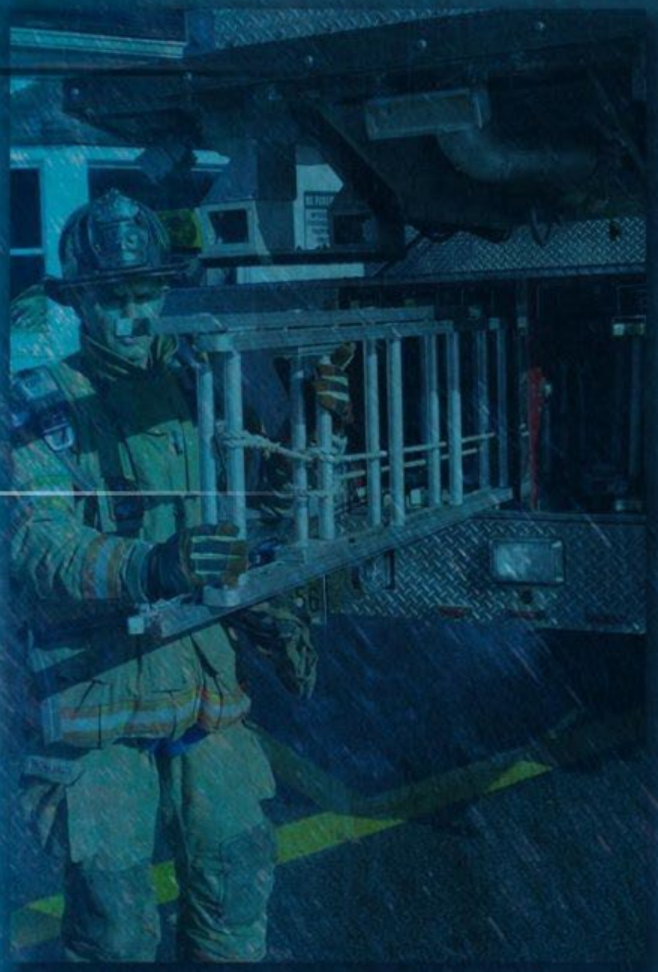
CHAPTER 13



Ladders

Module 7

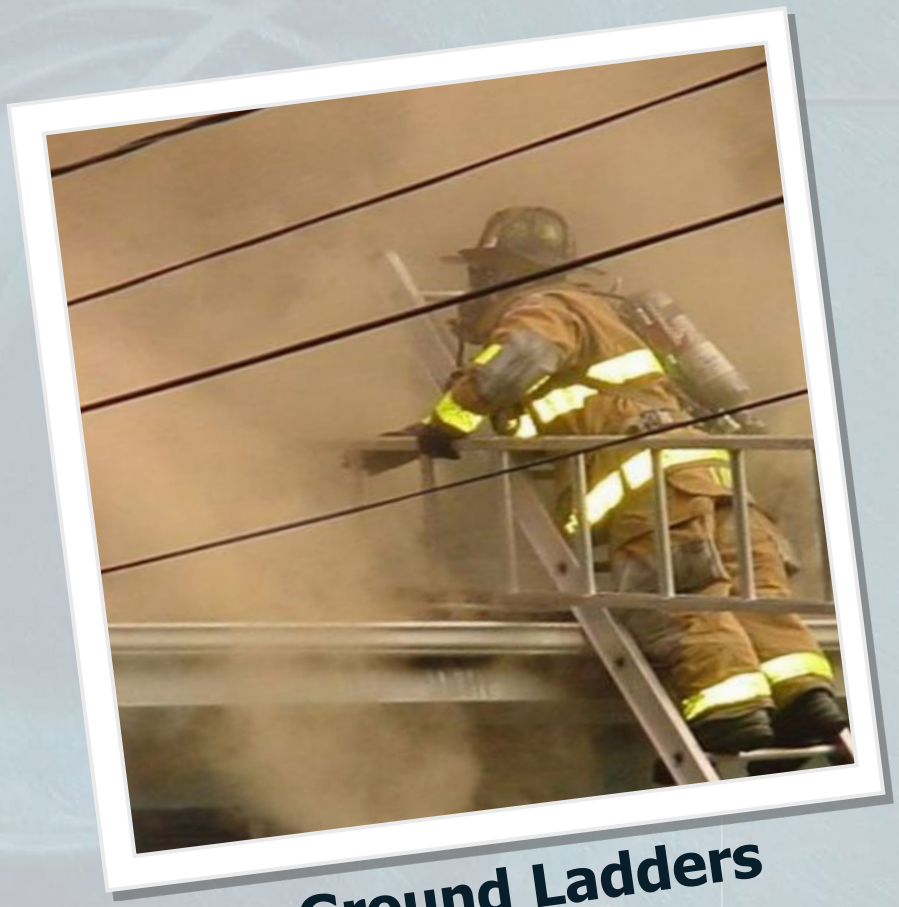
(Training & Equipment Manual 304)

Critical fireground operations rely on proper placement of ladders

Photos courtesy of Anthony Delucia, Thomas Lenart,Chris Saracenco and Robert Yates

Two Types of Fire Service Ladders

Types of Ladders



Ground Ladders (under 50′)

Photo courtesy of M. Kuhar

Aerial Ladders (over 50′)

Photo courtesy of Kevin Soucie

Apparatus-Mounted Ladders

Types of Ladders

Aerial Ladder

- Permanently mounted telescoping ladder
- Constructed of steel or aluminum
- Uses a hydraulic system with steel cables and pulleys
- Typically 65’ – 100’
- May have pre-piped waterway

Apparatus-Mounted Ladders

Types of Ladders

Platform

Photo courtesy of Thomas Lenart

Photo courtesy of Frank Ricci

Straight Stick

Apparatus-Mounted Ladders

Types of Ladders

Quint Ladder

- Performs both ladder and engine functions
- Equipped with:
  - Pump, tank and hose
  - Aerial with waterway
  - Compliment of ground ladders

Photo courtesy of Matt Fernandez

Ground Ladders

Types of Ladders

Straight Ladder

- Single section
- Fixed length: 12’ to 20’ long
- FFD uses aluminum roof ladders as straight ladders
- Engines carry one 14’
- Trucks carry a compliment of 14’, 16’, and/or 20’ roof ladders

Ground Ladders

Types of Ladders

Roof Ladder

- Straight ladder: 14’-20’ long
- Spring loaded hooks mounted to tip
- Hooks allow ladder to bite into roof ridge
- Provides stable work platform

Ground Ladders

Types of Ladders

Extension Ladder

- Adjustable ladder with two or more sections
- Typically 24’ – 50’ lengths
- More flexibility to reach different heights
- Larger ladders equipped with tormentor poles (No longer used)
- FFD utilizes 10’, 14’, 24’, and 35’ extension ladders

Ground Ladders

Types of Ladders

Folding (Attic) Ladder

- Narrow, collapsible ladder
- Ideal for small and narrow spaces

Photo courtesy of Robert Yates

Ground Ladders

Types of Ladders

Fresno Ladder

- Narrow extension ladder
- No pulleys or halyards; raised manually by pushing up fly
- Provides access to narrow areas
- FFD utilizes 10’ and 14’ Fresno ladders

Construction Materials

Structural Components of Ladders

Wood

Aluminum (FFD)

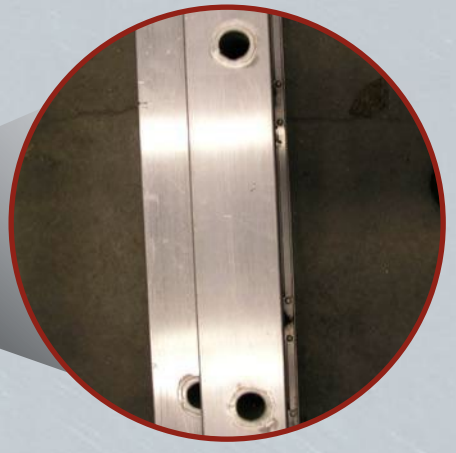
Fiberglass

Components of a Ladder

Structural Components of Ladders

Beam main structural component

- Supports the rungs at 14” intervals
- Trussed Beam
- Solid Beam (FFD)
- I-Beam



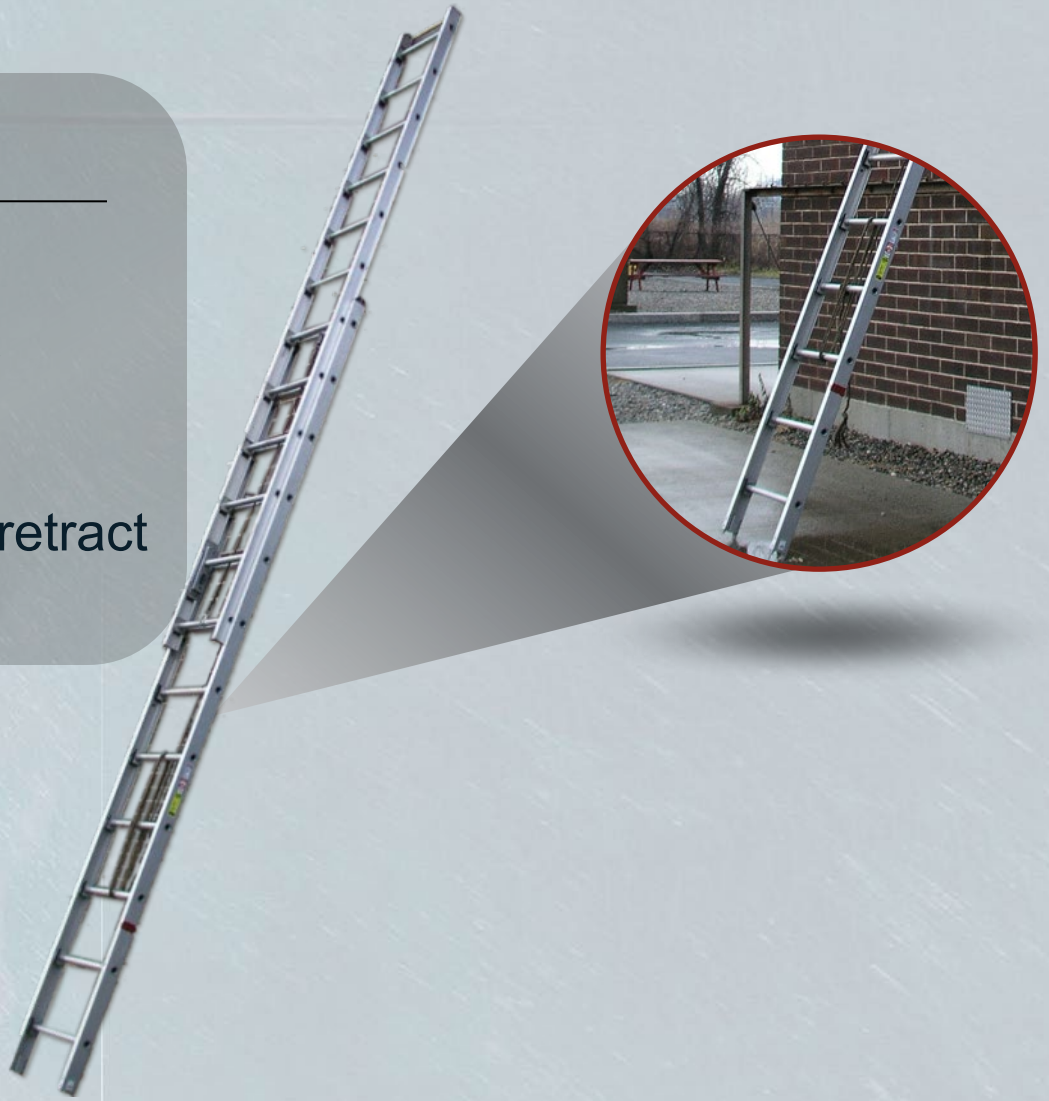
Trussed Solid I-Beam

Components of a Ladder

Structural Components of Ladders

Bed section

- Bottom section
- In touch with ground or apparatus
- Widest section, others retract into it

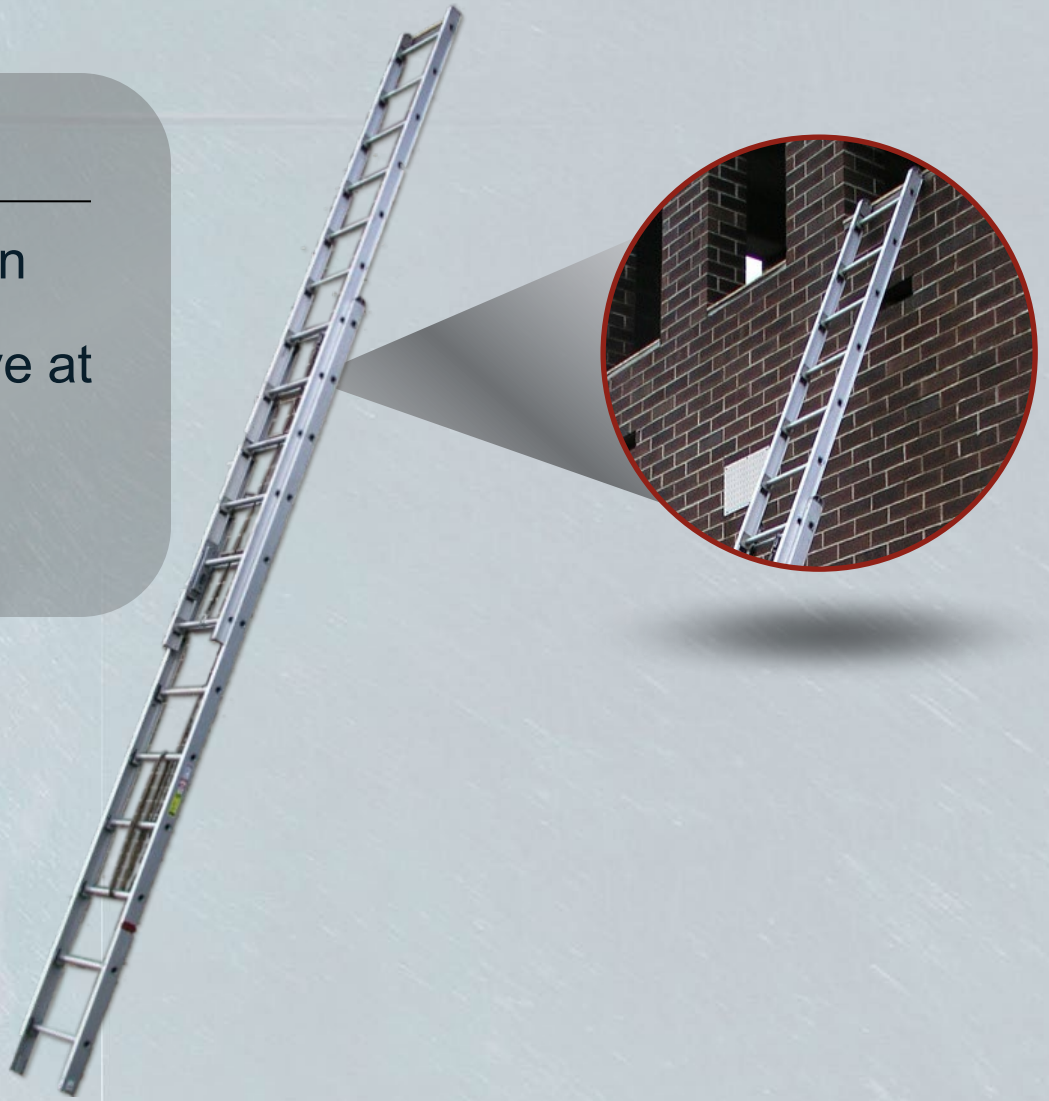


Components of a Ladder

Structural Components of Ladders

Fly section

- Extends from bed section
- Multiple fly sections move at same time
- Narrower than base



Components of a Ladder

Structural Components of Ladders

Butt (spur)

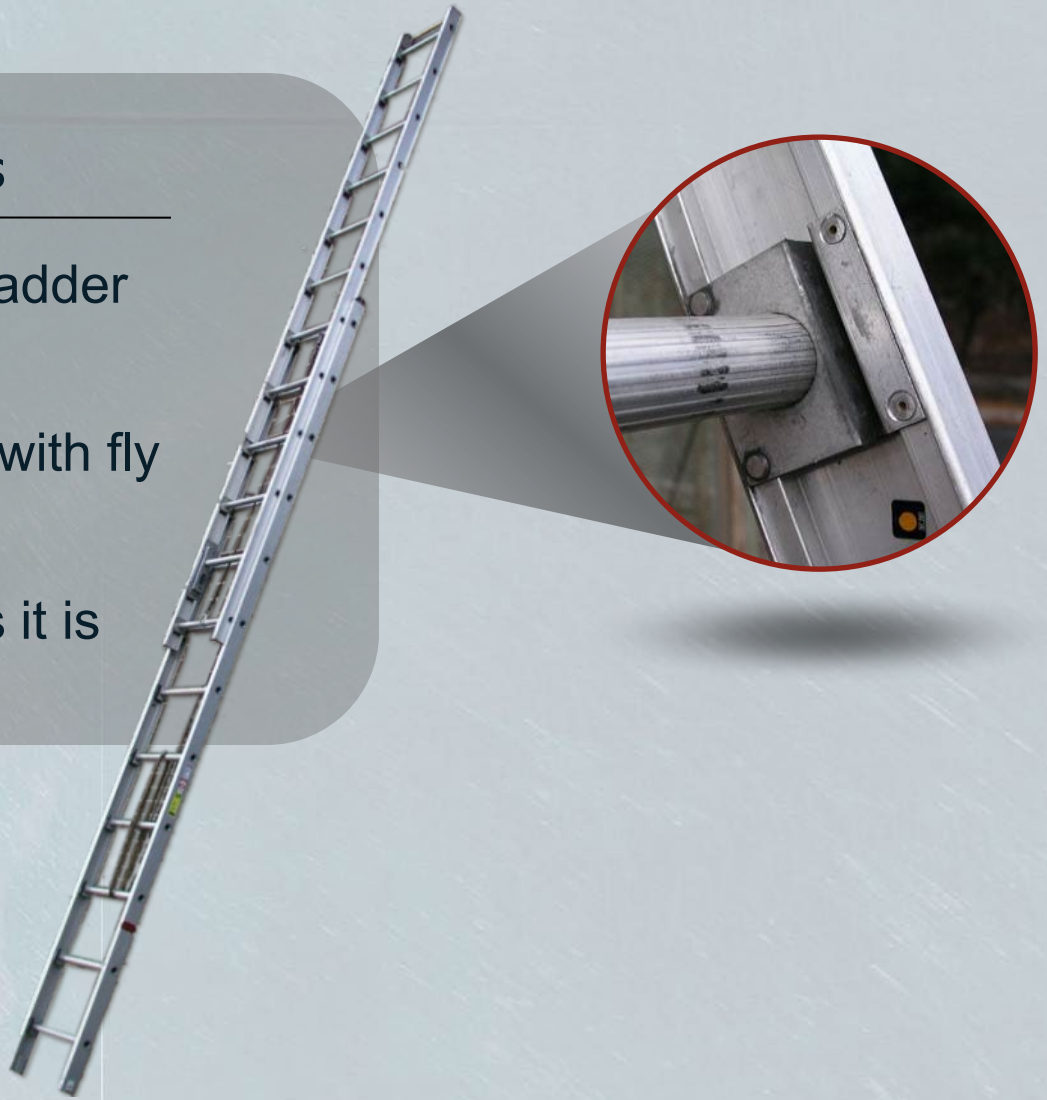
- Base of ladder or bed section
- Designed to prevent ladder from slipping

Components of a Ladder

Structural Components of Ladders

Channel guides

- A channel or slot in the ladder beam
- Supports and interlocks with fly section
- Guides the fly section as it is raised



Components of a Ladder

Structural Components of Ladders

Dogs

- Mounted on end of beams of fly section
- Spring-loaded
- Engages rungs on bed section as it is raised

Components of a Ladder

Structural Components of Ladders

Heat sensor labels

- Small orange sticker
- Attached in various locations
- Turns black when heated over 300º F

Exposure

No Exposure

Components of a Ladder

Structural Components of Ladders

Halyard

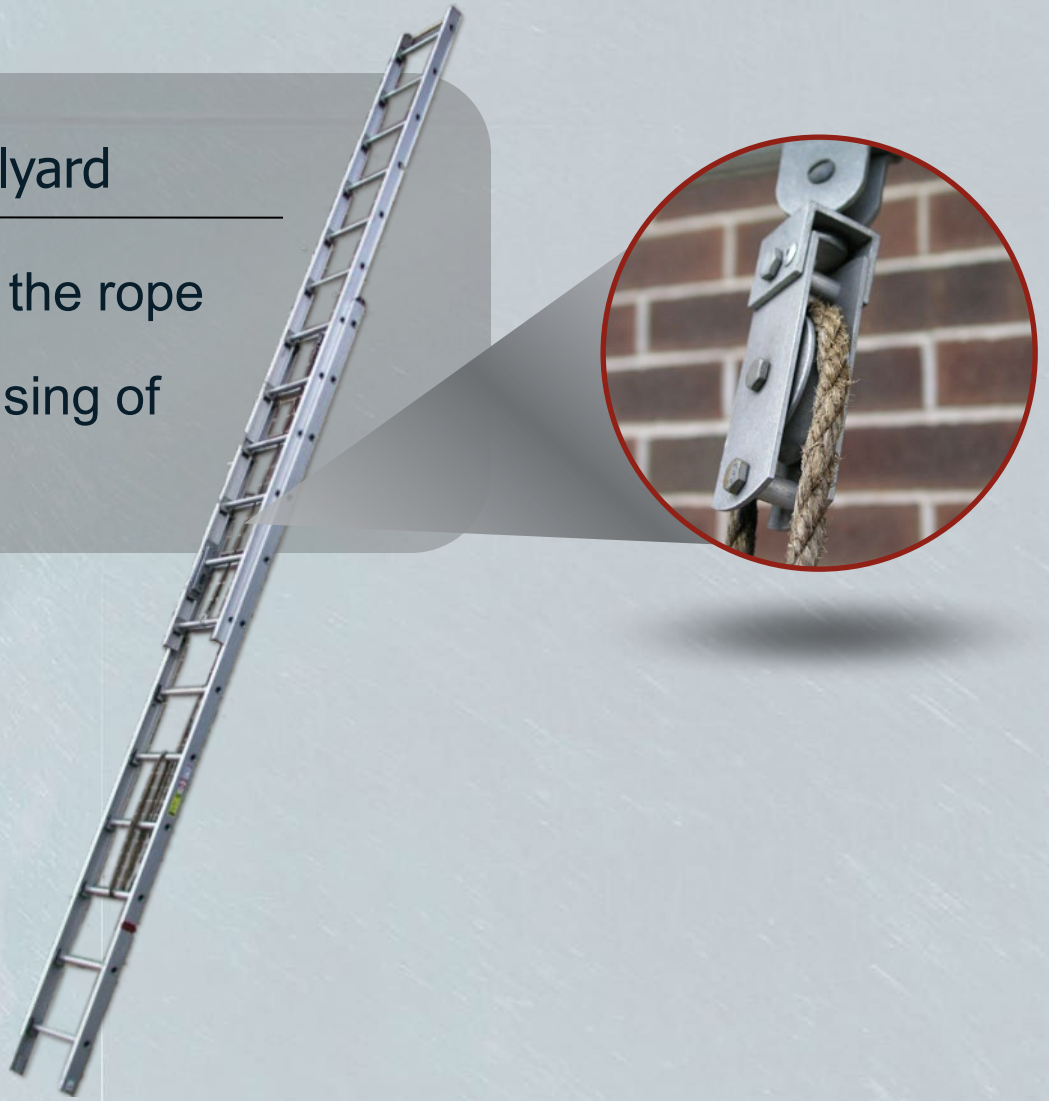
- Manilla or nylon rope
- Used to extend or retract fly section

Components of a Ladder

Structural Components of Ladders

Pulley for halyard

- Reduces friction on the rope
- Allows for easier raising of the fly section



Components of a Ladder

Structural Components of Ladders

Rungs

- Horizontal cross members tie beams together
- Circular in design with rung spacing of 14”

Components of a Ladder

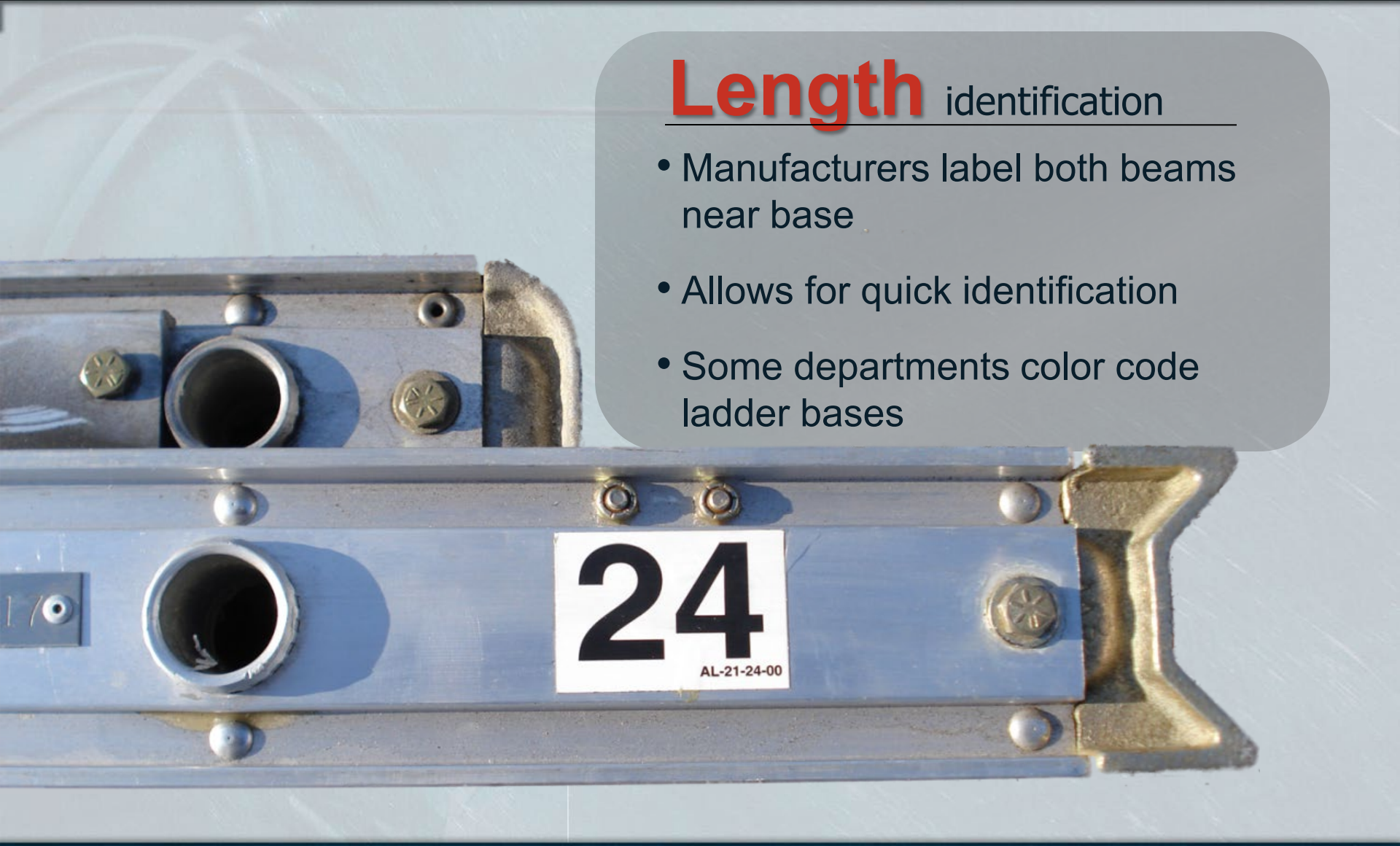
Structural Components of Ladders

Tip

- Top of ladder or fly section
- Should rest squarely against the building

Easy Identification of Length

Marking Ladders

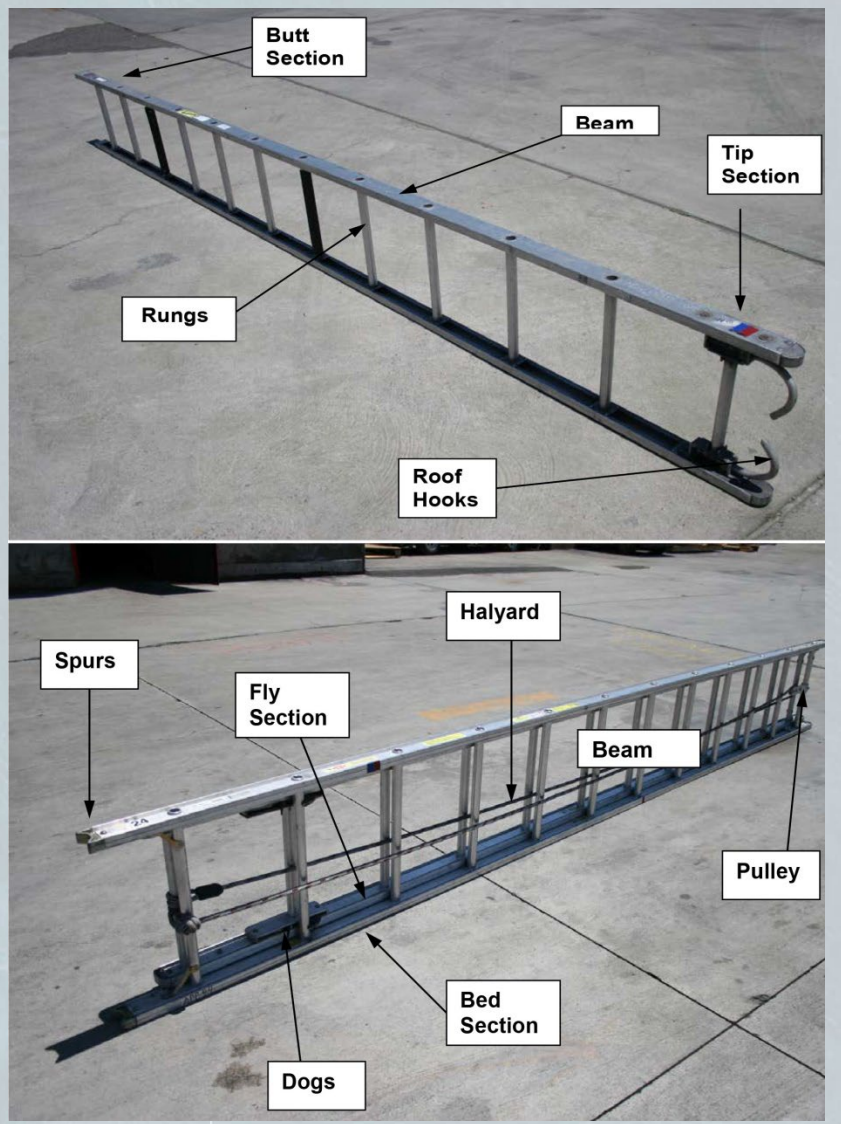


Length identification

- Manufacturers label both beams near base
- Allows for quick identification
- Some departments color code ladder bases

Components of a Ladder

Review



Ladder Maintenance

Maintenance, Inspection & Cleaning

Exposed

to harsh conditions

Photo courtesy of Frank Ricci

Must

be cleaned, maintained and inspected weekly per T&E Manual 304.003

Inspection Procedure

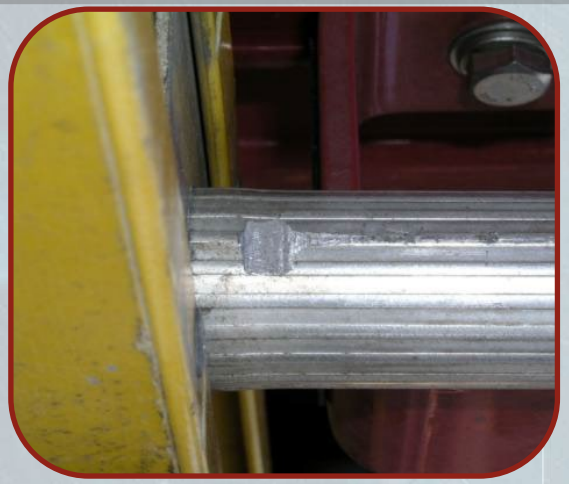
Ensure all components are in good order

Halyard	Feet	Dogs
Rungs	Tip	Ladder hooks
Beams	Channel guides	Heat sensors
Ladder locks	Pulleys	

Inspection Procedure

Check all components for

- Gouges
- Chips
- Dents
- Sharp Edges



Service & Load Testing of Portable Ladders

Annually
on portable ladders

or

Exposure
to possible damage

- Dropped
- Overloaded
- Exposure to high heat
- Structural damage
- Repaired
- Unsure of serviceability

Testing Requirements

Maintenance, Inspection & Cleaning

- All Department ground ladders are tested annually by a certified vendor during the months of September and October.

Safety Guidelines

Operating Safely with Ladders

Use ladders safely

- Work in teams to prevent injury
- Any ground ladder greater than 16’ must be handled by 2 Explorers
- Maintain a 10’ distance from power lines
- Look for trees, overhangs, canopies, elevated decks, or platforms
- Full PPE

Photo courtesy of Jim Duffy

Always

- Lift ladder from ground using leg muscles
  - Avoids injury to the back

Safety Guidelines

Operating Safely with Ladders

Always

- Ascend and descend facing the rungs

Photo courtesy of Patrick Egan

Working from the Ladder

Operating Safely with Ladders

Photo courtesy of Patrick Egan

Safety first

- Do not overreach when working on a ladder
- Always use an arm or leg lock
- Ensure 4 points of contact for the ladder
- Keep 3 points of contact on the ladder
- Always have someone footing the ladder, unless it is tied off

Selection Considerations

Selecting the Proper Ladder

Quickly determine

- Where does the ladder have to be placed?
- What length is needed?
- What purpose is it being used for?

Photo courtesy of Michael Schwartzberg

Photo courtesy of Thomas Lenart

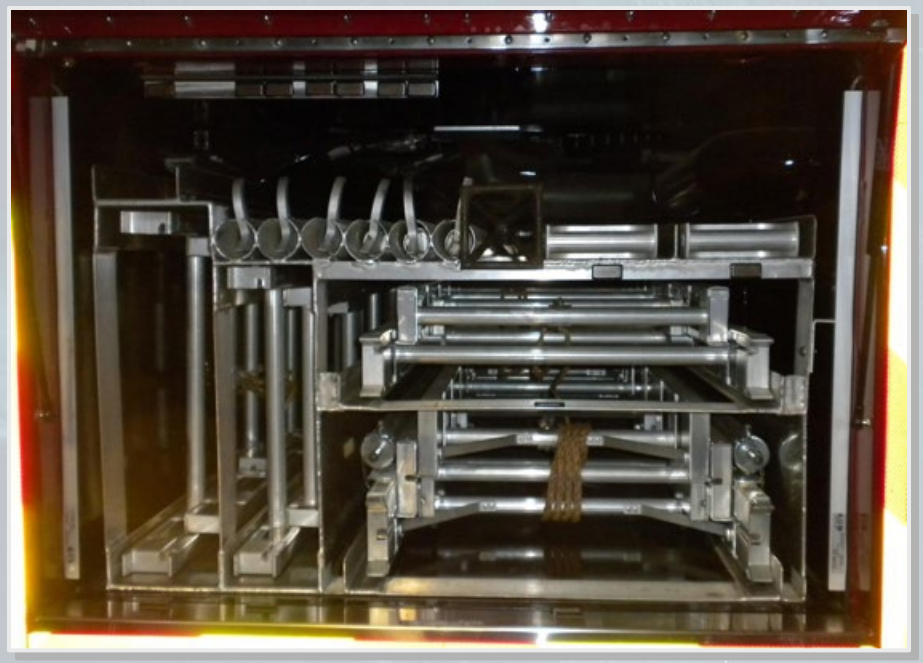
Photo courtesy of John Rainey

FFD Typical Complement of Ladders

Selecting the Proper Ladder

Engines

- 24’ Extension Ladder
- 14’ Roof Ladder
- 10’ Fresno Ladder



Trucks

- 35’ Extension Ladder
- 24’ Extension Ladder
- (2) 16’ Roof Ladders
- 14’ Fresno Ladder
- 10’ Folding Attic Ladder

Ladder Length vs. Working Length

Selecting the Proper Ladder

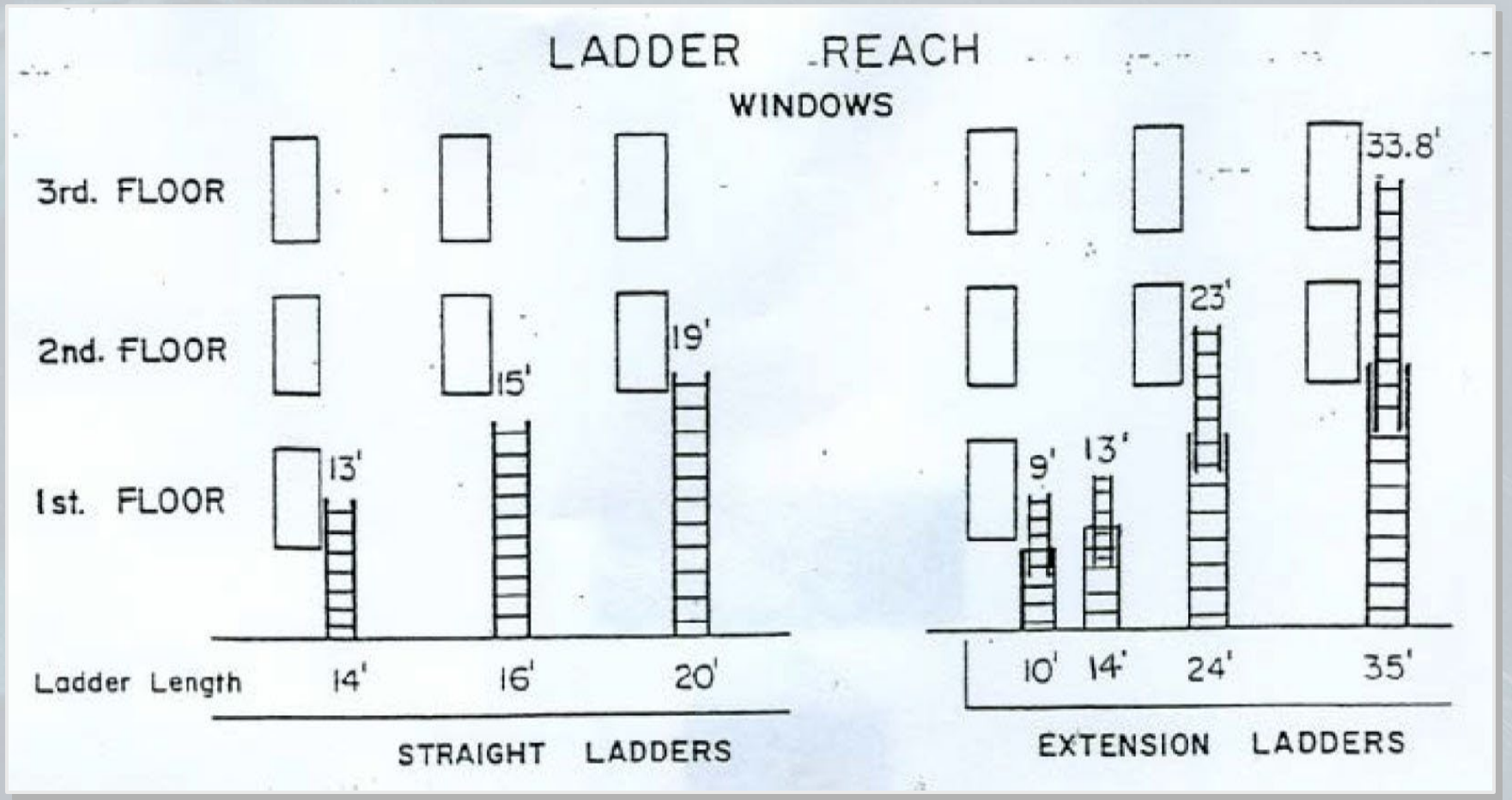


Photo courtesy of PJ Norwood

Ladder Placement

Operating Safely with Ladders

Caution when placing ladders

Placing ladder in front of door/window:

- Blocks means of egress and ingress
- Could be knocked off of balance by a charged hose line

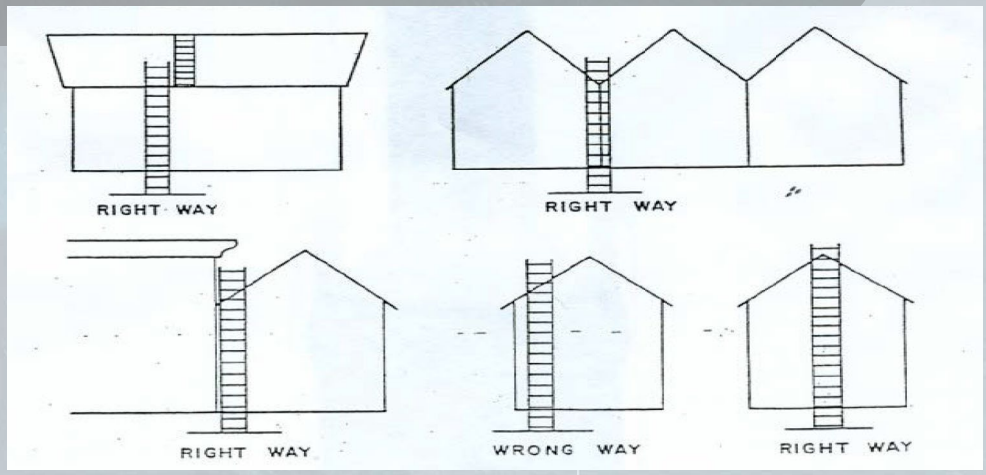


Photo courtesy of Frank Ricci

Setting the Proper Climbing Angle

Placement, Climbing, and Operational Guidelines

Ladder climbing angle

- Must be set at a 65º to 75º angle
- Anything greater than 75º is too steep and can result in injury

Photo courtesy of Rob Ladd

Setting the Proper Climbing Angle

Placement, Climbing, and Operational Guidelines

Check the climbing angle

- Stand in front of ladder
- Reach outward at chest level, arms extended
- Rung should be in a comfortable location for climbing
- Double-check using label on beam

Ladder Orientation

Placement, Climbing, and Operational Guidelines

Fly position

- Most ladders require fly section to be out
- Follow manufacturers guidelines

Raising the Ladder – Position Assignments

Placement, Climbing, and Operational Guidelines

Butt position

- Hand-over-hand motion on halyard
- Listen for clicks of the dogs
- Never place hands on the rungs

Raising the Ladder – Position Assignments

Placement, Climbing, and Operational Guidelines

Front position

- Supports ladder with right or left foot
- Notifies butt firefighter when ladder is properly extended

Raising the Ladder

Placement, Climbing, and Operational Guidelines

Lower ladder

- When proper height is achieved
- Lower ladder slowly into objective

Butting or Footing the Ladder

Placement, Climbing, and Operational Guidelines

Stabilizes

ladder and prevents movement

Front

Rear

Anchor

Must

be done before climbing

Front

- Apply pressure with one boot against the base
- If a firefighter is working off one side of ladder, the boot must be applied to opposite side

Rear

- Hold beams from rear of ladder and lean back
- Disadvantages
  - Falling tools may strike firefighter
  - Cannot see building
  - Cannot assist climbing firefighter

Anchor

- Secure ladder to substantial object such as a car or dumpster
- Anchor tool into ground
- Pry bars can be used to secure to a window

Securing the Ladder Tip

Placement, Climbing, and Operational Guidelines

Securing tip of the ladder

- Used when ladder is to remain stationary
- Prevents ladder from being moved in an emergency

Climbing Technique

- Climb with hands on rungs
- If carrying a tool, slide hand along beam
- Stand up straight
- Keep balls of your feet on the rungs

Spacing Personnel on the Ladder

Space firefighters evenly

10’-15’ (per FFD) spacing on an aerial ladder

Limit one firefighter per section

Follow guidelines and recommendations from manufacturer

Leg-Lock

- Originally used with ¾ length boots
- Today's turnout pants with pockets full of tools make this difficult

Portable Ladder Placement

Placement is critical

- Butt and tip must be secure
- Both beams in contact with a solid surface
- If integrity is doubted, move ladder

Portable Ladder for Roof Operations

Portable Ladder Placement: Access & Egress

Five rungs above roof line

- Provides visibility for quick exit
- Provides stability for stepping on and off structure

Photo courtesy of M. Kuhar

Portable Ladder for Window Access

Portable Ladder Placement: Access & Egress

Place

portable ladders with tip slightly below or even with window sill

Tips

placed in window opening decreases the size of window and limits operations

Photo courtesy of Joseph Ciscone

Portable Ladder for Working at Window

Place

portable ladders even with top of the window on the windward side