

LADDERS

Purpose

Ground Ladders provide firefighters a means of safe access and egress, above and below ground for rescue, ventilation and firefighting purposes. It may also be used as bridging, ladder drain, catch basin, PPV, ladder sling, portable sump and other applications

Location

Engine Companies, Truck Companies

Components

Bed Section - Base or lowest section of an extension ladder

Fly Section - Upper section of an extension ladder

Butt - Bottom of the ladder

Spurs - Metal safety plates on butt used for stabilization (aluminum or steel)

Beam - Main structural member of ladder that supports the rungs

Rungs

Dogs/Pawls/Locks - Locks that hold the fly section up

Halyard - Nylon rope used to extend fly section

Pulley - Grooved wheel that halyard is pulled through

Anchor - Connected to the bottom of the bed to hold halyard rope

Guides - Slots or channels that fly section is raised

Stops - Metal pieces that prevent fly from extending to far

Tips - Top of the ladder

Heat Sensors - Indicates exposure to excessive heat

Hooks - used to secure to roofs. Made of cold rolled steel

Basic Construction

- Incorporates 3 1/4" C-Channel beam with rung plates, riveted for strength
- 1 1/4" corrugated rungs are welded and expanded, spaced 14" apart
- 1/2" Nylon rope halyard
- Open truss type
 - Two metal rails connected by aluminum truss blocks
 - Truss blocks support the rungs

24' Extension Ladder

- 900A, made by DuoSafety in Oshkosh, Wisconsin
- Aluminum (6061-T6) solid beam construction
- 72 pounds
- 24'6" full extended with a maximum reach of 23'6"
- 21 3/4" bed section width
- 19" fly section width
- Rungs are made with a two-step process, weld and expanding the rungs (24)
- Rated at 750 lbs working load with a 4 to 1 safety margin (3,000 pounds)
- Meet/exceed all applicable standards established by NFPA 1931

14' Roof Ladder

- 775A series, made by DuoSafety in Oshkosh, Wisconsin

- Aluminum (6061-T6) solid beam construction
- 28 pounds
- 14'2" long
- 19' bed section width
- Rungs are made with a two-step process, weld and expanding the rungs (9)
- Rated at 750 lbs working load with a 4 to 1 safety margin (3,000 pounds)
- 3/4" Roof hooks, tested to 2,000 pounds
- Meet/exceed all applicable standards established by NFPA 1931

10' Attic Ladder

- 585A series, made by DuoSafety in Oshkosh, Wisconsin
- Aluminum (6061-T6) hinged beam construction
- 16 pounds
- 10'1" long open, 11'1/4" long closed
- 13.25" open width
- 6 total rungs, have swivel footpads
- Rated at 300 lbs working load
- Meet/exceed all applicable standards established by NFPA 1931

Operation

- Method of carry: one or two man operation, high shoulder, low shoulder, suitcase
- Methods of raising: Flat raise, beam raise
- Spot ladder 3 feet away from building, raise extension if needed, adjust for proper climbing angle
- Climbing angle: RFD-1/5 height from the point of contact, plus 2 feet or 75 deg.
IFSTA 1/4 height from the point of contact, or 75 deg.
- Placement
 - Roof Access – 3-5(IFSTA), 5 (RFD) rungs above roofline
 - Access for non-rescue operations – place to one side of the window with one rung above the sill (RFD), directly under sill (IFSTA)
 - Rescue operation – tip slightly below window sill (60 deg. angle)
 - Breaking window – windward, adjacent to top of window opening
- Avoid placing ladder within 10 feet from power lines
- When working off ladder, you should lock in using opposite leg of side you are working off of
- Passing – the person passes on the left, the person being passed locks in on right
- Roof ladder – used in conjunction with an extension ladder. Place butt of ladder at heel of extension ladder, open hooks away from user, walk roof ladder to vertical position resting ladder against extension ladder. Climb extension ladder and shoulder 14' extension ladder one rung above balance point. Take the ladder to the roofs edge and place the ladder on the roof and slide the ladder up on the hooks, secure ladder to roof

Commands

- Ladder coming through!
- Ladder coming around!
- All clear!
- Dogs unlocked fingers and toes!
- Check for overhead obstructions

Maintenance

- NFPA 1932
- Keep free from moisture
- Do not place ladder where it will be subject to extreme heat
- Only paint bottom and top 12” for identification and visibility
- Clean after every use
- Use a soft bristle brush and running water
- Use a safety solvent for tar, oils and grease
- Wipe dry
- Look for defects
- Wax every 3 months with candle wax or paraffin wax.
- Ladders are inspected daily, Saturday checks, monthly checks, after use, after any damage or repair, and every year each
- Send repairs to station 11 A shift.

Daily Inspection

- Check Halyard rope for fraying
- Check for loose rungs
- Dents or heavy impacts
- Make sure ladder is secured to the unit
- Check the heat sensors

Stickers

H – Height

E – Electrical Hazards

A – Angle, asset # 344-24

D – Dangers

S – Sensors (Heat)

Heat Sensor Label

- 4 labels per ladder
- 2 below the 2 rung from the top on both sides
- 2 labels with instructions below the middle rung on both sides
- They indicate heat exposure greater than 300F
- Label will turn dark in color
- Ladder should be removed from service and load tested.

Ladder Testing

- Tested annually, station 11 A shift

Horizontal Bending Test

24’ Extension, 14’ Roof

- Place ladders on 1” supports 6” from ends of ladder
- Apply 350 lbs to center of ladder for 1 minute, record distance to ground
- Apply 500 lbs to center of ladder for 5 minutes on 32” piece of wood
- Ladder cannot flex more that 1/2”

Folding ladder

- Place ladders on 1” supports 6” from ends of ladder
- Apply 160 lbs to center of ladder for 1 minute, record distance to ground
- Apply 225 lbs to center of ladder for 5 minutes on 16” piece of wood

- Ladder cannot flex more than 1/2"

Roof Hook Test

- Hanging 2,000 lbs for 1 minute
- Cannot show more than 10% bend

Hardware Test

- Extend fly at minimum 1 rung
- Hang 1000 on highest run of ladder for at least 1 minute
- Inspect hardware for damage

Aluminum

- Advantages
 - Lighter
 - Won't shrink or swell which would affect load limits
 - Cost effective
- Disadvantage
 - Conducts electricity

Policy and Procedures

- a) NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders*, contains the requirements for the design and manufacturer's testing of ground ladders
- b) NFPA 1932, *Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders*, provides the requirements for both maintaining and service testing ground ladders.
- c) NFPA 1901, *Standard for Automotive Fire Apparatus*, set the minimum lengths and types of ladders to be carried on all pumper or engine companies (one 10' folding ladder, one 14' roof ladder, and one 24' or larger extension ladder).

TOPIC: GROUND LADDERS

PURPOSE: Purpose of the ladder is for climbing. It is used for rescue above or below ground, for ventilation and may be used to bridge between buildings.

LOCATION: Engine Companies, Truck Companies, Squad's and Brush Truck's.

TYPES: RFD uses following extension ladders:

Duo Safety 900-A Series 24' Extension Ladder	Duo Safety 525-C Series 24' Extension Ladder
Ladder weighs 72 Lbs.	Ladder weighs 90 lbs.
Width of bed section: 21 (21 ¾)	Width of bed section: 24"
Length Closed: 14' (14' 2 ¾")	Length Closed: 14'
Width of fly section: 19"	Width of fly section: 21"

Duo Safety 500-C Series 28' Extension Ladder	Duo Safety 525-C Series 35' Extension Ladder
Ladder weighs: 87 lbs.	Ladder weighs: 114 lbs.
Width of bed section: 24"	Width of bed section: 24"
Width of fly section: 20"	Width of fly section: 20"
Length Closed: 16', 3"	Length Closed: 20', 3"

RFD uses the following Roof Ladders:

Duo Safety 575-C Series 16' Roof Ladder	Duo Safety 575-C Series 20' Roof Ladder
Ladder weighs: 55 lbs.	Ladder weighs: 59 lbs.
Width: 22 ½'	Width: 22 ½'

Duo Safety 575-C Series 14' Roof Ladder	Duo Safety 775-A Series 14' Roof Ladder
Ladder weighs: 50 lbs.	Ladder weighs: 28 lbs.
Width: 19', ¾"	Width: 19"

RFD uses the following Attic Ladders:

Duo Safety 585-A Series 10' Attic Ladder
Ladder weighs: 16 lbs.
Open length: 10'
Closed length: 11'
Open width: 12"

COMPONENTS:

1. Bed Section
2. Fly Section
3. Spurs-for stabilization of the butt of the ladder
4. Dogs or locks-locking the fly section in place
5. Truss blocks-support rungs
6. Rungs-made of corrugated aluminum with a min. dia. Of 1 ¼ and spaced 14 inch. Apart.
7. Beam guides- to guide fly section, preventing the fly from being over extended.
8. Stops-on both bed and fly section, preventing the fly from being over extended.
9. Halyard-a ½ inch dia. Nylon rope, used to extend the fly section.
10. Pulley-which is connected to the tip of the bed section. Is what the halyard is pulled through making it easy to hoist.
11. Anchor-which is connected to bottom of the fly section to hold the halyard in place.
12. Heat sensor-is used to indicate when the ladder is exposed to heat greater than 300 degrees F.
13. Balance marker-1" in width and painted red indicating the balance point.

SECTION 10.1

GROUND LADDERS

14. Mounting Marker-1" in width and painted black to indicate where the ladder is positioned on the ladder rack.

OPERATION:

The 24' ext. ladder can be a one or two man operation. It can be carried a number of ways, (high shoulder, low shoulder, arms length). It can also be raised a couple of ways, (flat raise or beam raise). After raised it needs to have the proper climbing angle, and that is determined by a formula. It is 1/5 of the point of contact plus 2 feet, this will give you a climbing angle of 75 degrees.

Placement of the ladder depends on it's intended use. For rescue from a window place in the window one rung above the sill. For used of directing a hose threw the window, place directly in front with the tip above the top of the window. For roof access at least 5 rungs above the roofline or as many as possible without changing the balance point.

When working off the ladder, you should lock in using opposite leg that you are working off of. When passing on the ladder the man coming up locks in on the left and allows the man coming down to pass on the right side.

MAINTENANCE:

Visually Inspect Daily. A daily inspection should include checking the halyard for fraying, the rivets and rungs, and make sure the ladder is secure to the unit.

Inspect after every use.

Inspect 1st of the month, which includes:

1. Inspect for damage or wear.
2. Inspect all components.
3. Wash and dry the ladder.
4. Wax the ladder.

Clean the ladder with running water and a brush. Use a mild soap if needed and or solvents for grease. Always wipe dry. Every three months (Duo Safety recommends the use candle wax) to lubricate all moving parts. RFD has changed this to once a month. A ladder log should be filled out once a month according to duo safety.

REPAIRS:

For repairs fill out a 210-6 and contact the ladder coordinator.

TESTING:

An annual test is conducted by an approved company by UL. The test consist of a 350-lb. Weight test for one minute. 500 lbs. For 5 minutes. A safety factor of 4:1 is built into the ladder. The max weight of the ladder is 2,000 lbs. before failing. Weight limit should be limited to 500lbs., or One firefighter per section.

HAZARDS:

Metal ladders are good conductors of electricity. Maintain a distance of 10' from energized electrical sources.

NFPA 1901:

NFPA 1901 sets the minimum lengths and types of ladders to be carried on all pumper or engine companies. Each engine must carry the following:

1. One Straight ladder equipped with roof hooks.
2. One Extension Ladder.
3. One Attic Ladder.

SECTION 10.1

GROUND LADDERS

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SAFETY:

Reflective white tape on the top 18" of all ground ladders in the RFD.



All RFD Ground ladders have white reflective safety tape placed at the tip of the ladders to help with visibility at nighttime to see the location of the ladder to aid in firefighter safety.

To provide firefighters operating in low-light dark environment the opportunity to locate a ladder that is in a window or for roof to ground access.

To quickly locate a ladder in low visibility quickly scan the windows and roof line with your flashlight to locate the ladder by hitting the reflective tape with the beam of the flash light.

RESCUE MODE:



Utilize the halligan bar to foot the ladder in soft soils. Drive the pick of the par into the ground and utilize the adz to hold the but of the ladder.



Second method is to drive the forks into the ground with the adz biting onto the second rung. You can use a hose strap to secure the halligan to the ladder.

NFPA REFERENCE #'s:

1901	Standard for automotive fire apparatus 1999 Edition.
1931	Standard on design of and design verification tests for fire department ground ladders.
1932	Standard on use, maintenance, and service testing of fire department ground ladders.
	Duo Safety