TOPIC #3 CFD LADDER DESCRIPTIONS & TERMINOLOGY

LADDERS USED IN THE CFD

The "Little Giant":

Type: Combination
Maximum Load Concentrated: 300 pounds
Maximum Load Distributed: 300 pounds
Height: 15 foot in straight mode and 7 foot 3 inches in "A" frame mode
Carried On: All Ladder Companies & HR Companies

Note: It may be used as a straight ladder or an "A" frame ladder. This ladder is equipped with skid resistant feet and flared legs for improved stability. This ladder has the ability to form many different angles by employing its locking system. The Little Giant ladder is ideal for use on uneven surfaces.

Collapsible Ladder or Folding Ladder:

Type: Folding
Maximum Load Concentrated: 300 pounds
Maximum Load Distributed: 300 pounds
Height: 10 feet
Carried On: All Ladder Companies, Heavy Rescue Companies and some engine companies

Note: This ladder folds so that both beams come toward each other, as the rungs pivot on their respective beams. This ladder is ideal for confined areas or spaces.

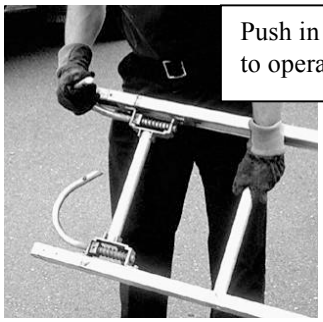
Adjustable Hook Ladders 10' -12' –14' - 16':

Type: Roof Ladder
Maximum Load Concentrated: 500 pounds
Maximum Load Distributed: 750 pounds
Height: 10, 12, 14 or 16 feet
Carried On: Ladder and Engine Companies

Notes:

- These ladders are made of fiberglass except that some of the adjustable hook ladders carried on engine companies are made of aluminum.
- Adjustable hook ladders have hooks that can be swiveled in or out, depending on the situation in which they are being used. The swivels on these ladders are carried swiveled in. To rotate the hook, pressure must be exerted downward on the hook, as it is rotated.
- These ladders will have the length indicated on the beam approximately 12" from the ends.

Hooks swivels should be kept clean and lubricated

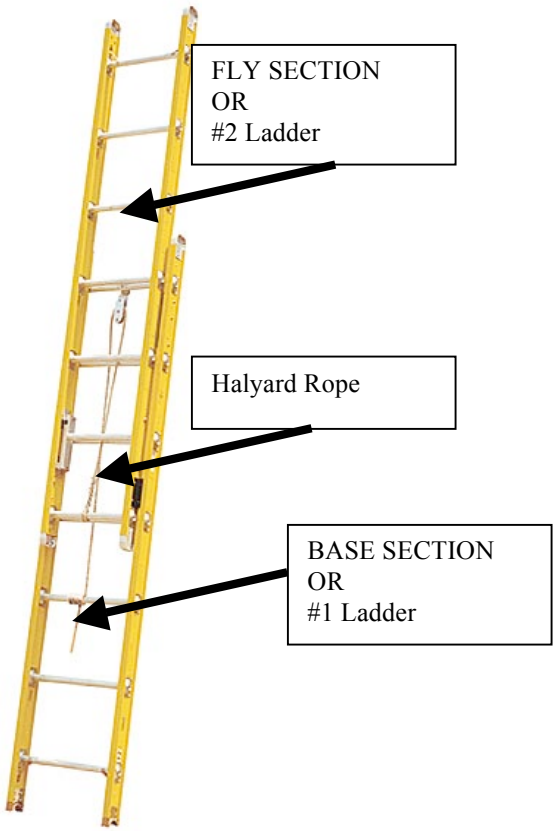


Push in & Turn to operate

Extension Ladders:

Type:	Extension Ladder
Maximum Load Concentrated:	500 pounds
Maximum Load Distributed:	750 pounds
Height:	24, 28 and 35 foot
Carried On:	Ladder Companies (28 and 35 foot) Engine Companies (24 foot)

Note: Extension ladders in the CFD are made of fiberglass, except for the 24' extension ladder, which may be made of fiberglass or aluminum. Fiberglass and aluminum ladders will have the length indicated on the beam approximately 12" from the ends. The 35 foot ladders are equipped with poles to ease raising and lowering. All extension ladders are equipped with a rope (called a halyard) to allow for extension and retraction of the ladder.



Length indicated about 12” from the ends of the ladder

Aerial Ladders:

Type:	Aerial Ladder
Height:	100 foot or 110 foot
Carried On:	Ladder Companies E-One Straight Trucks 100 and 110 foot Rosenbauer & Seagrave Straight Trucks

Note: Each Ladder Company in the CFD is equipped with a 4-ply aluminum or steel Aerial ladder. The length of the Aerial ladder may be either 100' or 110' depending on the type of apparatus.

BASIC LADDER INFORMATION

MAXIMUM LADDER LOADS:

NFPA establishes maximum ladder loadings. These maximum ladder loadings, as shown below, are only applicable if the ladder has been tested in accordance with the full load as defined in NFPA 1932.

Folding ladders	300 lbs.
Single or Roof ladders	750 lbs.* distributed or *500 Ibs. concentrated
Extension ladders	750 lbs.* distributed or *500 Ibs. concentrated

Maximum ladder load weights include all personnel and equipment and other weights such as charged hose lines. These weights are only applicable for ladders set at 75.5 degrees.

**** For other angles, NFPA recommends that the weight limit is reduced to 250 Ibs.***

If ladders have not been tested to meet NFPA 1932, do not subject them to a load greater than 250 pounds.

USEFUL INFORMATION

PLACEMENT:

- All ladders (ground or aerial) should be raised according to their intended use:
  - **Rescue** –the tip of the ladder to the sill or directly under a protruding sill for rescue operations from a small window. (Make sure the ladder is reachable by the Firefighters on the inside feeling for a ladder)
  - **Ventilating** – to the windward side with the tip of the ladder at or above the top of the window to allow for glass to fall away from the fire fighter and the smoke to blow away.
  - **Entering a big window** – to one side of the window – at least 2 to 3 rungs inside the window
  - **Roof Operations** – at least 5 rungs above the edge of the roof. If you have enough ladder to have it extend more than 5 rungs, the safer it will be for those fire fighters on the roof.
  - **Placed alongside a fire escape on a building wall** - Tip shall be 1 to 3 feet above the fire escape railing.
  - **Placed against a fire escape** - Tip shall be slightly above the fire escape railing.

- When fire fighters are climbing or working from a ladder, there should be at least one fire fighter on the butt of the ladder for safety. **Note**: *when performing rescue operations at an angle less than 75.5 degrees (ie: RAT operations), there should be at least 2 fire fighters performing an aggressive heal to prevent the ladder from kicking out.*

- Use the following guide when estimating heights for ladders:
  - Ladder raises are most often done in residential structures. For purposes of this manual, residential structures will be estimated to have 9 feet between floors (8' ceilings and 1' between floors). Windows are about 3 feet off the floor. Therefore, window heights will be as follows:
    - 2nd floor window – 12 feet
    - 3rd floor window – 21 feet
    - 4th floor window – 30 feet
    - 5th floor window – 39 feet (will not be able to reach w/ a CFD ground ladder)

- The proper distance from the building to place the butt of a ladder, with the exception of the 60-degree angle for rescues, is determined by taking the length of the ladder being used (from ground to the point of contact with the building), and dividing this distance by 4. This will give the length in feet that the ladder butt should be placed from the building.

- For the 60-degree raises, use ½ the length of ladder used to estimate the distance from the building. Example: raising a ladder to the 2nd floor window (about 18 feet). You will need a 24-foot ladder and it will need to be about 9 feet from the building.

USE THIS AS A GUIDE TO PLACE LADDERS PROPERLY

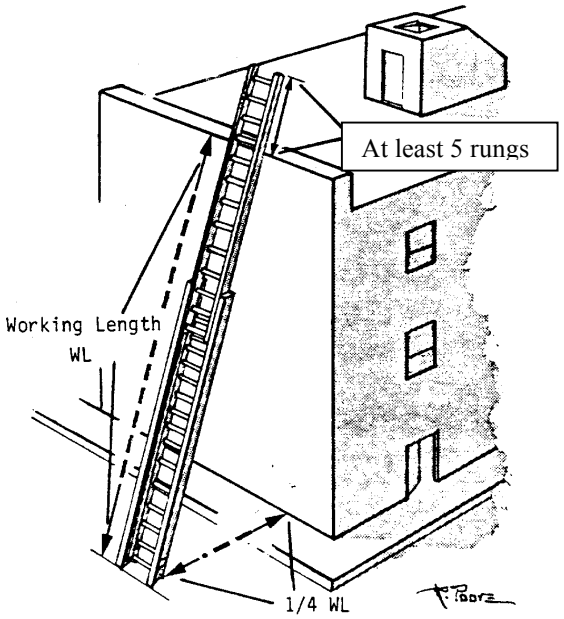
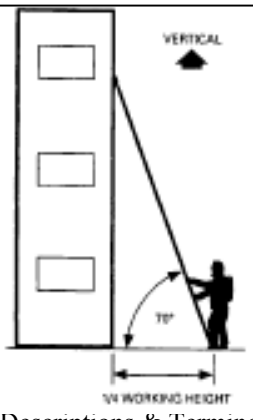
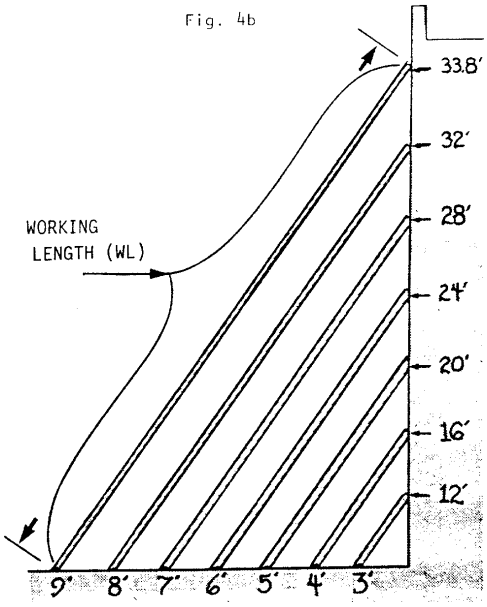


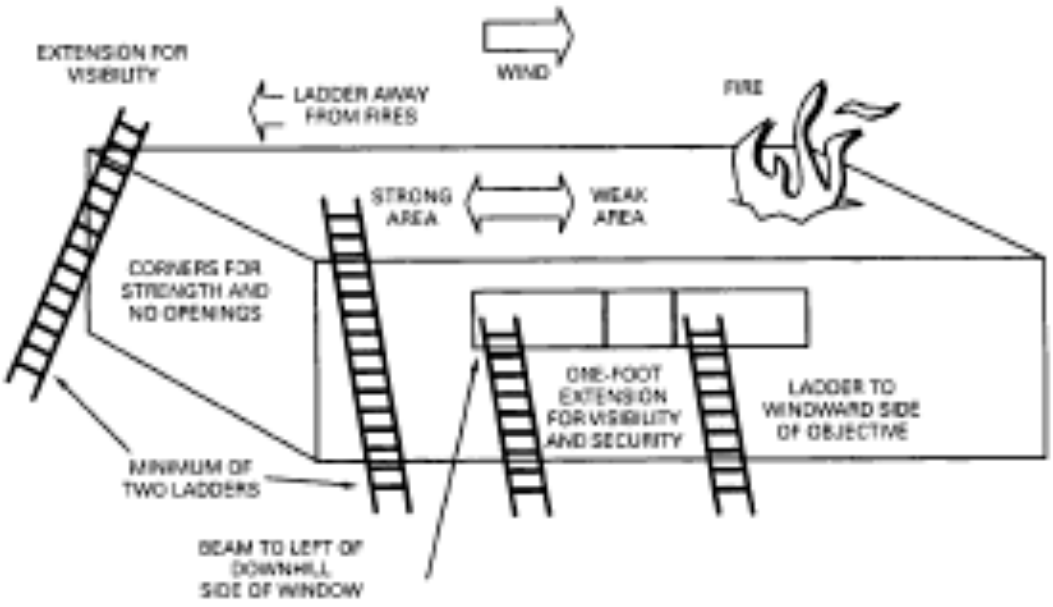
Fig. 4b





- When performing a parallel raise, the butt of the outside ladder beam should be used for spotting and should be placed in line with the near side of the window frame (from the direction you are traveling). This will permit proper placement of the ladder when boomed into the window after it has been pivoted.

ADDITIONAL FLOOR HEIGHT AND PLACEMENT INFORMATION



REMEMBER: Sometimes during life and death emergency situations, due to terrain layout, obstacles, and other unforeseen situations, ladders may have to be placed at angles other than the accepted range of 75.5 degrees to 60 degrees to get the job done. All Ladders are service tested for weight limits while being suspended parallel to the ground.

INSPECTION & CLEANING:

- Ladders are inspected and cleaned every month.
- General maintenance should begin by cleaning the ladder with soap and water, taking care to flush the inside of the rungs to remove debris, road salt, etc. (Aluminum ladders can be cleaned with a fine steel wool pad; fiberglass and wood ladders can be cleaned with a rag or sponge). Use caution near the labels so as not to remove the outer label coating.
- Once the ladder is clean, perform a visual inspection to log any possible defects. Ladders are inspected for cracked, split, loose or bent rungs and beams. Fiberglass ladders should also be checked for fraying in the fiberglass.
- Heat sensor labels should be checked every month and after each use. If the dot on the heat sensor label turns black remove the ladder from service until it is tested. If the heat sensor label has reached its expiration date, replace the label.
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Example #1 of Heat Sensor

Example #2 of Heat Sensor

- You can protect the ladder by applying a mild liquid car wax to the side rails. On extension ladders, apply paraffin wax or candle wax to the friction (slide) areas to lubricate the contact areas. Additionally, apply the wax to accessible lock parts.
- Over time, some ladders begin to warp. During visual inspection, care should be taken to observe the ladder on a flat surface (resting flat on the beams) to see if the beams of the ladder are warped from end to end.

USING LADDERS:

- When placing an aerial apparatus, be sure that the ground ladders can be removed. Engine companies should be placed so that they do not block the removal of ground ladders from either apparatus.

- The base, main or bed section of an extension ladder may also be referred to as the number 1 ladder.

- The fly section may also be referred to as the number 2 ladder.

- When picking up or setting a ladder down, the rear person will give the commands. If there are two persons on the rear, the right rear person will give the commands. The "right" is determined by the direction of travel and the direction in which the fire fighters maneuvering the ladder are facing.

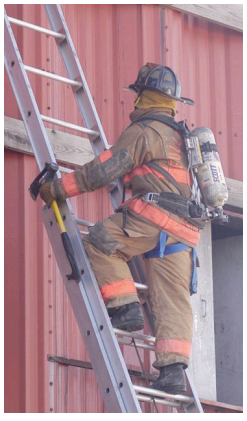
- When possible, ladder operations should begin with fire fighters on the fourth rung from the ends.

- When carrying an adjustable hook ladder on the ground, the hooks are to be rotated inwards until you reach the point of service. Upon reaching the point of service, the hooks should be swiveled out on an adjustable hook ladder before carrying it up another ladder.

- When picking up an extension ladder from the ground, grasp the rungs on the "base" or "number 1" ladder.

- Ladder companies carry their ladders with the butt to the front of the apparatus. Engine companies may carry ladders with the butt forward or butt to the rear.

- Fire fighters on the rear butt during "booming in" procedures will have one hand up and the corresponding foot back to assist in "booming in".



- When carrying equipment up or down a ladder allow sliding of the tool along the beams of the ladder as you grasp the beam with that hand.

- Climb ladders in a systematic manner, moving the same foot and hand while ascending and descending to avoid loosing control and bouncing the ladder.

EXTENSION LADDERS:

Terminology:

Boom-in - to lower a ladder from the vertical position to the point of service.
Boom-out - to raise a ladder from the point of service to a vertical position.
Raise - moving a ladder from a horizontal to a vertical position.
Lower - moving a ladder from a vertical to a horizontal position.
Pivot - to turn a ladder on the beam while it is in the vertical position.
Extend - to increase the length of an extension ladder.
Retract - to decrease the length of an extension ladder.
Butting - to apply pressure at the base of a ladder (usually on the first rung or bottom of the beams)

- A 35' extension ladder can be raised by three or more fire fighters.(two in an emergency)

- A halyard is a rope used to extend and retract a ladder. Always use the halyard in a hand / over / hand method

- A member may "tie-in" or “lock-in” on a ground ladder in order to work safely from the ladder. The member climbs the ladder and places the leg, opposite the working side of the ladder, over a convenient rung. The member then drops the leg, on the working side of the ladder, to the next lower rung to "lock-in" the upper leg. This will anchor the member so that they may perform window ventilation, overhauling of box gutters, pulling of siding, etc.

SPECIFIC POSITION / TASK INFORMATION

BUTT PERSON

- A person must always be on the front butt when "Booming-in" or "Booming -out".
- A person must be on the rear butt whenever a pivot is made.
- When "Booming- in" or "Booming-out", the front butt person will have both feet on the bottom rung and both hands on a convenient rung.
- When pivoting, the fire fighters on the butt should assist the pole men in pivoting the ladder.
- Fire fighters at the butt will keep their head down while "Booming-in" or "Booming-out" in order to protect themselves from falling debris.
- If the ladder begins to tilt or slide, the fire fighters at the butt should apply downward pressure to stabilize the ladder. Pressure should be applied to the high side when possible.
- While "Booming-in", the rear butt person will have one hand in the center of the rung at shoulder height and his corresponding foot will be back with his body in a straight line. The other hand will be on a rung below and the other foot will be forward.

POLE PERSON

- Only one pole person may move at any given time.
- Fire fighters on the poles will be on the outside of the poles, facing each other, except in the three person raise. *(see the 3 person raises for more information)*
- When one fire fighter has both poles, the poles are tucked under the armpits. Either foot may be forward.
- When a ladder is raised parallel to a building, the pole person closest to the building will move first.
- When lowering a ladder so that it is parallel to the building, the pole person opposite the intended lowering direction will move first.

- When pivoting, the pole person on the wide side of the beam pulls the ladder toward himself.

- When pivoting, the pole person on the narrow side of the beam will allow the pole to turn in his hands, while keeping both feet on the ground for balance.

- Poles are to be "set" only when the ladder is raised on soft ground. If both poles cannot be used, then no poles should be used. (The use of only one pole is not recommended) **NEVER SET POLES ON CONCRETE OR HARD GROUND**

- Fire fighters on the poles should take a good athletic stance, with the poles crossing the chest. The poles should be held with the thumbs toward the top of the ladder. The pole should extend past the body to allow the fire fighter to "give" with the ladder.

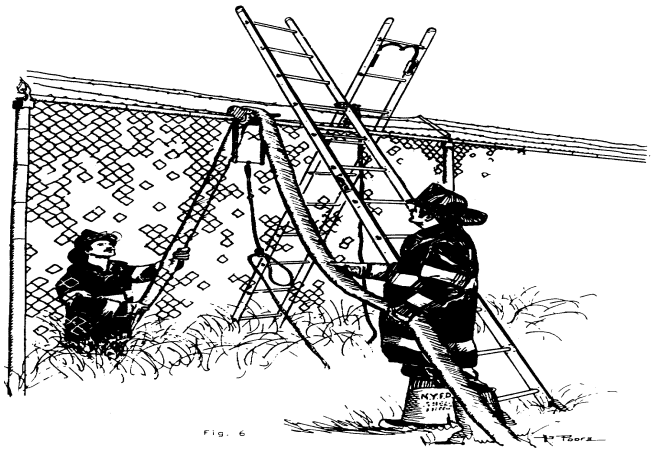
OTHER USES OF PORTABLE LADDERS

Portable ladders may be used in many ways and with different tools to perform a variety of functions at fires and emergencies. The most innovative uses of ladders have resulted from quick responses to unusual situations.

Uses of portable ladders at fires or emergencies may include:

- **Used to Bridge a Fence, Wall or other Obstacle** - At times it's necessary to gain access to a particular area surrounded by a high fence or other obstacle with no immediately available entry way. If the situation does not require cutting the fence, entrance may be gained by using two short portable ladders, e.g., a short extension ladder and a adjustable hook ladder, and a short length of rope or hose strap. (Figure 6)
  - One ladder is placed against the fence at the proper climbing angle and butted by a member.
  - One man ascends the ladder to the point where the top of the fence is at about waist level.
  - The butt end of the second ladder is passed to the member on the first ladder. He in turn takes the ladder and places one beam on top of the fence. The second ladder is slid out a sufficient distance, pivoted downward from the fence top, and lowered to the ground.
  - The second ladder is adjusted to provide a proper climbing angle.
  - The adjacent beams of the two ladders are tied together securely where they intersect, to prevent ladder movement during use.
  - **Note:** The heavier of the two ladders is used first against the fence because of its heavier weight. The smaller ladder is lighter and less cumbersome and may be passed more readily over the fence. Other combinations of short ladders may be used, depending on the height of the fence to be laddered and the available ladder inventory.

Figure 6



- **Used as a Barrier** - Portable ladders may be utilized as barriers to dangerous areas or conditions, to protect members or civilians from injury.
  - A portable ladder secured across a doorway in an area where operations are in progress will indicate that entrance to that section or room of the building is restricted.
  - Portable ladders placed on one beam, elevated to the waist level on supports and properly secured, can act as a barrier to civilian pedestrian traffic near a hazardous condition or fire operation.
  - Short ladders may be placed over holes in floors of buildings to prevent members from falling through during operations.
  - During any operation where ladders are used as barriers and exposed to the public, care must be exercised to prevent theft.

Other Uses of Portable Ladders at Fires:

- **Forcible Entry** – Portable ladders should only be used to break windows to allow for egress points or provide ventilation when the use of a ceiling hook or other tool is not advantageous.
  - **Ventilating Lexan Windows** - some occupancies have used Lexan panels instead of conventional glass in their windows. At times, the Lexan panel is protected by a wire screen on the exterior. These windows may be forced with a portable ladder if the window is at ground level.
    - Remove the exterior screen.
    - Place the butt of the ladder on the Lexan window in the corner adjacent to the window frame.
    - Three or four members apply a gradual leaning pressure against the window until it is forced inward.
    - If a section of window snaps off, continue forcing around the window perimeter until a sufficient opening has been made.

- **Ventilation of windows on upper floors** may be accomplished by the use of portable ladders with or without a member operating from the ladder.

  - **Member on the Ladder:**
    - The ladder is placed upwind from the window to be ventilated. The placement should provide a margin of safety to the member if the fire extends out of the window.
    - The tip of the ladder, if possible, should be level with, or higher than the top of the window.
    - The member should climb to the tip of the ladder so their hands are at a point above the window that is to be broken.
    - The member's eye shield shall be in the down position.
    - When the member is positioned on the ladder and prepares to use a tool to ventilate the window (a 6 foot hook is preferable), he should extend his arms out and slant the tool downward and strike the glass. This will prevent the window glass from sliding down the tool handle and causing injury to the member.
    - Placing the ladder upwind from the window will allow the falling glass, to some degree, to be blown away from the member butting the ladder below.
  - **Portable ladder with only one member:**
    - The member using a portable ladder to ventilate a window must wear full firefighting clothing, eye shield down. This will help prevent injury if he is struck by failing glass.
    - The ladder should be positioned so that it will break the desired window glass area when dropped against the window.
    - When the ladder strikes the glass, there should be no contact between the member and the ladder. The reason for this is that there is a great probability that the window glass will slide down the ladder beams. By the member maintaining a ‘no contact’ position, he reduces the chances of personal injury. Care should also be taken to insure that no other personnel are in the ‘danger area’.
    - As soon as the glass sections have fallen or are clear of the ladder, the member must stabilize the ladder to prevent its falling to the ground.

OTHER USES:

- Hook ladders, in addition to their use as conventional straight ladders, may be used on sloping roofs, to gain access to bulkheads, or any other application where a hanging ladder may be required. To prevent slipping on peaked roofs, set hooks into roof by pulling down on ladder.
- Portable ladders may be placed over weakened, damaged or burnt-out stairs in order to safely gain access to upper stories of a building.
- Portable ladders may be used to gain access to a higher or lower roof level from an adjoining roof
- When portable ladders are placed over holes in a floor or roof or over a shaft opening, they aid in preventing members from falling into these unprotected openings. Other objects placed on top of the ladder will identify the hazard and can provide additional coverage over the opening.
- **ONLY FOR EMERGENCIES:** Portable ladders used in bridging operations can span courts, alleys, shafts and similar openings between floors and roofs. Extension ladders must be used only in the nested position when bridging.
- In order to prevent electrically operated overhead doors from closing when power in the fire building is shut down or affected by fire, a short ladder may be used to chock the door in the open position.
- When a ladder has been positioned and used by a member to gain entry to a fire building, there is the possibility that he will also need it as a means of retreat. He expects the ladder to be there. Therefore, do not move or reposition a ladder used in this manner except if it is necessary to use the ladder for rescue.

USES OF PORTABLE LADDERS - EMERGENCIES

- In order to perform an emergency search, portable ladders may be used as a brace where there is partial collapse of a floor area. The ladders may be used singly or in groups depending upon the extent of the collapse and the amount of stress to which the ladders will be subject. To insure that the searching members' lives are not jeopardized, the collapse condition must not be underestimated. Therefore extreme care and judgment must be exercised.

- Portable ladders may be used in an emergency to shore excavations, or reinforce weakened walls. The proper placement of ladders and planks can prevent refilling of areas that are being dug out.

- During winter months, portable ladders may be used for the rescue of victims that have fallen through ice that has formed on bodies of water. Laid flat on the ice, the ladder distributes the weight of the rescuer and/or the victims over a larger area of ice. It thereby reduces the total weight concentrated at any one point.

    - If it is necessary for a member to proceed out on the ladder to attempt rescue, he shall be secured with a life safety rope as a safety precaution.

SAFETY

General

- During freezing weather when ice forms on the ladder due to water spray, to ensure safe ascending and descending:
  - Position the rung of the ladder under the arch of the boot, next to the heel.
  - Position the feet on the rungs directly next to the beams with each step, to avoid slipping.
  - The hands remain on the underside of the beams. Should a member slip while climbing, he should immediately pull himself into the ladder and regain his footing.

- Whenever a member operates on a ladder of any kind, he must have enough hand control to ensure his safety. This is an absolute necessity when on vertical ladders, such as fire escape drop ladders and gooseneck ladders to the roof. Greater physical effort is needed when using a completely vertical ladder, because a missed step or a slip of the hand will result in a vertical drop and a serious injury. A similar mishap on a ladder which is angled into an objective could result in the member falling toward the ladder other than straight down.

- Checking Ladder Lock Assemblies:

  - The mechanical ladder lock assemblies on the extension ladders are positive action automatic spring loaded locks. If in good condition, they will work and lock in either the fly up or the fly down position. The advantage of the fly up position is that the fly ladder tends to tighten its hold on the bed ladder, when it is extended at the proper climbing angle. **For this reason and for standardization, the CFD has adopted the fly up position for the placement of extension ladders.**
    - The first member ascending the ladder should always check the ladder lock assemblies to insure that they are completely engaged on the rung.
    - Before dismounting from ladder, the surface to be stepped on should be probed with a tool for stability, especially when visibility is poor.
- Extension ladders in general are not made to be taken apart and used as single section ladders. The upper sections normally are not furnished with any type of safety foot. Therefore they are prone to slip when used as a single ladder.

- Extension ladders should never be used upside down, that is, with the round ends down, since this will cause the ladder to slip on the ground. Also, the lock assemblies will not be able to function correctly.

- When an extension ladder is raised, the halyard shall be tied off to the lower section of the ladder as a safety measure and prevent the ladder locks from accidentally unlocking by a pull on the rope.

- Make sure the ladder is set on a firm foundation. Before climbing, take care to see that it does not wobble.

- Ladders should never be placed against window panes, window sashes, or loose boxes, barrels, or other surfaces that may break or collapse.

- Always face the ladder when ascending or descending.

- When a ladder is resting against a building, do not climb higher than the third rung from the top on either straight or extension ladders.

- Resist the temptation to overreach. It is better to get down and move the ladder.

- Never maintain a defective ladder in service. When a defect in a ladder is found during an in-quarters inspection or damaged at a fire, remove the ladder from service and notify Central Stores or Administration for their recommendation as to collection, repair or replacement.

- Hooks of roof ladders in general are used to secure the ladder over the peak of a house or to hang it from a wall edge or window opening. Be sure the bolts are secure on the roof hooks and that the hooks have not been accidentally bent open.

- Many pumper extension ladders, when in position in the ladder holding brackets on the side of the apparatus, protrude enough to create a potentially hazardous condition. Care should be exercised when mounting the back step of the pumper or when walking around the end of the pumper. All ladders overhanging the end of an apparatus should have a protective cover.

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- Electrical Hazards:

  - Both metal and, under certain conditions, fiberglass portable ladders can conduct electricity. The fact that a metal ladder will conduct electricity is obvious. However, wet fiberglass ladders or the metal component parts such as tie rods, ladder lock assemblies and the like, when in contact with electrical wires or equipment can do likewise.
  - Whenever a portable ladder is to be raised and transported in a vertical position, special care must be exercised near overhead electrical wires.
    - As a general rule don't use ladders within 10 feet of electrical wires.
  - If a member becomes part of an electrical circuit, either by raising a ladder that touches a live wire or by the member touching a live wire while on a ladder, he can receive an electrical shock and be seriously or fatally injured.
  - Depending upon the voltage in overhead wires, the proximity of a metal ladder to them, and the quality of the grounds (ladder and electrical circuit), it may not be necessary to actually touch the wires to suffer an electrical shock. Electrical current can arc and jump the distance between the ladder and the wires and cause death to an unsuspecting member.

- Safety During Operations:

  - (**EXCEPT FOR RAT RAISES**) After a portable extension ladder has been raised and placed into a position against a building, do not lower the ladder by pulling the butt end further away from the building.
    - Doing it will reduce the load capacity as the angle becomes more shallow.
    - There is a great possibility that it will unlock the lock assemblies in the upper section.
    - Always lower the fly ladder below the desired level and re-raise it in order to insure a safe 65 - 75 degree climbing angle and also the proper locking action of the lock assemblies.

  - When ventilating the upper windows of a building with a portable ladder, watch for glass shards sliding down the beam.

  - When placing a metal portable ladder against a building constructed with an aluminum siding exterior, the member should release the ladder before contact is made with the building.

- You will not usually know; however, there have been occasions when the aluminum siding was energized due to a faulty electrical service connection or a faulty ground, or due to the service being damaged by fire conditions. If a member places an aluminum ladder on such a building, he could make himself part of an electrical circuit and receive an electric shock.

- Position metal ladders away from electrical service wires entering buildings from utility poles. Injury to a member can be caused by the member brushing against wires having an outer insulation covering that is in a deteriorated condition.

- When operations are to be conducted at electrical generating stations or substations, under NO circumstances shall metal ladders or tools be brought inside the gates.

    - In these facilities, never place a ladder of any type, fiberglass, wood or metal, against what appears to be metal superstructure. It may turn out to be some form of electrical conductor.