting off the escape route of a firefighter. A ladder positioned by a door can be knocked off its base by a charged hoseline or unassuming firefighter.
- Always face the rungs when ascending and descending from a ladder. If you were to slip, you could grab the ladder for support. A slip while not facing the rungs could cause you to fall off the ladder and be injured.
- When lifting a portable ladder lying on the ground, use your leg muscles. Just bending over to pick the ladder off the ground could cause a back injury.

These are a few safety guidelines that must be followed to prevent injury and death. In following sections of this chapter, equally important safety guidelines are presented.

SELECTING THE PROPER LADDER



Firefighters must be familiar with the apparatus-mounted ladder and the capabilities of all portable ladders on the apparatus. Ladder selection often must be made in a split second, and choosing the wrong ladder can have severe consequences. Prior to choosing a ladder, ask yourself where the ladder must be placed, what length is needed, and what its purpose is. An upper-floor fire in an eight-story building might require an aerial ladder or tower ladder, whereas a portable ladder could be used faster than a mechanical device for second-floor fire at the same building.

Knowing a building's characteristics can also assist in choosing an appropriate ladder. Normally, most residential structures measure approximately 8–10 ft (2.4–3 m) from floor to floor, whereas a commercial structure may measure 10–12 ft (3–3.7 m). A general rule passed through the fire service is that taking the first number of a ladder's length determines what floor it will cover. (For a 24-ft (7.3 m) portable ladder, two is the first number, so the ladder will cover the second floor). Exceptions should be noted. A 28-ft (8.5-m) or 35-ft (11-m) extension ladder can reach the next higher floor's window if set up on a level surface. Again, knowing the capabilities of your apparatus' ladders and your response area characteristics will assist you in choosing the proper ladder.

Of course, other factors will influence your choosing a ladder at a fire. Often when operating short staffed, firefighters choose straight ladders because they are easy to maneuver around the fireground single-handedly. If the straight ladder were being placed only to a low porch roof for access, it might be a wise choice. If the ladder were needed later for a task at a higher elevation, it might not reach. An extension ladder offers more variables. Remember, straight ladders offer only one height and cannot be adjusted.

REMOVING LADDERS FROM THE APPARATUS



Following sections of this chapter discuss how to store and remove ladders from different fire apparatus, including apparatus positioning and effects on the removal of portable ladders. Often on the fireground, one apparatus pulls close to the rear of another apparatus

and prohibits the removal of a portable ladder. Apparatus operators must leave sufficient clearance to the rear of an apparatus to permit ladder removal. Some fire departments offer apparatus operators tips in this area. If the largest ladder on a ladder apparatus with rear storage compartments is a 20-ft (6-m) roof ladder in nested position, the apparatus must leave at least a 20-ft (6-m) clearance at the rear. Other departments instruct operators to park at an angle to the fire building to expose the rear ladder compartment. If an apparatus has side-mounted ladders, allow enough side access for ladder removal.

Engine company apparatus

Because of the numerous styles and designs of fire apparatus, portable ladders are stored or mounted in many places. In years past, engine company apparatus had portable ladders mounted in shoulder-height brackets on the sides. As fire departments kept pace with society, the need for more compartments was necessary and ladder locations changed. It is common to find engine company ladders mounted on hydraulic or electric lift assemblies that lower themselves from a horizontal position over a hosebed to a vertical, shoulder-height position on the side of the apparatus. Other lift assemblies raise only the ladder over the highest compartment on the side of the apparatus. Note that the controls to lower the ladder may be in the cab of the apparatus or near the ladder itself.

Once either assembly is in the down position, the rungllocking clamps must be released for ladder removal. Normally, the engine company's extension and roof ladders are nested inside one another. It is a good rule to mount the extension ladder so it can be the first ladder off the apparatus. Once the locking clamps are released, two firefighters can lift the ladder off the rack and proceed to where it is needed.

If the roof ladder must be removed to reach the extension ladder, place it out of the way. Carrying it to the rear of the apparatus and sliding it under the apparatus could cause you to interfere with the hose when it is stretched off the back step. Plus, it puts the ladder out of the firefighter's sight, and it might be problematic to retrieve it for other uses. Laying the ladder up against the tire in the standing position can also be problematic. It could fall and strike a firefighter in the leg, or it could become heated from apparatus exhaust and suffer structural damage. Putting the ladder back on the rack and out of the way or taking both ladders with you can be solutions.

On some engine company apparatus, ladders are stored in a vertical or horizontal compartment under or along-

side the hosebed. If the hose hasn't been stretched, it is easy to remove the ladders by sliding them out of the compartment. If the hose has been stretched, it might be necessary to lift loose ends back into the hosebed to prevent a tripping hazard or the ladder from snagging onto the hose. If the hose has been charged with water, it might be necessary for one firefighter to lift up on the hose as another firefighter slides the ladder from the compartment (figs. 13–23, 13–24, 13–25, and 13–26).



Fig. 13–23. Ladders mounted on a lift. (Courtesy of Bill Marshall)



Fig. 13–24. A vertical ladder-storage compartment. (Courtesy of S. K. Willis)

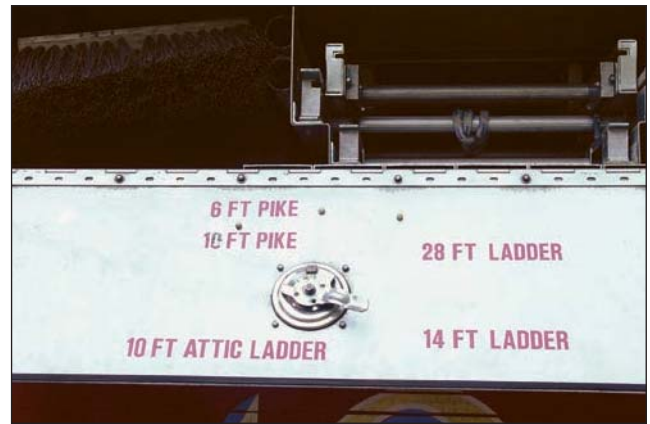


Fig. 13–25. A horizontal ladder-storage compartment



Fig. 13–26. Side-mounted ladder

Ladder company apparatus

Normally, there are three ways to store portable ladders on ladder company apparatus. Two involve the ladders being stored in a rear compartment or trough, which permits storage under the main ladder assembly. Firefighters might have to use caution when working near the rear of some ladder apparatus. Some of these apparatus can have a rear overhead obstruction such as an aerial ladder or tower ladder bucket. Firefighters must wear head protection when working in these areas. These compartments or troughs may be an enclosed or an open-style compartment (figs. 13–27 and 13–28). The ladders in this compartment sit in a vertical or horizontal position with tips facing forward and bases toward the rear of the apparatus (figs. 13–29 and 13–30).



Fig. 13–27. Ladder compartment



Fig. 13–28. Ladder trough



Fig. 13–29. Horizontal ladder storage. (Courtesy of S. K. Willis)



Fig. 13–30. Vertical ladder storage. (Courtesy of S. K. Willis)

There might be exceptions. Some fire departments place roof ladders with the butt end inside the compartment. In this manner, a roof ladder's hooks are closer to the outside of the apparatus. This way there is less chance of the roof hooks snagging the other ladder's halyards in the compartment as the ladder is removed. Plus, when the ladder is carried to the structure, the hooks and tip of the ladder are forward, ready to be raised onto the roof without spinning the ladder around (fig. 13–31). The third way portable ladders are stored on ladder company apparatus is in compartment racks on either side of the apparatus (fig. 13–32).

Removing ladders from the rear compartment is easy for two firefighters. Open the compartment door(s) and/or release the ladder lock mechanism or stop bracket assembly. Then position yourselves on the side of the ladder that enables you to keep the fire building in sight. Often, this is referred to as **body to the building**. You will be able to remove the ladder and watch changing conditions on the fireground.

After choosing the appropriate ladder and checking that no one is in the way, one firefighter pulls the base of the ladder to slide it out of the compartment. This firefighter should maintain his or her position at the base of the ladder to prevent it from striking anyone as the ladder is removed from the apparatus. He or she should proceed slowly and steadily as the ladder nears the end of the compartment. Once the second firefighter supports the ladder at the opposite end and it is clear of the compartment, this firefighter can turn into the direction of deployment (figs. 13–33 and 13–34).



Fig. 13–31. Ladder with hooks toward the rear of the compartment



Fig. 13–32. Ladders stored on side compartment racks



Fig. 13–33. One firefighter pulls the base of the ladder from the compartment.



Fig. 13–34. The second firefighter supports the ladder at the opposite end.

The second firefighter, also facing the fire building, can now assist in removing the ladder by slowly sliding the ladder out of the compartment. As the end of the vertically stored ladder nears the end of the compartment, the second firefighter can place his or her shoulder into one of the rung spaces near its end. If the ladder is coming out horizontally, it must be grabbed with both hands and then be positioned in a shoulder- or suitcase-carry position for transport. Verbal communication between the firefighters makes this operation smooth. If a third firefighter is available, he or she may be positioned midway on the opposite or same side of the ladder to assist in the ladder's removal and transport.

One firefighter may perform this a few ways, but it is more difficult. One technique involves pulling the base of the ladder almost completely out of the compartment. As the ladder is suspended tilting toward the ground, or its base touching the ground, the firefighter may proceed to the balance point and remove the ladder from the apparatus in a well-balanced position. Another common method involves the firefighter's sliding the ladder from the compartment while maintaining a position near the back of the apparatus. As the ladder's balance point comes out of the compartment, the firefighter either steps into the rung spacing or grabs the ladder and continues walking the ladder out of the compartment. Again, the ladder is well-balanced and can be transported by a single firefighter. A safety concern when using this method is that the ladder's butt is unprotected as it slides out of the compartment and could strike an unsuspecting firefighter (fig. 13–35).



Fig. 13–35. Find the balance point and carefully remove the ladder.

Side-mounted portable ladder storage. Numerous ladder company apparatus have portable ladders mounted on sides of their apparatus. These ladders can be mounted vertically or horizontally in compartments or on mounting brackets. Tractor-trailer-type aerial ladders often have a portable ladder mounted on one or both sides of the trailer apparatus. Some rear-mount aerial

ladders are constructed with the turntable mounted lower in the rear. This reduces the overall height of the apparatus and ensures it will fit through the apparatus bay doors of older fire stations. Because the turntable is mounted lower, there is reduced ladder storage in the rear and more side storage. Some rear-mounted tower ladders have a large frame and brace assembly in the rear of the apparatus with reduced ladder storage in the rear compartment. Ladders may be stored on the sides of the apparatus.

For firefighters to remove ladders off the side of fire apparatus, there must be sufficient clearance between any object and the apparatus. Removing ladders off the side of the apparatus is easy for two firefighters. The ladder securing bracket(s) or locking mechanism must first be released, and then both firefighters can position themselves evenly along the ladder. After releasing the holding mechanism, lift the ladder off the bracket or slide it off the side of the apparatus and transport it to the proper location. Sometimes sliding or lifting the ladder off the apparatus from the side is difficult because the ladders are stacked high. If they are, the shorter roof ladders are normally stacked toward the top.

When removing ladders from an apparatus side on a narrow street with parked cars, sometimes it is necessary to carry the ladder to the front or rear of the apparatus to gain access to the fire building. Lifting the ladder over parked cars might be an option, but one that must be done slowly to allow both firefighters room.

In a one-firefighter evolution, lifting the ladder off the side of the apparatus is difficult when the ladder's balance point is not marked. Many times firefighters guess the balance point, and when they lift or slide the ladder off the side of the apparatus, it tilts toward the heavier end. Sometimes in this situation, firefighters quickly compensate for the tilting with shear muscle, which can cause a pulled or strained muscle. The firefighter should transport the ladder to the front or rear of the apparatus, then try to lift it over a car and maneuver it when working alone.

Roof ladders mounted on the side of the bed section of an aerial ladder. Many of today's newer aerial apparatus are equipped with a roof ladder mounted to the side of the bed section or on the inside of the fly section of the aerial ladder. The roof ladder is usually a 14- or 16-ft (4.3- or 4.9-m) ladder mounted in a holding bracket assembly. Prior to lifting the ladder out, a firefighter must release the hold-down mechanisms. If any of these ladders are needed on the ground for

portable ladder operations, they must be handed down off the side of the apparatus prior to raising the aerial. If a ladder is transported up a ladder for use as a roof ladder, there are a few options.

If only one firefighter is available to lift the ladder out of the brackets, he or she should find the balance point and lift the ladder out of the brackets once the aerial ladder is positioned on the roof. Depending on the incline of the ladder, he or she has a few choices on transporting the ladder up the aerial ladder. If the ladder is on a slight incline and no obstacles are present to either side of the aerial ladder, the roof ladder may be laid flat across both rails of the aerial ladder and slid up the ladder as the firefighter slides his or her hands up the rails. The firefighter will be in good control of the ladder and the ladder will be well-balanced. Another way to transport the ladder up a slight incline is to place the ladder on one of its beams and slide it up the rungs of the ladder as the firefighter climbs. Some firefighters prefer to open the hooks of the roof ladder prior to sliding it up the ladder because it enables them to quickly secure it to the ridgepole of the structure once they reach the top of the aerial ladder. Remember that the open hooks can strike an obstacle or part of the ladder and cause a firefighter to slip. No matter how slight of an incline, firefighters must remain in constant contact with a ladder at all times.

On a steeper incline, the firefighter must secure the ladder in a shoulder-carry position. Then the firefighter should climb the ladder using a hand-over-hand motion on the rungs. Climbing at steep angles is dangerous, and with a roof ladder, it becomes more dangerous. At steeper angles, it is often better to perform this tactic with more than one firefighter or it might take more than one trip to transport the ladder and tools.

Roof ladders mounted inside the fly section of an aerial ladder. Some apparatus have roof ladders mounted in holding brackets on the inside of the aerial ladder's fly section. When the aerial ladder rises to its desired location, the roof ladder also rises mechanically and is easily accessible. Mounting the ladder in the fly section eliminates having to carry the roof ladder up the aerial ladder. The ladder securing brackets should be released, and now the ladder may be lifted out of its brackets for use on the roof (fig. 13-36).



Figs. 13–36. Roof ladder mounted on aerial

Use caution when climbing an aerial ladder with a roof ladder mounted in the fly section. The roof ladder takes up space inside the fly section, decreases the space between the rails, and makes climbing more difficult. This is especially true if other tools are mounted on the opposite side of the fly section, the ladder is at a steep incline, or a firefighter is carrying up tools or a saw. Roof ladders mounted inside the fly section can make it difficult to slide a Stokes basket up or down the aerial when performing a technical rescue operation. Removing the roof ladder from the fly section before the rescue might be necessary.

Folding ladder mounted inside the tip of an aerial ladder. For buildings with high, front parapet walls (the front section of a building's wall that extends above the roofline), folding ladders mounted inside and near the tips of aerial ladders are common. To use these ladders for roof access over a high or steep parapet, a firefighter must first release the ladder from its holding brackets. At a high elevation or steep incline, a firefighter must lock into the ladder with an approved safety belt prior to releasing the folding ladder.

After releasing the ladder, the firefighter opens it and slides it down onto the roof. As the ladder comes in contact

with the roof, the firefighter should **sound the roof** with the ladder to make sure the roof is stable. Making the transition from the aerial ladder to the folding ladder can be dangerous at high elevations. Always use caution and keep one hand on the aerial ladder prior to transferring yourself to the folding ladder (fig. 13–37).



Fig. 13–37. Folding ladder mounted inside aerial

Collapsible ladders mounted inside a tower ladder bucket. To address high parapet walls, many tower ladder companies carry some type of collapsible or folding ladder mounted inside their buckets or the fly section of the main ladder assembly. Some tower ladder apparatus have a short folding or extension ladder attached to the inside or outside of their bucket doors. Once the apparatus is in position, these roof-access ladders can be deployed (fig. 13–38).

FIREGROUND NOTE

Marking the ladder's balance point can make removal off any apparatus easier.



Fig. 13–38. Collapsible ladder mounted inside tower bucket

PLACEMENT, CLIMBING, AND OPERATIONAL GUIDELINES

Transport

**SKILL
DRILL**

Ladders may be carried numerous ways. A firefighter performing the carry must take command of the operation. Normally, fire academies teach that the firefighter assigned to the butt of a ladder controls the evolution. The butt is normally transported first because it must be properly positioned in line with a window or the objective. Therefore, the firefighter leading the transport should control the overall operation of the ladder.

The firefighter at the ladder's butt must consider ladder length in negotiating turns around corners and obstacles. In some situations, the firefighter at the tip of the ladder must swing out or turn wide. Both firefighters must communicate with one another. "Obstacle to the right," "Swing out," and "Okay, clear," are simple statements that communicate much during transport.

When rescuing a civilian hanging onto a window ledge, firefighters may transport a ladder tip-first. In cases such as this, the firefighter at the ladder's tip takes command. If a firefighter lacks the confidence or skill to control a ladder operation, it might be necessary for the other firefighter to take command.

Uneven ground surfaces. **FFI 5.3.6** Uneven ground surfaces are obstacles on numerous firegrounds. Many times, the spot in which the ladder must be placed is not

level, and one of the ladder's feet dangles far from the ground. Because the ladder is not supported evenly at the base, it tends to lean toward the unsupported side. One of the easiest ways to overcome this is to find a better location for the ladder. Often this is not feasible and the ladder must remain at this location.

When the ladder is on soft surfaces such as grass, dirt, or even hot asphalt, use the sharp point of an axe or the adze end of a Halligan to dig a trench wide and deep enough for the ladder's foot that touches the ground.

Insert the ladder's foot into the cutout. Both of the ladder's feet should touch the ground, and the ladder should be evenly supported at the base. It might be necessary to lift the base out of the trench and dig deeper or along the area in which the bottom rung sets for the ladder's base to rest evenly on the ground. Remember, climbing a ladder with an unsupported base is dangerous and can cause injuries.

When firefighters face an uneven ground terrain with a hard surface such as a poured concrete walkway or street curb, breaking up the area and digging a trench is not feasible. Many fire departments carry a set of wooden step chocks, angular wood cribbing, and 2 × 4 or 4 × 4 in. (51 × 102 or 102 × 102 mm) cribbing on their apparatus. Using a combination of chocks on hard surfaces levels the ladder base, assists a firefighter in footing, and maintains the ladder's balance. Many fire departments drill a hole at one end of each piece of a 2 × 4, 4 × 4 in. (51 × 102, 102 × 102 mm), and piece of angular cribbing. Next, they place a short section of rope through each hole to make a loop. Now a firefighter can grab the chocks, which come in various heights and shapes, and take them with the ladder (fig. 13–39).¹



Fig. 13–39. Various chocks. (Courtesy of Nicole Ciampo)

Some cribbing is available in a plastic resin design, but it can be slippery. Ensure a firefighter properly butts a ladder when another firefighter climbs on these hard, uneven, cribbed-up surfaces. It is dangerous, but when life is at stake, it might be necessary.

Another technique passed through numerous fire academies is that a firefighter should survey his or her work area. Sometimes nearby objects such as landscape bricks, blocks, wooden railroad ties, pallets, and lumber can level a ladder's base. Placing a large piece of wood such as plywood on a wet, muddy surface prevents a ladder's base from sinking. When ladders sink into mud, suction develops and it is often difficult to lift them out of the mud. This can cause havoc if a ladder is needed for another fireground task.

Some firefighters place a Halligan bar or other tool beneath the foot of the ladder not touching the ground for support. The Halligan bar, when placed with the adze and point facing down, creates a slope and acts like a wedge with variable height adjustments under the ladder's foot. This creates a few problems: First, on terrain with a slight slope, the metal base of the ladder may slide on the metal tool and cause the ladder to move. Second, why would a firefighter want to leave a valuable tool on the ground when he or she might need it at the top of the ladder or inside a building (fig. 13–40)?

Today's technology assists firefighters combat uneven ground surfaces. Some ladder manufacturers make adjustable legs that bolt onto the bed section of ladders near the base. When needed, these legs may be adjusted to level the base.



Fig. 13–40. Halligan used as ladder support

Proper climbing angle. **FFI 5.3.6** Once a ladder has been removed from the apparatus and transported to its objective, it must be raised and set in a proper climbing angle. Portable ladders must be set in 65–75 degree angles against buildings to ensure the ladders can carry their maximum load capacities. This angle range increases the overall safety for firefighters climbing, descending, and operating ladders. A portable ladder angled lower than 65 degrees increases the probability of the ladder sliding down the building or having its base kicked out; it also

reduces the ladder's maximum load capacity. A portable ladder positioned in an angle greater than 75 degrees creates a steep climb and increases the probability that a firefighter will fall.

To attain the proper climbing angle, place the base of the ladder one-fourth the **total working length of the ladder** away from the building. The total working length of a ladder is the distance from its base to the spot of its upper support. For example, the base of a portable ladder raised 24 ft (7.3 m) should be 6 ft (2 m) from the building for a proper climbing angle.

Another quick method of checking proper climbing angle exists. Position yourself in front of a ladder with both feet on the ground. Now, reach outward at about chest level. The ladder's rung should be in a comfortable location for climbing. Although this is not a foolproof way to check a ladder's climbing angle, it is often relied upon during firefighting operations (fig. 13–41).

Also, some ladder manufacturers place stickers on the bed section of portable ladder beams to assist firefighters in placing ladders properly. These stickers resemble a small carpenter's square on a distinctive background. When the bottom line of the sticker is parallel to the ground, the ladder is in the proper climbing position.

Physical ladder position. As a result of fire department ladder construction, most manufacturers insist that when a ladder is raised, the fly section must be in the fly-out position. Another way to describe this is that when the ladder is raised, the fly section must be positioned away from the fire building and on top of the bed section. A sticker affixed to the side of the bed section serves as a reference guide and safety reminder. Note that some ladders can be raised opposite, with the fly toward the building. Firefighters must follow manufacturers' recommendations when using portable ladders.



Fig. 13–41. Quick method to check ladder angle

Raising to the objective

**SKILL
DRILL**

When a ladder becomes vertical, the fly section may be raised to its objective. Some fire departments pre-tie their ladders' halyards or ready them in a continuous-loop design. Either way, a ladder's halyards needn't be untied to raise the ladder. Other departments tie ladders closed with the extra halyard tied or looped around the rungs. In these cases, the halyard must be untied and unwrapped from the rungs to permit raising of the fly section.

Because the halyard is behind the ladder or closest to the structure, the firefighter assigned to the butt is in the best spot to be in control. He or she may easily untie and operate the halyard. Once he or she unties the halyard, the firefighter should place the right or left boot against the ladder's butt to brace it as the ladder rises. Before raising the halyard, the firefighter verifies it is safe to begin operations by rechecking overhead and with the other firefighter. When clear, he or she pulls the halyard down in a hand-over-hand motion. The motion should be fluid and deliberate as the firefighter listens to the dogs clicking over the rungs. If the firefighter were to slip, he or she might be able to lock the dogs on the next available rung or last rung passed. Firefighters should not wrap their arms or hands around the halyard because it is dangerous. Some departments require

firefighters to tie off the halyard to a rung after the ladder raise has been completed to keep it from getting in the way of firefighters moving on and around the ladder; other departments just push it to the side, keeping the firefighter who raised the ladder from having to take the time to tie a knot, and as well to allow for the ladder to be quickly raised if needed without having to untie a knot. Determine your department's policy on this issue.

The firefighter in front of the ladder should be well-balanced with each hand on either of the beams. He or she balances the ladder as the halyard pulls downward and the fly section extends. This firefighter also watches the extending fly section and lets the firefighter operating the halyard know when the ladder could hit something such as a gutter or roof overhang and when the ladder reaches the objective. Most ladder operations progress this way. In other situations, firefighters must use a person to act as a guide, watching the tip of the ladder meet its objective. Keep in mind that buildings often have different floor heights—commercial buildings often have higher ceilings than residential buildings.

If a raised ladder lowering into its objective is about to come up short, the firefighters operating it have a few options. A ladder being laid slowly into a structure will hint if it will come up short. Firefighters must bring the ladder back to vertical and raise it to the proper height, then lay it back into the structure. If the ladder is laid into the structure and there is not time for this evolution, the firefighter operating the halyard might be able to pull it, raising it a rung, as the bracing firefighter pulls the ladder off the structure to extend the fly section. In some instances, the ladder is a little long, but bringing it down a rung makes it too short. In such cases, the butt of the ladder might need to be pulled out. Pulling the base too far, in some instances, decreases safety margin and proper climbing angle.

Footing or “butting” a portable ladder

**SKILL
DRILL**

Once a ladder is in a proper climbing angle, it must be secured before a firefighter climbs it. This prevents the ladder's butt end from sliding out while a firefighter climbs or descends. It also prevents the tip of the ladder from sliding or moving along the building, and it stabilizes the ladder as the firefighter climbs. The most common way to secure a ladder is for one firefighter to foot, butt, or heel the base while another firefighter climbs.

The preferred method of footing, butting, or heeling the base of a ladder is for one firefighter to face the front of the ladder in the direction of the climb or the building. This firefighter applies pressure with one boot against one of the bottom rails of the ladder near the base or on the first rung, preventing it from kicking backward. Then, he or she places the other foot behind in a well-balanced position and places both arms on the beams. As one firefighter climbs, the firefighter footing the ladder can apply slight pressure on the rails. This takes any bounce out of the ladder and steadies it.

As the firefighter climbs, the one footing the ladder must watch the climbing motion. If the firefighter were to lose his or her balance, the footing firefighter could quickly climb the ladder while holding the underside of the ladder rails and pin the climber back onto the ladder. The footing firefighter could also climb the ladder quickly and reach up with one arm to support the climber. In addition, if the climber were glancing at his or her tools and didn't notice another issue, the footing firefighter could relay that information.

If a climber were operating off one side of the ladder while in a leg-lock position, the firefighter footing the ladder should place his or her foot on the opposite side of the ladder's base. This prevents the base and tip from shifting and equalizes pressure on both rails, keeping the ladder secure. It might be necessary to place additional hand pressure on the opposite side rail to equalize pressure and secure the ladder.

Some fire academies and departments prefer to foot ladders from the rear. A firefighter positions himself or herself under a ladder with arms mounted on the rails and feet positioned for good balance. Then he or she leans back into the building to keep the ladder in place and remove any bounce during the climb. Problems can occur, however, when this firefighter is behind the ladder. First, if the climber drops a tool, it might hit an unprepared firefighter who was trained not to look up in order to avoid falling dirt from the climber's boot or a shingle. Second, the footing firefighter has no vision of the fire. He or she is oblivious to all conditions behind him or her. Last, if the climber were to lose his or her balance, the firefighter footing from the rear could quickly come around the ladder to offer support, but this traveling momentum could knock the climber off balance (figs. 13-42 and 13-43).



Fig. 13-42. Footing a ladder from the front. (Courtesy of Nicole Ciampo)

If the base of the ladder cannot be footed properly, substantial objects near the ladder such as cars, dumpsters, curbs, other buildings, or even parking lot bumper poles may be used. Normally, this will prevent the base from sliding or kicking out. Also, a firefighter with a piece of tubular webbing pre-tied in a loop may tie the ladder's base to a substantial object with a chocker hitch around the ladder's rung (fig. 13-44).



Fig. 13-43. Footing a ladder from the rear. (Courtesy of Nicole Ciampo)



Fig. 13–44. Using the environment to foot a ladder.
(Courtesy of Brian Doyle)

Securing the tip



In the past it was recommended that the first firefighter to reach the objective should secure the tip of the ladder to a substantial object. In theory, this is a good safety tactic. In practical fireground operations, however, it is not always acceptable. If a portable ladder will be in position for a long time for access and egress or at a technical rescue situation, secure the tip. Normally, a hose strap, short piece of utility rope, or piece of webbing on a rung, beam, or both beams can be tied off to a substantial object. Emergencies occur on the fireground and a portable ladder placed at one location might be needed at another. If the ladder were secured at its tip, it could delay its relocation to another urgent matter.

Moving a portable ladder once it is in position



Often, portable ladders raised to a window or roof must be moved for another task or because they are exposed to fire. These ladders can be in either the nested or extended position. In many situations, bringing the ladder vertical

and retracting the fly section into the bed section takes too long. Getting the ladder off the building and into a vertical position, then attempting to move it while it is extended is often difficult, especially in inclement weather or on uneven terrain.

FIREGROUND NOTE

Portable ladders with extended fly sections are heavier at the tip than they are when nested. Use care in moving top-heavy, extended ladders.

Some firefighters think sliding the ladder along the building is the answer, but a few things could happen. The ladder's tip could move too fast along the aluminum gutter of the building and slide away, causing a firefighter to lose control. This often causes the ladder to fall, and it could injure a firefighter and damage itself. Also, depending on weather and terrain, the firefighter sliding the ladder could slip and the ladder could slide away. Portable ladders slide quickly across buildings with aluminum or vinyl siding, especially if the siding is wet, icy, or snowy.

Many fire academies teach that two firefighters may position themselves on opposite sides of the ladder, lift the ladder once it is nested in the vertical position, then carry it to the new location. Carrying an extended ladder is difficult because firefighters must maintain an awkward physical position. This becomes even harder in inclement weather and on uneven terrain. In addition, firefighters might have to move the vertical ladder around overhead obstacles.

Rolling a portable ladder, whether it is extended or nested, solves that problem. One firefighter may position himself or herself at the base. If the ladder is on soft terrain and the butt is partially buried in the earth, first a firefighter must pick up the ladder or slide it upward to release it from the earth. This tactic is not necessary, but it does assist in the initial roll of the ladder. Next, the firefighter takes a well-balanced position in front of the ladder with his or her back leaning slightly into the ladder and his or her feet behind it. Now, the firefighter does a push-and-pull motion with his or her arms to roll the ladder to its desired location. When the ladder is

being moved to the right, the firefighter's left arm pulls the left beam forward, and the right arm pushes the right beam backward. The motion is opposite when the ladder is moving to the left.

Keep your feet and legs away from the rotating ladder. If a firefighter loses control of the ladder during the evolution, both hands may press it into the building to regain control. It might occur if a firefighter were to roll the ladder quickly along the building. Sometimes it is necessary to take up any slack in the halyard lying behind the ladder and attach it to the bed section before rolling the ladder. If the halyard has too much slack, it might get spun around the ladder during the rotation. When performing this maneuver over a long distance, a firefighter might notice the ladder slide down or lose its proper climbing angle. All a firefighter must do is stop, pick up the base, and slide the tip farther up the building. Then, continue the roll (fig. 13–45).

When operating on a moderate-grade terrain, rolling or lifting the ladder might be difficult. It might be better to take the ladder down, carry it to the new location, and re-raise the ladder.



Fig. 13–45. Rolling a ladder. (Courtesy of Megan Ciamp).

FIREGROUND NOTE

Before moving any portable ladder, talk with the firefighters who used the ladder to determine their positions. If they give permission to move the ladder for another task, you must return the ladder to its original position upon completing the new task. In addition, verbally communicate to the firefighters that the ladder is back in its original position.

Climbing a ladder



Climbing a portable ladder. Once the portable ladder is raised in position, it is almost ready to be climbed. Prior to climbing, the first firefighter should glance up the ladder and make sure all the dogs are locked onto rungs. In three-section extension ladders, it is possible that only the lower set of dogs will lock and the top section's dogs will not engage. Once the firefighter has checked that all the dogs are locked and the ladder is heeled properly, he or she may climb.

The firefighter should climb on the balls of the feet with hands positioned on the underside of the beams and maintain a fluid, deliberate motion while ascending. Climbing this way is safest because it affords the firefighter three points of contact: both hands and a foot. While climbing, the firefighter should keep his or her eyes focused on the destination. An occasional glance at the ladder and surrounding area is okay to check for dangers. The firefighter should not race up the ladder because it could cause a slip or fall. In instances such as rescues, it might be necessary to progress quicker than normal, but firefighters should strive to maintain balance and a fluid climbing motion.

In rain, snow, or ice, the ladder-climbing technique might need to change. The firefighter should place the arch of the boot near the heel next to the rung to permit a better grip onto the ladder. The climbing motion should be slow, deliberate, and consistent with weather conditions. Ladder falls and slips increase during situations such as these.

Many firefighters climb with their hands on the rungs, but this can have bad consequences. First, as a firefighter proceeds up or down the ladder, there is only one point of contact made with the hands. Second, if he or she were to slip, only one hand would be in contact with the ladder and the firefighter could fall. Third, a firefighter climbing with a tool in one hand does not keep contact with the ladder with that hand. While he or she climbs, the other hand would release a rung to reach for the next, leaving a short time of no hand contact with the ladder. Climbing with no hand contact, even for a short period, can lead to disaster.

When more than one firefighter climbs a portable ladder, they should space themselves evenly to avoid interfering with one another. Limit one firefighter to each section of the ladder. When climbing an aerial ladder, firefighters should space themselves at 10-ft (3-m) intervals to evenly displace their weight. During many fireground operations such as a rescue, additional firefighters may be on a ladder. Fire department ladders are made to strict standards. If proper maintenance and inspections are followed, these ladders can withstand grueling circumstances.

Climbing a portable ladder with a tool. Firefighters must be proficient in carrying tools on ladders. It is a common fireground experience. Hoisting tools by ropes may be safer, but it is also more time-consuming. Improperly carrying tools up a ladder reduces a firefighter's grip on the ladder and can lead to a slip or fall. Firefighters must maintain a grip on ladders while carrying tools to prevent any slip, fall, or injury to themselves or firefighters below them.

A firefighter should find a comfortable hand position to climb with a hand tool. Sometimes firefighters prefer to carry tools by their balance points and slide them up the outside of a ladder's beam. If a tool is thin enough, it might be possible for a firefighter to grip the underside of this beam and climb the ladder, allowing both hands contact with the ladder. At all times while climbing, the free hand must maintain a position under the opposite beam and slide up the beam. If a firefighter were to climb the ladder using the rungs with the free hand, he or she would have no hand contact with the ladder for each step (figs. 13-46, 13-47, and 13-48).

When a firefighter climbs a ladder with a hook or pike pole, the tool's head can hook onto a rung, and the firefighter can climb the ladder while maintaining their hand on the underside of the beam. Using this method, the firefighter can climb with two tools: one hook and a

hand tool in the opposite hand. Initially, the firefighter reaches up with the hook and places it onto the highest rung within reach. Remember, it is not necessary to reach for the highest rung possible.

Next, two methods can move the hook up as the firefighter climbs. The first occurs as the firefighter passes the top of the hook. Once the hook is about thigh-level, the firefighter can straighten his arm and reach down to grab the hook. Now he or she lifts the hook off the rung and slides it up until he or she can hook it on a higher rung. Again, the firefighter does not need to stretch to place the hook on a higher rung. It should be a fluid motion that does not change foot position.

For the second method, the firefighter stops at the balance point of the hook while climbing. Now, he or she removes the hook from the rung and lifts it to a higher rung. This involves additional times the hook must be moved because the total length of the hook is not used when climbing. This method, however, does not cause the firefighter to bend or lean to one side of the ladder in reaching back for the hook as in the first method.



Fig. 13-46. Slide the tool up the outside of the beam. (Courtesy of Megan Ciampo)



Figs. 13–47 and 13–48. Firefighters should always maintain a grip on the ladder when carrying tools to avoid any slip, fall, or injury. (Courtesy of Megan Ciampo)

Climbing a portable ladder with a saw. Climbing a portable ladder with a saw is difficult, especially if the saw is not equipped with a saw-carrying sling or harness. If a firefighter carries a saw without a sling or harness, he or she should carry only the saw—no other tools. While climbing or descending, the firefighter must maintain constant contact with the ladder by sliding the free hand up the outside or under the beam. The firefighter can place the arm carrying the saw either alongside the opposite beam of the ladder using the ladder as a guide, or he or she can carry the saw alongside himself or herself. The firefighter must use caution. The saw, in this position, has a tendency to hit the firefighter in the leg (fig. 13–49).



Fig. 13–49. Carrying a saw

While climbing an aerial ladder at a low angle, the firefighter might be able to slide the saw on top of the ladder's sections. Use caution when the sections become narrower because the saw changes positions.

When climbing with a saw in a sling or harness, there are a few options. The firefighter may place the sling over the head and let the saw rest underneath the arm and back as he or she climbs. Another variation is to push the saw farther back and up on top of the SCBA's bottle. Doing this can assist firefighters when climbing steep angles and keeps the saw from hitting the side of the ladder.

Some firefighters prefer to climb with the saw sling over a shoulder. The sling can ride down the shoulder as the firefighter's arm position changes. The firefighter must use caution when climbing with a dangling saw because the saw can throw off the firefighter's balance and cause a slip or fall. Firefighters must maintain hand contact with the ladder at all times to prevent this (fig. 13–50).



Fig. 13–50. Using a sling to carry a saw is recommended

Climbing a portable ladder with an uncharged hoseline. When an uncharged hoseline must be carried up the ladder, have sufficient hose at or near the base of the ladder to ensure it is deployed smoothly as the firefighter climbs. Insufficient hose anytime during the climb could cause the climbing firefighter to be pulled backward off the ladder.

The firefighter climbing with the nozzle should place the hose under one shoulder and over the opposite shoulder with about 2–3 ft (0.6–0.9 m) of hose extending over the back. A firefighter at the base of the ladder should feed the hose up as the firefighter climbs. If the climb is high, a second firefighter might need to be in the middle of the climb and another firefighter at the base of the ladder to assist in hose deployment (figs. 13–51 and 13–52).



Fig. 13–51. Place the hose under one shoulder and over the opposite one.

The second firefighter should position the hose over the shoulder on the side the hose is being raised. The hose should have some slack and form a small loop to the side of the ladder. This loop prevents the second firefighter from being pulled off the ladder should the hose become taut or be pulled up during the climb.

The hose must be fed at a steady pace and kept outside the climber's body to avoid tripping and entangling the climber.

Advancing a hoseline up a ladder is easier when the hoseline has not been charged with water. If the hoseline has been charged with water, climbing might be easier if you shut the line down and partially drain it. It might be necessary to place firefighters along the line of the ladder to advance the hoseline. These firefighters should be secured to the ladder by either an approved safety belt or leg-lock maneuver. If that is not practical, send a few firefighters up to where the hoseline is needed. Drop a utility rope down and pull the hose up and over a hose roller to this location.



Fig. 13–52. The firefighter at the base feeds the hose.

Climbing and working on an aerial ladder. An aerial ladder's angle often determines how a firefighter climbs it. If the ladder is at a low angle, the firefighter climbs in a hunched position and must maintain at least one hand sliding along the top of the ladder's rails. If the ladder is not extended far, the rails are wide and the firefighter is more comfortable sliding the rail toward the edge. In this manner, he or she can grip the outside of the rail to maintain grip and balance. Sliding the hand flat on the wide surface of the rails should be avoided.

When the ladder is at a steep angle, it might be difficult to reach the top of the rails and climb, especially at the first few sections. Some aerial apparatus are constructed with wide base sections that make it difficult for firefighters to reach. In these situations, they can use the rungs. Climbing should be done in a fluid, hand-over-hand motion while transferring boots from rung to rung. Steep-angle climbs should be done slowly and safely. A slip or fall could result in a severe injury or fatality (fig. 13–53).



Fig. 13–53. Be careful when performing steep angle climbs. (Courtesy of Andy Moloney)

FIREGROUND NOTE

Remember, if a charged hoseline is tied onto a portable ladder with a hose strap, the opening and closing of the nozzle will cause back pressure in the hoseline and possible shifting. An unattended ladder could shift and fall if it is not properly secured.

As with climbing portable ladders, a firefighter climbing an aerial ladder with a tool such as a hook can place it on the aerial's rung and move it as he or she climbs and descends. At some angles, it might be more comfortable to slide the tool along the upper portion of the aerial ladder's rail. When a firefighter climbs an aerial ladder at any angle, he or she must maintain a grip on the ladder. Aerial ladders slide between greased tracks, and small drops of grease on the rungs often create slipping hazards. A firefighter walking down an aerial ladder like it is a tight rope or balance beam with no hand contact is an accident waiting to happen.

When working from aerial ladders, firefighters should never perform any leg-lock maneuver through the rungs or beams. If a ladder were to move or mechanically fail, a firefighter could be injured severely. When performing any type of work from an aerial ladder, a firefighter

should lock himself or herself into the ladder by wearing an approved safety belt.

Climbing a vertical ladder on a fire escape. In some areas with exterior fire escapes, firefighters commonly ascend and descend these appliances. Most fire escapes are constantly exposed to the weather, so they might not be in the best structural condition. Climbing them can be hazardous and difficult. Firefighters must use caution on these secondary means of egress.

The small vertical ladder, or **drop ladder**, that connects the first floor landing to the ground when released and the top vertical ladder, or **gooseneck ladder**, that connects the top floor landing to the roof, are difficult to climb. Prior to climbing any vertical ladder, shake the ladder to check its stability and if it is attached to the building and the fire escape's main structure.

Once a firefighter verifies stability, he or she may climb the ladder. A hook in a firefighter's hand can hook either onto the highest reachable rung or the fire escape landing itself. Then the firefighter can maintain hand position on the rails or rungs of the ladder. With these narrow, straight ladders, it is often difficult to maintain a hand position on the rails. Climbing with hands on the rungs is permissible. A firefighter should climb slowly, placing feet toward the rail on each rung and ensuring with each step that the ladder can maintain his or her weight.

FIREGROUND NOTE

A firefighter should always position him or herself under the fire escape landing when releasing the vertical drop ladder. These ladders have fallen out of their tracks when released. A falling ladder could injure a firefighter in the wrong position (fig. 13–54).



Fig. 13–54. Position yourself under the landing to avoid a falling ladder.

Operating and working from a ladder

SKILL DRILL

Throughout their careers, firefighters work with hand tools on portable ladders. Usually, firefighters place ladders to the side (overhauling window trim) or possibly under the work area (removing window bars). In both cases, a firefighter's hands are on his or her tools and he or she won't be able to hold the ladder properly. The first solution is for firefighters to wear and use certified ladder belts or personal safety belts and hook into the ladder. Hooking a safety belt into the middle of a rung, however, can allow a firefighter to slide. If you hook onto a ladder's rung, position the safety hook near the beam to reduce the risk of sliding. There are a few alternatives for a firefighter not wearing an approved safety belt while working from the ladder. He or she can perform a leg-lock maneuver to secure onto the ladder.

Leg-lock maneuver. The **leg-lock maneuver** (fig. 13–55) was developed years ago when firefighters still used **hip boots**, three-fourths rubber boots, and had more flexibility. Today's firefighters wear bunker pants with large side pockets that can hold numerous items. Performing the standard leg lock is difficult and often

firefighters opt for alternatives. Whatever type of lock firefighters choose, they must secure themselves onto ladders.



Figs. 13–55. Leg lock

Firefighters perform the standard leg-lock maneuver on the ladder side opposite the work side. For example, if a firefighter were to ventilate a window on the right side of the ladder, the firefighter's left leg would perform the leg lock. The standard leg-lock maneuver is done in the following manner:

- First, a firefighter reaches the proper working height on the ladder.
- Then, he or she climbs to the next higher rung.
- Next, he or she places the leg opposite the work side through the rung spacing. As the firefighter's knee approaches the rung, he or she can begin to bend the leg back toward the next lower rung. The leg is now inserted into this spacing. Depending on the firefighter's physical makeup, the foot may lock onto the outside of the ladder's beam or onto the next lower rung. Some firefighters even place their boot behind their knee to lock themselves into the ladder.
- Now, the firefighter steps down a rung and places a boot nearest the work side, next to the beam of

the ladder. Now he or she is in the original work position on the ladder.

Normally when a firefighter completes the maneuver, he or she is two rungs below the rung through which he or she inserted a leg. Many firefighters can stand on the rung at a desired work location, lift a leg up the two rungs, and perform the maneuver. Others with shorter legs find it uncomfortable. It is fine to position themselves one rung below the bent knee.

Hook-in leg-lock (hill) maneuver. Because now firefighters carry bail-out ropes, pliers, cutters, screwdrivers, chocks, etc., in their bunker gear pockets, performing the standard leg-lock maneuver is a nuisance, takes too long to get into, and is uncomfortable. In addition, many firefighters feel trapped in the ladder because releasing the leg lock takes a while.

To prevent ladder falls by firefighters performing no leg lock, a few leg locks have been modified. The **hook-in leg-lock maneuver** is relatively quick and simple, and it reduces the bending and twisting of a firefighter's leg. Plus, firefighters of varying shapes and sizes can perform the maneuver.

Firefighters can perform the hook-in leg-lock maneuver with the leg opposite the work side of a ladder or the leg on the same side of a ladder. A firefighter's physical makeup decides which position is suitable. Follow these steps to perform the maneuver:

- Reach the proper working height on the ladder with both feet on the same rung.
- Then, place a boot in the center of the rung with the heel slid into the rung.
- Next, lift the other boot over the rung and through the rung spacing.

Variations can be performed depending on a firefighter's body:

- The standard tactic is to place the heel of the boot that has come over the rung on top of the boot's toe that is positioned on the center of the rung. By maintaining downward pressure on the boot while the thigh and knee are wedged under the rung, you are locked into the ladder. Position the thigh and knee next to the beam of the ladder to prevent sliding. Firefighters with shorter legs might have to turn the bottom boot's tip toward the beam for the thigh and knee to lock securely. Firefighters should not perform this maneuver with the thigh and knee

positioned in the center of the rung. Movement in either direction could cause a firefighter to slide across a rung and the ladder or firefighter to fall.

- Some firefighters might be able to place the heel of the lifted boot over the rung onto the rung they are stepping on as the locking device.
- Some firefighters feel more comfortable placing the tip of the boot lifted over the rung onto the rung they are stepping on or over the beam of the ladder as the locking device.

Practicing the hook-in leg-lock maneuver determines which option suits a firefighter's body style (figs. 13-56 and 13-57).



Figs. 13-56 and 13-57. Hook-in leg-lock (Hill)

Hyperextend leg-lock (hell) maneuver. Many times firefighters execute unique, dramatic ladder rescues with no time for safety maneuvers. There are also times when victims hand a child to a firefighter who must release his or her hand grip on a ladder to accept the child. Positioning into any of the leg locks can be difficult and dangerous for the firefighter and victim during such a transition.

Lt. Ciampo has also developed the **hyperextend leg lock** to assist firefighters who might momentarily lose their grip on a ladder, slip, or who perform rescues. Its primary purpose is to help firefighters maintain balance, control, and prevent ladder falls. Although nothing is safer than being belted in or performing a leg-lock maneuver, sometimes those are unachievable. To perform the hyperextend leg-lock maneuver:

- Reach the proper working height on the ladder with both feet on the same rung.
- Then, raise one leg, similar to standing on the tip of the toe or flexing a calf muscle. You may use either leg to perform this tactic and should be well-balanced, not attempting to balance on the toe itself.
- As the leg extends upward, wedge the lower thigh or knee under the ladder's rung. Firefighters with short legs might not reach the rung with a knee. If you can't reach, do not attempt to rise all the way up on a toe, but rather follow the next direction.
- As this is performed, you may press outward with both legs and wedge yourself between the ladder's beams for additional locking support. This tactic might be the only one to follow for firefighters with short legs.

This maneuver should be done with the raised leg near the ladder's beam to prevent sliding and movement, especially if a firefighter must reach off the side of the ladder for a victim. Firefighters should never come up on both legs to wedge themselves under the rungs. This gives them little foot contact with the ladder, and any sudden movement could cause them to slide back or lose their balance on the rung and possibly fall (figs. 13-58 and 13-59).



Fig. 13–58. Raise one leg up on tip-toe.



Fig. 13–59. Press outward with both legs.

Arm-lock maneuver: venting windows from a portable ladder. The **arm-lock maneuver** can be performed by a firefighter venting windows from a portable ladder.² It is relatively easy and requires minimal time to get into position on the ladder, thus saving time for other tasks. It may be used in conjunction with the leg-lock maneuvers previously described or by itself.

To perform the arm-lock maneuver, follow these steps for ventilating a window to the right side of a ladder:

- Reach the proper working height on the ladder with both feet on the same rung. When venting the window off the side of the ladder, place a leg and foot up against the ladder's beam. This offers more support and balance as you swing the hand tool. It also braces you onto the ladder.
- Then, hold the hook in the right arm and place the left arm between the two rungs directly in front of you.
- Then, place the butt end of the hook behind the ladder and grab it with the left hand.
- Next, position the hook to the window and check that no part of the ladder or structure will interfere with the swinging. Now the window can be ventilated (figs. 13–60 and 13–61).



Fig. 13–60. Arm-lock



Fig. 13–61. Place your left arm between the rungs.

The hook used for ventilation acts as the safety brace for you. If the hook were to bounce off the window and the recoil were too much, you must only pull yourself back into the ladder to prevent falling. When performing the arm-lock maneuver:

- Don't choke up on the hook. The entire length of the hook must be used to clear the opposite beam of the ladder while swinging the tool. If the tool is not used properly, it could cause the swing to come to an abrupt halt, shake the ladder, and cause the hook not to vent the window.
- You must split the rungs with your arms. Hugging the ladder can cause you to pinch a hand between the hook and the ladder's beam.
- Resist pulling material out of the window. The butt end of the hook could come back and strike you or the ladder.
- You can create a small working space between your body and the ladder that allows for easier swinging of the hook.

Another method to vent a window involves the hook's butt end being placed behind the firefighter's back with his or her arm holding the hook. The firefighter's opposite hand holds the rung of the ladder and secures him or her to the ladder. Next, the firefighter can twist or quarter turn with the upper body. The momentum assists in letting the hook strike and break the window. If the firefighter chooses this method of venting a window, he or she must remain below or toward the side of the window and out of the path of the escaping heat, smoke, and gases (fig. 13–62).



Fig. 13–62. This allows the firefighter's free hand to secure him or her to the ladder.

FIREGROUND NOTE

When you first make physical contact with a victim, ask if anyone is trapped in the building.

PORTABLE LADDER RESCUES

SKILL DRILL

FFI 5.3.6 One of the most harrowing experiences for a firefighter is a portable ladder rescue. A victim waiting for a ladder under smoke, fire, and heat conditions normally is panicked and irrational. A firefighter must be trained in rescue procedures for the ladder rescue to be successful.

Often victims reach for and grab onto ladders being raised in their vicinity. Some have even jumped for ladders being raised toward them. Firefighters must constantly watch victims. Once a victim is on a ladder, he or she might become aggressive and panicked. Firefighters must be prepared for and in control of victims once they reach the safety of ladders.

When first faced with victims at windows, make verbal contact with them. Firefighters must take command and judge victims' conditions and states of mind. A severely panicked victim might lead a firefighter to throw a ladder

out of the victim's reach, then roll the ladder to him or her after it contacts the structure. In other instances, a victim might remain calm and self exit with no coaxing when a ladder arrives.

When a firefighter reaches a victim able to self exit onto a ladder at a window, the firefighter should make sure the victim faces the ladder. The firefighter should place both arms around the victim and onto the back of the ladder's beams. If the victim becomes panicked during descent, the firefighter can press him or her into the ladder to gain control or stop the descent.

Firefighters must not place their hands on ladder rungs while descending with a victim. If a victim were to suddenly move, turn, or become panicked while the firefighter changes hand position, both victim and firefighter could slip and fall. During the descent, it might be necessary to reinforce verbal commands or encouragement to keep the victim focused and not panicked.

If there are enough firefighters, another firefighter may climb up behind the firefighter and victim, extend an arm up to the firefighter's back, and offer physical and verbal support as they descend.

If two firefighters are available at the start of the rescue, one firefighter might enter the building prior to the victim's removal. If conditions aren't immediately dangerous, the victim might be able to be sheltered in place. If conditions are intolerable or if the victim is panicked, however, this firefighter can assist in lifting or placing the victim into the window and onto the ladder for the other firefighter to remove.

Semiconscious removals

**SKILL
DRILL**

Victims might become disoriented, semiconscious, dazed, or confused. In a **semiconscious removal**, a firefighter can continue their descent down a ladder much like a conscious removal, with one exception: the firefighter may place a knee into the buttocks of the victim as they descend. As the firefighter goes from rung to rung, he or she may transfer the victim's weight from knee to knee. Some firefighters prefer to use just one knee during the whole operation, but on longer climbs, this leg could become more fatigued. The firefighter must place only the ball of the boot onto the next rung. If he or she places the boot too deeply into the rung, lifting the victim's weight and completing the removal is harder (fig. 13-63).



Fig. 13-63. The semiconscious removal

FIREGROUND NOTE

When faced with aluminum gutters on a structure, a firefighter may gently drop the ladder into the gutter or apply pressure into the ladder with the beam to dent the gutter. A good spot is between the attachment spikes. This prevents the ladder from bouncing or sliding as the firefighter climbs. It also allows more room on the rungs for a firefighter's boot when he or she nears the top.

Unconscious removals

**SKILL
DRILL**

In an **unconscious removal**, a firefighter may place both arms out and onto the beams of the ladder, accepting a victim across both arms. The firefighter can control the descent by pressing the victim into the ladder with his or her chest. Sometimes, the victim's legs can be split to assist in the carry down. Cradling an adult victim can be dangerous because the victim might slip through the arms during the descent.

If additional personnel are on scene, a second ladder may be placed next to the first to assist in the rescue. The

ladder may slide up behind the victim on the leg side so two firefighters support the victim.

Children are always carried down ladders. In addition, a rescue is not complete until victims are out of harm on the ground. These techniques may also be used to rescue downed firefighters.

In the case of multiple victims, firefighters must decide who is in the most danger and needs to be rescued first. Normally, the most critical places to address first are adjacent areas, then the floor above. Victims two floors above a fire and a few rooms away might also need to be removed, but they might not be the first priority (fig. 13–64).



Fig. 13–64. An unconscious removal

PORTABLE LADDER PLACEMENT

Access and egress



FFI 5.3.6 Safely placing a portable ladder's base is important, but equally important is resting the ladder's top against a reliable structure. Normally the top of a ladder rests on a roofline, eave line, parapet, or wall. Both beams of the ladder near the top must make contact with the structural support. As a firefighter climbs a ladder in this position, the ladder rests firmly on the support. If

one of the beams did not touch the support, the ladder being climbed could twist, bounce, or slide off the structural support. Beware of awnings on the front of a row of stores—they have no structural stability. Placing a ladder against the awning and walking on it may cause the awning to collapse, dropping firefighters to the ground.

As the ladder reaches the reliable structure near its tip, the firefighter should check the support's sturdiness. If the support is questionable, weak, or unreliable, the firefighter should gently press in on the ladder about chest level. This added pressure shows whether the structure can support the firefighter. If doubt still exists, the ladder must move to a reliable support area. If a firefighter were climbing the ladder and the support were to fail suddenly, he or she must attempt to quickly climb down the ladder. Remember, before a firefighter climbs a ladder, he or she must ensure that the base and tip are positioned properly, securely, and safely.

Roof level



Portable ladders providing roof access (fig. 13–65) should extend at least five rungs above the roofline because:

- This increases the ladders' visibility when smoke obscures rooflines and means of egress.
- Extra rungs above the roofline assist firefighters dismounting and mounting ladders when they get onto or off roofs. Firefighters have better hand grips on ladders and don't overreach as they get on or off ladders. In addition, they are in more comfortable, upright body positions to transfer onto roofs or ladders. Ladders that aren't raised high enough make firefighters bend over rooflines to grab the ladders. When firefighters lean forward to grab ladders, they lean off the edges of buildings, which is dangerous. A fall could be fatal.
- If ladders have a light beacon attached to the end of one of their rails, they might be more visible in smoke.
- If a firefighter were to accidentally slide down a pitched roof, more rungs above the roofline could stop his or her descent.
- When placing a roof ladder to a pitch roof, a firefighter at the top of the ladder can lean into the ladder for support as he slides the roof ladder up onto the roof.

In situations such as short porch roofs with varying grades of slope, extending the ladder five rungs above the roofline might interfere with firefighting operations. It might be necessary to decrease the number of rungs extended over the roofline.

A firefighter may perform a simple procedure prior to transferring completely off the ladder. If he or she steps onto a pitched or flat roof, a boot or hand tool may **sound the roof**. This means banging a boot or tool to test a roof for structural soundness. In many instances, this tactic informs firefighters that a roof's underside is weak or burned away.

Firefighters should avoid jumping off ladders onto roofs. The impacts could be a problem, especially on a roof weakened by fire. Firefighters should slowly transition from ladders to roofs. Doing it too quickly sometimes causes ladder tips to slide along rooflines.



Fig. 13–65. The ladder should extend five rungs above roof level.

Windows



A portable ladder should be placed to a window with its tip slightly below or level with the windowsill. A tip extending into a window decreases the window's size, which hampers entering, exiting, and performing victim removals and rescues. In addition, during a headfirst, ladder-slide maneuver, the ladder could be knocked

from its position or a firefighter could get caught on the ladder's tip. A ladder at this location provides the safest, most effective window-entry method.

Until recently, firefighters relied on an older window-entry technique. They placed ladders next to windows with the tips even or level with the tops of the windowsills. Once a window had been entirely removed to create an access point, a firefighter stepped from the ladder onto the sill and into the building. This is dangerous for a few reasons. First, the firefighter enters high in the window and exposes himself or herself to exiting smoke, gases, and heat. Second, a slip could mean a high fall. And last, it is common for a ladder's tip to slide once the transition from ladder to window occurs.

There is another danger in placing the ladder in this position. If a firefighter must exit a structure rapidly, it can be a long reach for the ladder under difficult circumstances. During this reach, ladders often slide when firefighters transfer their weight from windows to ladders. Fire debris on firefighters' boots can also increase slips and falls during this evolution.

After the tip of the ladder is in position at the window and the ladder is footed by another firefighter, it is ready to climb. The climbing firefighter approaches the window and prepares to ventilate the window for climbing access. Prior to venting, the firefighter positions himself or herself into a leg-lock maneuver. Now the entire window and sash should be removed for easier entry. After completing window removal, the firefighter checks the floor conditions with the **sweep-and-sound maneuver** before entering the window. The firefighter keeps his or her head outside the building toward the window's side and uses the structure's wall for protection. Next, he or she sweeps the floor with a hand tool to look for a victim. If the tool meets no resistance, the firefighter sounds the floor with a tool. Sounding the floor ensures that there is a stable floor in the immediate area and moment. Then the firefighter may drop the tool forward and listen for that distinct sound, reinforcing that the floor exists.

Now the firefighter may enter the window, driving the right shoulder into the bottom of the left side of the window frame with his or her face facing outward while climbing toward the top rung. While climbing over the top rung, the right leg enters the window while the left hand maintains a grip on the ladder's rung or beam. Next, he or she slides the buttocks back toward the right side of the window frame. This way the firefighter is low in the window frame—away from escaping heat, gases, and smoke. As the firefighter's right leg enters the room,

it again sweeps and sounds the floor. The firefighter's physique and the window's size determine which of two options to select. If the window's opening is small, a typical firefighter lifts his or her head into the room and over the sill, riding down the wall to the floor. The left leg naturally follows as the firefighter enters the room. If the window's opening is larger, a firefighter can bring the left foot up behind and into the window while keeping the head outside. Numerous safety items protect the firefighter performing this maneuver:

- He or she maintains contact with the ladder at all times. If the room were to suddenly ignite, the firefighter could reverse direction and exit quickly.
- A large portion of the firefighter's body is outside the window and limits exposure to superheated gases and smoke that could ignite.
- The firefighter can quickly exit a building in the same fashion as entering. He or she does not have to reach or look for a ladder placed to the side of the window. This also reduces the chances of slipping and falling.
- If a firefighter is trained in self-exiting techniques such as the headfirst ladder slide, the ladder is in position from the start.

In another window entry, the firefighter goes over the sill headfirst after sweeping and sounding the floor. Some instructors teach this tactic because it allows the firefighter to slip under the escaping gases and heat. Many fire academies shy away from teaching this method because of its disadvantages:

- With today's newer **lightweight construction**, a firefighter going in headfirst could travel through the fire-weakened floor itself.
- A firefighter could land on furniture near the window, causing it to tumble over and land him abruptly or farther from the window.
- If a quick escape were needed, the window that the firefighter came through might not be visible. He or she might dive into the wall looking for it on an escape.
- Broken glass on the floor could cut a firefighter as he or she extends the hands during the headfirst descent.
- Firefighters entering head first often do this much faster than when entering leg first. Controlling the complete entry is more practical.

FIREGROUND NOTE

As firefighters leave ladders and proceed along roofs, occasionally they should sound the roofs for weakness with hand tools or their feet.

Balcony, deck, or fire escape



Firefighters face numerous victims trapped or congregating on balconies, decks, and fire escapes. Or, this avenue might be the only access point to a fire building, so firefighters must ladder it. All are exposed to weather and constantly deteriorate. Introducing a fire department ladder with a firefighter's weight could break them. It is common to see bent, rusty, or even missing handrails, railings, and balusters on these structures.

It is best to ladder the side of the balcony, deck, or fire escape and use the building as the ladder's main support. When a ladder is placed to the side of a structure, it should be placed with the tip several rungs above the side of the railing with the ladder's beam next to the railing. After climbing, a firefighter can swing a leg over the railing and maintain a hand on the ladder while checking the structure's stability with his or her leg. It is also easier to remove victims because the ladder is more stable. In addition, the ladder is out of the way and does not interfere with operations on the platform. Plus, it is less likely to slide along the handrail and fall.

If a ladder's beams were placed on and just over the front of the railing when a victim transfers his or her weight over the railing, the ladder might slide along the handrail, which could cause panic. This can also happen when a firefighter transfers his or her weight off the ladder and onto the platform. A firefighter must butt the ladder when any firefighter transfers from ladder to platform. If it is necessary to place a ladder in this position, a firefighter must remember before climbing to forcefully tap the handrail with the tip of the ladder to ensure it is structurally sound and can carry the weight of the ladder and firefighter.

Another option for decks that are lightweight, have minor structural defects, or that can't be laddered on the side is to place the ladder at the front of the deck. Both beams of the ladder should rest on the structure's

platform frame or flooring. Now, a firefighter with a hand tool may climb the ladder and remove some balusters, permitting an egress point. Using the deck's structural frame is often better than placing the ladder's beams on the top handrail.

Fire escapes often become overcrowded in an instant because the vertical drop ladder is hard for civilians to descend. To relieve overcrowding and make descent easier, place a portable ladder to the first landing opposite the fire escape from the drop ladder. If the fire escape is severely overcrowded, another portable ladder may be positioned on the second landing on the same side of the drop ladder.

CARRIES AND RAISES

There are many ways to carry, transport, and raise a ladder. Many carries and raises depend on the number of firefighters available. Normally, ladders are taken butt-first toward their objectives. Sometimes it is necessary to carry the ladder with the tip forward. As we often find in firefighting tactics and techniques, each has advantages and disadvantages. It is up to the operating firefighters to choose the best technique for each situation.

Single-firefighter evolutions



Although not the preferred method to transport or raise a ladder, one firefighter sometimes finds himself or herself performing the tasks of two. It is essential to learn single-firefighter evolutions when dealing with portable ladders.

Single-firefighter shoulder carry. A firefighter on one side of a vertically stowed ladder may lift the ladder at its balance point with the butt end facing the front or direction of travel. Then, he or she inserts a shoulder between the rungs and rests the ladder on the shoulder. He or she may place this arm's hand on the bottom of the beam, at the base, middle, or top of the rung, or on the next forward rung. If the other hand is free, this hand can grasp the next forward rung to balance the ladder. As the ladder sits on the firefighter's shoulder, it may be tilted slightly down toward the base to help control the ladder, provide good visibility, and prevent striking another firefighter with the butt (fig. 13-66).

Single-firefighter suitcase carry. A firefighter on one side of a vertically stowed ladder may locate the balance point of the ladder and hoist the ladder with one arm. He or she may then carry the ladder like a suitcase with

his or her arm dangling to one side. Ladders carried in this position often strike firefighters in the leg if they move quickly or walk over rugged terrain. If a ladder is to be picked up off the ground, a firefighter should bend his or her legs to prevent a back injury. This carry is practical for short distances and small, straight ladders. It also allows a firefighter to carry tools in the other hand (fig. 13-67).



Fig. 13-66. Single-firefighter shoulder carry



Fig. 13-67. Single-firefighter suitcase carry

Single-firefighter ladder drags. During fire operations, firefighters might find themselves shorthanded or alone when tactics must be performed simultaneously. To assist a single firefighter in transporting ladders, firefighters have created ladder drags. These drags may be used on all surfaces during any weather. Both drags incorporate dragging tools and two ladders to a destination in one trip, which benefits short-staffed firegrounds.

The **Swick method** was created by Robert Swick of the Fairborn (Ohio) Fire Department who was assigned to a one-man truck company for 17 years. To perform this drag, a firefighter lays an extension ladder fly-section-up on the ground. Then, he or she places a roof ladder with open roof hooks on top of the extension ladder. The hooks bite into the top rung of the extension ladder, connecting the ladders. Next, the firefighter lays his tools on top of the ladders. Now, he or she goes to either side of the ladder nearest the tip, crouches, and places his or her arm downward to pick up the extension ladder's bottom rung. The firefighter stands up to lift the ladder with the leg and back muscles. It is more comfortable for some firefighters to place the bottom rung inside the elbow and place the hand under the ladder's rail. The ladder sits higher and into the firefighter's chest area. Now the ladders may be dragged to their destination (fig. 13–68).



Fig. 13–68. The Swick method

There are pros and cons. When a firefighter turns a corner with a long roof ladder on top, the longer ladder can catch on uneven terrain and spin slightly off the top of the extension ladder. In this case, the firefighter must only slide the roof ladder back on the extension ladder and continue dragging to the destination. Another drawback is that the ladder's tips or spurs can scratch during dragging over pavement or concrete. If this happens, small damages may be filed or sanded.

One other thing that bothers firefighters is the uncomfortable drag. The ladder has a tendency to rub the turnout coat under the armpit, and firefighters with shorter arms don't have the reach to carry the ladder in this position. When firefighters come across a problem or situation, they quickly find a cure.

The **Creed method** of dragging a ladder evolved after Creed McClelland of the Orlando Fire Department performed the Swick method at a fire conference. After pondering a few minutes about the drag, he came up with a variation. A firefighter may place a roof ladder flat on the ground with its open hooks pointing up. Now, he or she slides an extension ladder bed-section-down on top of the roof ladder and into the hooks. The hooks act like a stop and permit the extension ladder to ride on top of it. Now, the firefighter may come to the foot section of the ladder, lift the first rung, and drag the ladders to their destination. When using a longer roof ladder on the bottom of the drag, a firefighter has more rungs accessible near the base of the ladders, making it easier to drag. This method also removes the possibility of the ladders separating during the maneuver (fig. 13–69).



Fig. 13–69. The Creed method

FIREGROUND NOTE

The Stokes basket may be placed into the rungs of the roof ladder, filled with tools and equipment, and dragged to the fire scene for rapid intervention team operations or during inclement weather (Fig. 13–70).

Both drags take little time to set up and are easy. They allow a firefighter two ladders and tools in one trip, conserving energy for other tasks.



Fig. 13–70. Using a roof ladder to transport a Stokes basket

Single-firefighter flat raise. Although it is preferable to raise a ladder with another firefighter, it is not always possible on the fireground. All firefighters must know how to raise a ladder with one person and practice the skill. After a single-carry transport technique, a firefighter must check for overhead obstructions such as tree branches and electrical service lines, then place the ladder's butt end against a structure for bracing. Now, the firefighter kneels or bends at the tip of the ladder and lifts the tip off the ground using the leg muscles. He or she then walks the ladder up with hands sliding up the rails of the beam and eyes focused on the ladder rising overhead. As the firefighter slides hands up the rails, the fluid motion should not include a bouncing rhythm, which puts undue strain and stress on the firefighter's body (fig. 13–71).

If the firefighter uses a hand-over-hand motion on the rungs to raise the ladder to vertical, a few things may occur. First, the ladder balances on only one arm as it rises. If a loss of balance occurs, the ladder could drop. Second, ground conditions determine the possibility of slipping, and balancing a ladder with one arm might be difficult for the strongest of firefighters. Those who use this method often proceed quickly, which has caused

lost grips on the rungs and ladder drops. When using the hands-on-the-rail method to raise the ladder, a firefighter slipping or losing balance could push the whole ladder away to avoid injury.



Fig. 13–71. Single-firefighter flat raise

Single-firefighter high-shoulder carry and raise. Before becoming firefighters, many of us worked on job sites with lightweight, easy-to-maneuver ladders not built to fire department standards. Some fire academies instruct firefighters on a high-shoulder carry and raise that evolved from other occupations. The cons outweigh the pros. There are better, safer ways to perform a single-firefighter carry and raise evolution.

As a firefighter removes a ladder from an apparatus, he or she carries the balance point of the lower beam on top of the shoulder or places the shoulder inside the beams and rungs near the balance point. Then, the firefighter raises the other hand to grab the upper beam or a forward rung to balance it. He or she then transports the ladder, tilting the base toward the ground to avoid striking another firefighter (fig. 13–72).



Fig. 13–72. High-shoulder carry and raise

As the firefighter approaches the proper distance from the fire building, he or she plants the base of the lower beam in the ground to act as the foot. Now, the firefighter uses upper-body strength to push the ladder up and walk it up in a hand-over-hand motion and beam-raise position. In other situations, a firefighter may place the base against the base of the fire building and then raise it upward. This carry and raise puts a lot of stress on the firefighter's upper body. Time and conditions permitting, it is better to transport the ladder to its location in the high-shoulder carry than to perform the single-firefighter flat raise.

Two-firefighter evolutions



When two firefighters begin ladder work, they must perform safely, communicate effectively, and use teamwork. One firefighter must lead the operation. The firefighter at the ladder's butt normally leads and gives commands. This firefighter leads the operation because the butt of the ladder arrives to the structure first with this firefighter in the lead. Once the ladder rises, he or she controls the halyard and raising the ladder.

Two-firefighter shoulder carry. Two firefighters face the same direction on the same side of the ladder, one at the butt, and the other at the tip. Then, both squat, grab a rung, and with their leg muscles lift the ladder onto their shoulders. As they place the ladder onto their shoulders, each firefighter's same arm can enter between rungs and grab the next forward rung. The butt firefighter should be inside the first or second rung spacing to protect the butt and use the other arm to warn approaching firefighters, move obstacles, and open doors and gates. The firefighter at the tip following the butt firefighter steers the ladder around obstructions and corners (figs. 13–73 and 13–74).



Figs. 13–73 and 13–74. Two-firefighter shoulder carry

The two-firefighter shoulder carry is for removing a ladder from an engine or ladder truck and for farther distances than the suitcase carry. If a third firefighter is available, he or she goes in the middle. A very tall third firefighter will throw off the ladder's balance. He or she might have to keep the shoulder free from the ladder and use only arm strength.

FIREGROUND NOTE

Firefighters must attempt to stay at least 10 feet from electrical power lines when raising portable ladders. In some instances, electrical power has jumped from power lines to ladders.

Two-firefighter suitcase carry. Two firefighters position themselves on the same side of the ladder and face the same direction. One firefighter is at the butt of the ladder and the other is at the tip. Both firefighters squat, grab the beam of the ladder, and prepare to lift it. Using their leg muscles, both firefighters begin to stand.

Their arms and bodies raise the ladder to a vertical carry position that resembles a suitcase. The butt firefighter must maintain a position to protect the butt of the ladder from striking another firefighter or an object. If a third firefighter is available, he or she may go to the center of the same side (fig. 13–75).



Fig. 13–75. Two-firefighter suitcase carry

Remember, the suitcase carry is designed for carrying ladders a short distance. Note a few disadvantages:

- The ladder often strikes firefighters in the lower leg, making it a nuisance or injuring firefighters.
- The ladder can strike uneven terrain. In addition, if a firefighter were to lose balance or stumble, the ladder increases the risk that the firefighter would fall if the ladder were to strike his or her leg.
- Carrying large ladders is difficult and can injure and tire a firefighter.

Two-firefighter beam raise. After the ladder reaches the desired location, the butt-end firefighter places the ladder the proper distance from the building with the fly section out and, if possible, out of the way of overhead obstructions. Remember, this should be about one-fourth the working distance of the ladder so the ladder won't need to be repositioned once it is vertical. The firefighter places the ladder with one beam planted on the ground so it is in the vertical position on one beam.

The firefighter at the ladder's butt or foot is commonly called the footer. His or her main objective is to apply body pressure to the ladder as a counterweight to help the other firefighter raise the ladder. The footer places one foot forward and onto the ladder's butt end on the ground. The other foot goes comfortably behind the firefighter. This leg must not be directly in line with the

other leg and the ladder because it could get struck as the ladder rises. The footer's hands go onto the beam. The arm that's on the same side of the body as the leg on the ladder's butt extends forward. The back arm now goes on the beam near the ladder's butt. Do not place this hand under or on the foot or spurs of the ladder's base. If the raise were performed rapidly, this hand could be pinched between the ladder and the ground. As the firefighter at the tip raises the ladder, the footer slowly leans backward and pulls slightly with his or her arms, reducing the weight of the ladder and assisting in the raise.

The firefighter at the tip rechecks the overhead clearance before raising the ladder. Next, the firefighters position themselves inside the ladder or nearest the building, with the ladder sitting on the opposite shoulder. By doing this, they are out from under the ladder and have a constant view to the objective. They raise the ladder by walking hand over hand, glancing up at the objective, and watching for overhead obstructions or changing conditions. If an obstruction such as a tree limb were problematic during the raise, the firefighter could pivot the ladder on its butt as it raises to avoid the limb.

Now that the ladder is vertical, both firefighters assume positions on opposite sides of the ladder with one foot against the butt to steady it and the other leg behind them to balance. Now they can untie the halyard and extend the ladder. The firefighter pulls the halyard down in a hand-over-hand motion and resists wrapping his or her hand or arm in the rope as it is pulled. If the rope were to snap, break, or slip without warning, it could injure the firefighter. As the halyard is pulled down, the other firefighter positions both hands outside the ladder's beam to steady it as it rises. Placing hands on the outside of the beams reduces the chance of an injury should the fly section suddenly retract. This firefighter has the best view of the raise and can give verbal commands to stop the raise. When the ladder reaches the desired height, firefighters slowly lean it into the building. They place one foot against an opposite foot on the ladder and use their arms to control the ladder's lowering into the building.

The two-firefighter beam raise is preferred over the two-firefighter flat raise because:

- The ladder is in a reduced-profile position because it is more narrow than when raised flat. In this position, the ladder is less likely to hit overhead obstructions. In addition, it is easier to pivot around overhead obstructions because only one foot is secured to the ground.

- Both firefighters can maintain good, balanced positions throughout the raise. The footer does not have to bend over and get onto the base or bottom rung of the ladder, which is a difficult position to assume and maintain. It also removes the possibility that the footer could slip off the ladder's base or rung as it is raised.
- The beam raise is the preferred portable ladder raise in a narrow alley or between overhead obstructions. The ladder's narrow profile allows for use in small, narrow areas (figs. 13-76, 13-77, 13-78, and 13-79).



Figs. 13-76 and 13-77. Two-firefighter beam raise



Fig. 13-78. The firefighter at the tip positions himself between the ladder and the building.



Fig. 13-79. The firefighter at the foot acts as the counterweight.

Two-firefighter flat raise. Once the ladder reaches the desired location by the footer, it can be raised flat. The ladder is positioned flat with both feet lying on the ground. The footer positions his or her feet onto the bottom rung or onto both rails of the ladder. Then he or she crouches with arms extended to grab a forward rung of the ladder. A firefighter's physical makeup determines which rung is feasible and comfortable to grab. As the ladder is lifted and raised, the footer maintains the position and leans slightly back to counterweight and

assist in lifting the ladder. As the ladder approaches the vertical position, the footer removes one foot from the ladder and places it behind him or her for balance.

The firefighter raising the ladder checks again for overhead obstructions, then raises the ladder. He or she walks at a steady pace sliding hands up the ladder's rails to raise it to the vertical position. When walking the beams of the ladder up, the firefighter slides his or her arms up the ladder and uses leg muscles to drive the ladder upward. Firefighters should not bounce the ladder up while sliding the rails because a slip could mean an injury.

Many firefighters prefer to walk the rungs up to raise a ladder. This has a few problems:

- As the firefighter proceeds up the rungs, for a moment only one hand balances the ladder, which introduces a tendency to twist. If the firefighter were operating on uneven terrain, a slip could cause a loss of grip and injury.
- A firefighter walking up the rungs normally watches his or her hand position on the rungs and takes his or her eyes off the objective and tip of the ladder.
- When the ladder rises rapidly, it often bounces and twists as a firefighter proceeds up the rungs (figs. 13–80, and 13–81).

Now that the ladder is vertical, both firefighters assume positions on opposite sides of the ladder with one foot against the ladder's butt to steady it and the other placed behind them for balance. They can untie the halyard now and extend the ladder to its objective.



Fig. 13–80. The footer reaches the bottom rungs.



Fig. 13–81. Slide your hands up the rails of the ladder.

Two-firefighter flat-arm carry and raise. Some U.S. fire departments must adapt daily to peculiar hazards such as catenary wires strung across roadways and intersections for light rail train cars. These overhead obstructions make raising ladders difficult because they carry a lot of voltage. Fortunately there is a method for dealing with these situations.

Because ladders can be stored horizontally on some ladder company apparatus, the firefighters can position the ladder between them for removal. As the balance point approaches the firefighters, they grab the ladder and begin walking to the rear of the apparatus. Once they remove the ladder from the apparatus, the firefighters bend their arms and carry the ladder flat to its objective. If the ladder were not stored flat, the firefighters could pick it up, rotate it into the flat position, lift it at the balance point.

As the firefighters approach the objective, they raise the tip with the forward hand or the one nearest the structure. The back hand grips the ladder firmly and drives the ladder forward and up to assist in the lift. Some firefighters perform a short dip with the tip as they begin the raise, which gains momentum. As the ladder reaches the building, the firefighters bring it to the vertical position, brace it, and prepare to extend the fly if needed (figs. 13–82 and 13–83).

The flat-arm raise is difficult with large ladders and must be practiced before fireground use. It can cause back injuries and its use should be limited. The flat-arm raise is extremely valuable for rescuing a victim hanging to a windowsill by his or her arms when firefighters arrive. Getting the ladder underneath the victim provides support and allows the victim to assist in the rescue.



Fig. 13–82. Both firefighters are positioned at the ladder's balance point.



Fig. 13–83. Raise the tip toward the objective.

Three-firefighter evolutions

**SKILL
DRILL**

When three firefighters begin ladder work, they must perform safely and with proper communication and teamwork. One firefighter must lead the operation. The firefighter at the ladder's butt normally leads and gives commands when performing ladder evolutions. He or she leads because the ladder's butt reaches the structure first. Once the ladder is raised, he or she controls the halyard and raising the ladder.

Three-firefighter suitcase/shoulder carry. The methods to transport a ladder described in the two-firefighter carries also apply to the three-firefighter carry, with one exception. The additional firefighter goes on the same side of the ladder at the center. To perform the shoulder carry when firefighters differ in height, the tallest goes at an end, not in the center. This way the ladder's weight distributes equally among all three firefighters (figs. 13–84 and 13–85).



Fig. 13–84. Three-firefighter suitcase carry



Fig. 13–85. Three-firefighter shoulder carry

Three-firefighter flat-arm carry. Three firefighters can also carry a ladder in flat position with their arms. Two of them go on the same side of the ladder at the tip and the butt. The third goes on the opposite side in the center. All three firefighters crouch onto one knee. On command, they lift the ladder off the ground using their leg muscles. They can place their hands on either the rung or beam, whichever is more comfortable and helps maintain their grip while they lift and transport the ladder (fig. 13–86).



Fig. 13–86. Three-firefighter flat-arm carry. (Courtesy of Joseph Alvarez)

If the ladder were removed from a ladder apparatus with rear horizontal storage, the two firefighters would position themselves on one side of the ladder with the third on the opposite side. Remember, a ladder should be carried butt first to the fireground and tip first upon return to the apparatus. This allows it to slide back into the apparatus storage compartment easier.

FIREGROUND NOTE

Firefighters may place their tools on top of the flat ladder during transport to the fire building.

Three-firefighter flat-shoulder carry. The three-firefighter shoulder carry's steps resemble that of the flat carry, except the ladder rides on top of the firefighters' shoulders during transport. The positioning is the same as the flat-arm carry, with two firefighters on one side and the other at the center of the ladder. All three lift the ladder from the ground to waist level, then continue lifting upward. Now, they can use both arms in lifting and placing it onto their shoulders (fig. 13–87).



Fig. 13–87. Three-firefighter flat-shoulder carry. (Courtesy of Joseph Alvarez)

Some firefighters learned to face the direction opposite where the ladder is needed (face the tip because the butt goes to the fire building). When the ladder reaches about chest level, the firefighters pivot and rotate by turning into the ladder and placing a shoulder under it. Now they face the butt ready to transport. Each method is acceptable, so firefighters should learn and practice both.

Three-firefighter beam raise. The same method of raising the ladder described in the two-firefighter raise applies to the three-firefighter raise, with one exception. The additional firefighter, depending on physical size, either walks the ladder up in front of or behind the firefighter raising the ladder to the vertical position. The tallest firefighter goes behind the other firefighter or toward the tip. This way, both firefighters can reach the

ladder and raise it in unison. If the taller firefighter were in front during the raise, the smaller firefighter could be unable to reach and assist in the lift.

Another option is for the additional firefighter to go in the middle of the ladder and face the tip. When the ladder rises, this firefighter pulls the ladder toward them, self-assisting in the lift. As the ladder passes his or her position, this firefighter turns toward the base and either maintains a position on the outside of the ladder assisting in balancing the ladder or follows the raising firefighter assisting in the raise (fig. 13–88).



Fig. 13–88. Three-firefighter beam raise. (Courtesy of Joseph Alvarez)

Three-firefighter flat raise. The same method of raising the ladder described in the two-firefighter raise applies to the three-firefighter raise, with one exception. The additional firefighter goes at the ladder's tip alongside the other firefighter. They raise the ladder using either a hand-over-hand motion with their inside hands on the rungs or they slide the rail of the ladder on their shoulders, using their leg muscles to assist them. Both firefighters must use caution while raising the ladder. They could strike the other's arm or bump one another. Either action could cause a slip or mishap. Many fire departments rely on this raise for the three-section, 35-ft (10.7-m) ladder becoming more prevalent on fire apparatus (figs. 13–89 and 13–90).

Four-firefighter evolutions

SKILL DRILL

When four firefighters begin ladder work, they must perform safely as a team and communicate properly. One firefighter must lead the operation. A firefighter at the ladder's butt usually leads and gives commands because the ladder's butt reaches structures first. He or she controls the halyard and raising the ladder. Firefighters should “step off left”—start on the left foot when commanded to move to the building by the ladder.



Figs. 13–89 and 13–90. Three-firefighter flat raise. (Courtesy of Joseph Alvarez)

Four-firefighter flat-arm carry. Four firefighters can also carry a ladder in the flat position with their arms. Two firefighters go on each side of the ladder, two at the tip and two at the butt. All four crouch onto one knee. On command, they lift the ladder off the ground with their leg muscles. They may place their hands either on the rung or beam, whichever is more comfortable and helps maintain a grip on the ladder during lifting and transport (fig. 13–91).



Fig. 13–91. Four-firefighter flat-arm carry. (Courtesy of Joseph Alvarez)

If the ladder were removed from a ladder apparatus with rear horizontal storage, two firefighters would go at the ladder's tip, and the other two would go at the butt. Remember, the butt should lead to the fireground,

and the tip should lead on return to the apparatus. This makes sliding back into the apparatus storage compartment easier.

Four-firefighter shoulder carry. The four-firefighter shoulder carry's steps resemble those of the flat carry, except the ladder goes on top of the firefighters' shoulders during transport. The positioning is the same as the flat-arm carry with two firefighters at the tip and two at the butt. All four lift the ladder from the ground to waist level, then continue lifting the ladder upward. Now, they can use both their arms in the lift and placing the ladder on their shoulders.

FIREGROUND NOTE

It might be necessary to push down and dent ornamental or sheet metal ridge vents for a roof ladder to sit properly on a roof. If this doesn't work, use a Halligan tool to make two holes on the opposite side of the roof's ridge so the roof ladder's hooks can secure onto the roof.

Some firefighters learned to face away from where the ladder is needed (face the tip because the butt arrives first at the fire building). When the ladder reaches about chest level, the firefighters pivot and rotate by turning into the ladder and placing their shoulders under the ladder. Now they face the butt ready to transport the ladder. Each method is acceptable and should be learned and practiced (fig. 13–92).



Fig. 13–92. Four-firefighter shoulder carry. (Courtesy of Joseph Alvarez)

ROOF LADDER OPERATIONS

Firefighters often ventilate structures with steep roof angles and ones covered with ice or snow. Working on these structures without a roof ladder can be dangerous and should be avoided. If there is no way to work from a roof ladder, position an aerial or tower ladder to the roof for a work platform.

A **roof ladder** is a straight ladder with solid aluminum or steel hooks attached to the tip. The hooks are mounted in a small bracket with a tension spring wrapped around the base of the hook and a square stop. To release the hooks, a firefighter must apply moderate downward pressure then turn the hook 90 degrees either away or toward himself or herself. This motion resembles pushing the hook down toward the base of the ladder and spinning it a quarter turn. Firefighters usually hold the ladder about waist level to release the hooks, but a firefighter can also perform this tactic while the ladder is flat on the ground. Applying pressure to the hooks with the inside portion of a boot might release them. Once the hooks are turned, pressure is released and the hooks spring up into a locking position inside their holding brackets. Roof ladder hooks secure the ladder to a structure's roof by allowing the hooks' tips to bite into the roof on the opposite side of the roof's ridge (fig. 13-93).



Fig. 13-93. Roof ladder hooks

There are a few methods to raise a roof ladder to a fire building's roof. The method depends on the size of the roof ladder and the type, angle, and length of the roof.

Single-firefighter evolution



It might be possible to raise an 18- or 20-ft (5.5- or 6-m) roof ladder from the ground to the roof of a one-story structure with a steep pitch. A firefighter transports the ladder to the structure, lays it down, and extends the roof hooks to the open position. Next, the firefighter

performs a single raise. When the ladder leans onto the roofline in the proper climbing angle, the firefighter lifts up the ladder's base and slides the ladder onto the roof and over the ridge. He or she must pull down on the ladder to ensure the roof hooks have bitten into the roof and will support the firefighter's weight.

Another ladder is brought to the base of the building and raised next to the roof ladder. Now the firefighter climbs the ladder and transfers to the roof ladder at roof level. With this method of sliding the roof ladder upward, firefighters often prefer to slide it flat so both rails ride up the roof. They can use both arms and push as the ladder slides upward.

When tall structure must have an extension ladder to reach the roof, another method must be used. After the extension ladder reaches proper climbing position, the firefighter opens the roof ladder's hooks and the ladder rises next to the extension ladder. Next, the firefighter may place the roof ladder on one beam and next to the extension ladder with the roof hooks facing away from the extension ladder. Now the firefighter climbs up the extension ladder. When he or she reaches the roof ladder's balance point, he or she places a shoulder between the rungs. The ladder now balances on the firefighter's shoulder as he or she begins to climb.

As the firefighter reaches the roofline, the roof ladder begins to pivot over the roof's edge. The firefighter pushes the roof ladder up the roof either on the beam or laid flat. Once it goes over the roof's ridge, the firefighter pulls back on the ladder, sinking the roof hooks into the ridge. Care must be taken while pulling back because the ridge could have a **ridge vent** made of fibers and shingles that tear. Firefighters must ensure the hooks bite into the roof and will be secure so the roof ladder can carry the weight of firefighters on the roof.

Two-firefighter evolution



The roof ladder must be raised after an extension ladder is in position. One firefighter climbs to a position near the top of the extension ladder that allows him or her to transfer the ladder from the extension ladder to its locked position on the roof. This firefighter locks into the ladder with a leg-lock maneuver or safety belt. Now the firefighter on the ground raises the roof ladder to the firefighter on the ladder.

There are two common methods: Have the roof hooks open or have them closed. There are pros and cons to both, but both are acceptable. Raising the ladder from the ground to the firefighter on the extension ladder may

be done a few ways. The firefighter on the ground can remain on the ground and transfer the ladder up using his or her arms. Or, the firefighter on the ground may first hand the roof ladder up to the firefighter on the ladder. Then, the firefighter on the ground may climb up the extension ladder and assist with the roof ladder's raise and balance.

Roof ladders are removed in the reverse fashion. Now and then roof hooks set deeply into a roof and are difficult to release. Use caution when trying to release them. Apply steady pressure to the ladder. Striking the ladder with a hand tool to release it could damage to the ladder.

VENTING A WINDOW WITH A LADDER

**SKILL
DRILL**

It is not the preferred method to vent windows, but venting a window with a portable ladder is often necessary because of manpower shortages, a lack of time, or numerous windows needing to be ventilated. There are a few methods, all of which start with raising or positioning the ladder's tip in contact with the top third of the window. Striking a window high has two advantages. First, the window might break easier as a result of being weakened or distorted by heat. Second, heat, smoke, and gases rise and collect at the ceiling and mushroom downward. Breaking the window high can help release these elements quickly (fig. 13-94).



Fig. 13-94. Venting a window using a ladder

Extension ladder throw

The extension ladder can be used in the beam or flat position to break a window. Some firefighters think the weight and structural makeup of throwing the beam into the window works better. Others think the flat position covers more surface area and breaks more glass. Both techniques work.

To begin, a firefighter raises the ladder vertically to the proper level near the top third of the window. Then the firefighter at the ladder's base forcefully drops or pushes the ladder into the window. As the ladder strikes the window, the firefighter removes his or her hands from the ladder to avoid glass that could slide down the beams. His or her hands remain in the vicinity of the ladder in case the ladder bounces off the window. This way, he or she can grab the ladder's rungs or beams to maintain its stability. Done properly, this often breaks the window's center sash and bottom windowpane as well. Sometimes it takes one or two attempts to break a window sufficiently for ventilation.

After ventilating windows with a ladder and completing fireground duties, the firefighter inspects the ladder for embedded glass shards, structural damage, and thermal damage from vented heat or fire.

Roof ladder throw

A firefighter may also use a roof ladder to ventilate a window. The roof ladder's two large roof hooks attached to its tips resemble firefighting hooks and pike poles. To perform this tactic, a firefighter first opens the roof hooks and places the ladder at the proper height. Then, the firefighter at the ladder's base throws or pushes the ladder into the window.

After the ladder breaks the top pane, the firefighter has a few options. If the window frame is wood, the firefighter places the ladder's hooks onto the center sash. Next, he or she picks up the base of the ladder and gives it a slight tug or pull backwards or out of the window. Usually this additional pressure lets the hooks break the bottom pane of glass and removes the center sash of the window. If the ground's terrain is bad, the firefighter avoids this method and instead drops the ladder into the window again to complete ventilation of the lower panes of glass.

Remember, firefighters must use all eye protection and personal protective equipment when performing these tactics.

FIREGROUND NOTE

If there are not enough firefighters to perform the flat raise with the Bangor ladder, consider using the building to physically butt the ladder as it is raised.

ADDITIONAL LADDER TYPES

Three-section extension ladder

Increasing numbers of fire departments are placing three-section extension ladders onto first-line apparatus for many reasons. Most departments put them on apparatus to meet standards and guidelines for ratings, while others encounter manpower shortages. Those departments think having a large ladder on the apparatus on scene immediately lets them handle any situation. Plus, many bedroom communities are experiencing growth in new and higher townhouses and condominiums.

Firefighters must be aware of three-section ladder characteristics before using it on the fireground. Most noticeable about the short-looking, three-section ladder is how heavy and bulky it is with the added fly section. Also, pulling down the halyard raises both fly sections and raises the ladder 28 in. (71 cm) compared with the 14 in. (36 cm) of regular extension ladders. Before climbing the ladder, a firefighter must ensure both fly sections are locked in place. Sometimes these ladders lock only one fly and require halyard adjustments to lock the other fly. Firefighters have suffered severe injuries using this ladder when it was not properly locked.

Firefighters may raise the three-section ladder in a beam- or flat-raise evolution. Three firefighters should be used if they are available. Once the ladder is vertical, two firefighters position themselves on the ladder's sides or beams. They place both hands out of danger on the back beam. Remember, this ladder has two moving fly sections that shouldn't be held during the raise. The firefighters place their feet behind them, not near the front base of the ladder, because the fly sections might strike the ground if something were to go wrong during the raise. The third firefighter goes behind the ladder

at the base to control the halyard. He or she ensures both sets of dogs are locked once the ladder rises to the proper position.

Bangor or pole ladder

The **Bangor** or **pole ladder** is a large extension ladder that has a permanently attached support pole hinged and mounted to each side of the bed section. Firefighters use these poles to assist in raising, lowering, and stabilizing the ladder. These ladders are normally raised only in a flat-raise evolution because of the position of the support poles. In emergencies, the ladder may be raised with the beam-raise evolution, but only one support pole can be used. The ladder should be raised flat and then pivoted to its desired location once the ladder is raised.

The support poles on the ladder's sides are usually attached to the beams with a pivoting bracket near the top of the bed section and either a clevis or cotter pin and mounting rod at the base of the bed section. A firefighter must remove the pin and lift the pole from the rod to release it. Next, he or she reattaches the pin to the rod to reduce the chance of slipping on it. These pins are often attached to a short chain or cable so they remain attached to the ladder and won't become lost.

Once the support poles are released, the firefighters at the base of these poles remove them. Next, they bring them to the vertical position if room allows or bring them up and around in a semihorizontal position to two firefighters near the center of the ladder. Once these firefighters have the support poles, they walk back past the ladder's tip to the ends of the poles. These two firefighters at the base of the poles are ready to assist in the lift by walking forward and pushing upward with the poles. They must keep the spur attached to the base of the poles between their fingers and palm up as they raise the ladder to avoid injuries (figs. 13-95 and 13-96).



Fig. 13-95. There is a sharp spur at the base of the poles.



Fig. 13–96. Keep the spur between your fingers as you raise the ladder.

With two firefighters at the ladder's tip, one at the base, and two on the support poles, the ladder is ready to be raised. The firefighter at the base foots the ladder and gives the command to raise it. In most instances with the flat Bangor raise, this firefighter positions himself or herself on the ladder as a counterweight. The two firefighters at the tip begin to walk forward, use their arms in a hand-over-hand motion, and raise the ladder. Most of the time, these firefighters position one hand on the rung and the other on the beam.

The two firefighters on the support poles are positioned to the outside of the poles with one hand holding the butt end as described above and the other arm extended up onto the pole at a comfortable position (fig. 13–97).



Fig. 13–97. Two firefighters at the tip, one at the base, and two on the poles.

As the ladder rises, the firefighters push the support poles forward and walk with the poles. They must advance at the same rate as the firefighters raising the tip of the ladder, not running or gaining too much momentum. If they go too fast, the ladder can get away from the firefighters at the tip and cause the ladder to become

unstable. If the ladder is being raised properly, all the firefighters should feel about the same pressure or weight throughout most of the lift. Initially, the firefighters on the support poles don't feel a lot of pressure or weight, but this changes once the ladder begins to gain height and the angle increases.

When the ladder is vertical, one firefighter on the support poles proceeds to the side of the ladder with the pole. The other firefighter moves more toward the center of the ladder in line with the beam with the support pole. Now both firefighters are stabilizing the ladder at a 90-degree angle. The firefighter on the side of the ladder controls the ladder's side-to-side movement while the firefighter in front of the ladder controls the front-to-back movement (fig. 13–98).

As the ladder is being raised vertically with the halyard, the pressure on the support poles increases and the firefighters holding the poles maintain their positions and balance the ladder. Next, as the ladder lowers into the building, the firefighter on the front support pole leans back into the pole and assists in the ladder's speed and descent. Now that the ladder is positioned and needs no further adjustments, the two firefighters with the support poles walk toward the building. They place the poles toward the back of the ladder and rest them on the ground.



Fig. 13–98. One support pole to the side and another toward the center stabilize the ladder.

The support poles are not designed to act as an outrigger and carry the ladder's weight. Use caution when positioning the poles because poles angled far from the ladder can cause problems. An unsuspecting firefighter could walk into the pole or an advancing hoseline could knock it out of position.

Folding ladder

The **folding ladder**, commonly called the **closet**, **attic**, or **scissor ladder**, can do more than provide access. If a firefighter were trapped or injured in a basement, the ladder could be lowered through a small cellar window and function as a stretcher. The firefighter would roll onto it and be attached with tubular webbing or hose straps. Then the ladder could slide out of the basement. Sometimes it is necessary to remove an injured firefighter's self-contained breathing apparatus from his or her back and put it between his or her legs. Remember, the face piece must remain attached to the firefighter to deliver fresh air. Repositioning the SCBA should allow enough clearance to slide the firefighter through the small window (figs. 13-99 and 13-100).

For a firefighter facing burned-out floors or a firefighter trapped in the floor, a closet ladder might be able to span the joists to reach the firefighter or distribute the weight of the rescuing firefighters. In addition, if a firefighter were to fall through the floor and into the floor below, firefighters could bring a closet ladder through the building and lower into the hole to reach the firefighter. Once the closet ladder is open, it does not matter which end enters the hole. The ladder usually has adjustable feet at one end and a square end design at the tip. This enables the ladder to sit evenly on either end when placed on a level surface. Plus, once weight is put on the rungs, the ladder can support it in either position, upright or upside down.



Figs. 13-99 and 13-100. Using a folding ladder as a rescue device

MISCELLANEOUS LADDER USES

There are numerous other uses for ladders on the fireground, and often firefighters develop ways to use them while operating at a fire or emergency scene. The following is a short list of ways ladders can be used:

- An exhaust fan can attach to a ladder outside a window to assist in ventilation efforts.
- A ladder covered with salvage tarps, runners, or plastic can function as a chute to divert water during salvage operations.
- Ladders placed on stanchions can serve as barriers.
- Two short ladders placed on opposite sides of a fence provide access to both areas.
- A ladder can prop open or act as a safety bracket for large roll-up and garage doors.
- A ladder can be a bridge from roof to roof. These ladders should remain closed or in bedded position to offer the most structural stability and load-carrying capacities.
- A ladder can be used as a hoisting point or high anchor point for technical rescue situations and firefighter removals.
- Lights attached to ladders add additional overhead lighting.
- Ladders can latch together to form a square frame for salvage covers to become a collection area for hazmat operations or a water-holding tank.
- Two ladders on opposite walls with a plank supported by each ladder's rungs can span the distance to create a work platform.

For firefighters to operate safely on the fireground, they must comprehend and understand the evolutions and tactics described in this chapter. Firefighting is a hazardous, unavoidably dangerous activity, and operating unsafely with ladders increases the risk of a serious injury or death. It is each firefighter's responsibility to operate within safety limits during any ladder activity.

NOTES

1. Mathew Rush, "Ground Ladder Chocks," *Fire Engineering*, March 2007.
2. Michael Ciampo, "The Arm Lock Maneuver," *Fire Engineering*, March 2006.



LESSON FROM THE FIREGROUND

Over the course of the years, having worked in two “big city” fire departments in some very active units, I’ve seen that learning from actual rescues and firefighting experiences is a large part of the educational process of becoming a seasoned firefighter. During some of these experiences some minor mishaps or “close calls” were averted, mostly due to luck and training. After experiencing some of these ladder rescues and close calls as well as reading and hearing about others who experienced similar mishaps during ladder evolutions, I felt there was a need for additional training and tactics on ladder operations.

Not long after presenting a “Street-Smart Ladders” hands-on training seminar which reviewed some of the procedures in this ladder chapter, I received one of the most rewarding gifts of my career, a manila envelope in the mailbox. I opened it and sat in awe as I read about the heroic act the letter described and the photos that accompanied it. Briefly, it read:

“As the first due units arrived, they were greeted with heavy fire on the 1st and 2nd floors that was rapidly extending to the 3rd floor of a wood frame dwelling. In addition, seven occupants had already jumped from the 2nd floor and were lying on the ground with a multitude of injuries. As firefighter Kevin Galligan proceeded down the narrow alleyway, a distraught woman was dangling an infant out the window on the 3rd floor. After verbally communicating with the woman, he began to raise a 35-ft (10.7-m) ladder with the assistance of Lieutenant Daniel Santry. Firefighter Galligan proceeded up the ladder and removed the infant, handing her down to the Lieutenant, and then entered the dwelling and removed her mother, helping her safely to the ground.

Once they got to the ground the woman informed the pair that two of her teenage children were still trapped inside. Without hesitation, the two then ascended the ladder in search of the children. The first child was quickly located and removed and placed into the bucket of Tower 2. As the two searched, they located the second child and dragged her back to the window, just as their air tanks were depleted. Now the duo had to exit and allow Firefighter Eonas to enter the window in order to remove the last child.”

After reading the unit citation report, a personal letter followed. The letter briefly stated:

“As a fellow instructor and newly promoted Lieutenant, I would like to inform you that the information you were instructing was accurate and very useful to me at this fire. The methods I found particularly helpful were the modified leg lock (HELL), the arm lock maneuver, Body to the Building while raising the ladder, and victim removal operations. These methods made a lot of sense to me and utilizing them assisted me in completing the successful rescues and may very well have saved some lives. From one firefighter and instructor to another, thank you. The methods and tactics you are teaching are right-on and street smart knowledge that firefighters need. I appreciate all that you’re doing for the fire service.”

This letter is one that any fire instructor would hope to receive and one that encourages me to keep on teaching ladder techniques to the fire service. Hopefully, some of the information in this ladder chapter will also be able to help you in your firefighting career.

QUESTIONS

1. Identify the primary functions of portable ground ladders.
2. What is the minimum distance that firefighters should maintain from overhead electrical wires when raising a portable ground ladder?
3. What is the main function of a heat-sensor label?
4. A firefighter should hold onto what part of a portable ground ladder while climbing and descending to maintain three points of contact?
5. Generally, there are four classifications of portable ground ladders. A roof ladder is classified as what type of ladder?
6. When working from the side of a ladder to remove burned siding, a firefighter should perform a leg-lock maneuver. Which leg does the firefighter use to perform this tactic if he is working from the right side of the ladder?
7. Prior to climbing an extension ladder, the first firefighter to climb the ladder should ensure that what are in the locked position?
8. What should a firefighter do while cleaning an aluminum ground ladder to ensure that soot, ash, and debris are removed from the inside of each rung?
9. What are the horizontal cross members of a portable ground ladder called?
10. How frequently should portable ground ladders be inspected?
11. Why is it important to regularly check the rails and rungs of wooden ground ladders?
12. Identify and explain a critical safety factor when placing an aluminum ground ladder against a building with aluminum siding.
13. What main function is served by a firefighter footing or butting a ground ladder?
14. Prior to placing a ground ladder in position, what should a firefighter do?
15. What quick reference can a firefighter use to identify the proper length of ground ladder to reach a desired floor level?
16. What part of a ground ladder should be carried first to the positioning point and why?
17. What steps should a firefighter follow to release the hooks of a roof ladder for use?
18. Which firefighter gives the commands when carrying or raising a portable ground ladder?
19. Identify the normal range of a ladder's angle when the butt is positioned one-fourth the distance from a building.
20. When a portable ground ladder is raised to a flat roof, how many rungs should there be above the roof surface?
21. When two firefighters are performing a suitcase carry, where should the portable ground ladder be positioned?
22. When raising a portable ground ladder equipped with tormentor poles, where should the spike on the end of the tormentor pole be placed?