

I. INTRODUCTION

- A. Purpose: To provide Los Angeles County Fire Department (Department) personnel with general information on the use and maintenance of wood fire ground ladders used by the Department.
- B. Background: Wood ladders have been used in the fire service since the beginning of fire apparatus history. This same type of design is still used by many fire departments in the United States. Wood ground ladders are considered to be the finest and safest ladders for fire service use.

Wood ladders are preferred by the Department because they are relatively light and easily handled. They are durable, strong, and resist hard use/abuse. Wood ladders can withstand heat, sunlight, and ozone better than metal or fiberglass ladders. Wood ladders are less susceptible to hidden damage than metal ladders. Although wood ladders cost more than aluminum and fiberglass ladders, a well-maintained wood ladder will outlast an aluminum or fiberglass ladder.

- C. Scope: This instruction applies to all Department personnel who use wood fire ground ladders.
- D. Author: The Deputy Chiefs of the Operations Bureaus, through the Training Services Section, shall be responsible for the content, revision, and periodic review of this policy.
- E. Authority: Guidelines on construction, testing, load limits, maintenance, and inspection procedures, and use of the ladders are obtained from the National Fire Protection Administration (NFPA), 1931; Design of and Design Verification Tests for Fire Department Ground Ladders, NFPA 1932; Use, Maintenance, and Service Testing of Fire Department Ground Ladders and other standards.
- F. Objective: To ensure proper use and maintenance of Department ground wood ladders.

II. RESPONSIBILITY

- A. All personnel shall be familiar with the proper operation, inspection, use, and maintenance of all Department ladders.
- B. Station Captains shall ensure that all Department ladders are well-maintained and operational at all times.

- C. Battalion Headquarters Stations shall keep one spare set of engine company ladders (one 24-foot extension, one 14-foot roof, and one 10-foot attic) for use while repairs are being made or while an engine is refinishing its ladder.

III. POLICY

- A. Ladders shall be inspected weekly and after each use.
- B. Ladder load limits shall be observed, as stated in this policy.
- C. To protect ladders from unnecessary exposure to water, ladders should be removed from the apparatus while the apparatus is being washed.
- D. Ladders shall be maintained as outlined in this policy.
- E. Damaged ladders shall be immediately reported for repair to the Department's Ladder Coordinator through the Equipment Development Committee.

IV. PROCEDURES

- A. Inspection of Ladders
 - 1. All ladders shall be visually inspected weekly and after each use.
 - 2. As per NFPA 1931 recommendations, ladder inspections shall be conducted:
 - a. Four times per year, and
 - b. Immediately after any use whenever it is suspected that a ladder was subjected to overloading or unusual abuse.
 - 3. During the detailed inspection, the following ladder parts shall be individually inspected:
 - a. Rungs – Check for looseness, cracks, gouges, and splintering of the wood. Rotatable rungs are an indication of looseness; rungs shall not rotate.

- b. Beams – Check for cracks, gouges, splinters, and soft dark streaks.
- c. Bolts – Check for missing or loose bolts. Loose flush or crown nuts can be tightened by using a pair of needle-nose pliers. Bolts shall be tightened until they are snug, without crushing the wood.
- d. Spurs – Check for looseness and excessive wear. Sharpen with a file if necessary. If one side of the spur is worn to the point that the ladder is difficult to balance while raising and lowering, the spurs must be replaced.
- e. Hooks – Check for proper operation. Hitting the apex of the hook with a rubber mallet can loosen stuck hooks. If the hook is difficult to operate by hand, the hook must be replaced.

Hooks must be sharp to prevent slipping on hard or smooth surfaces. Check the attaching nuts and bolts carefully. Over-tightening the bolts holding on the roof hook on older ladders will result in pulling the bolt head into the wood. Newer or modified ladders have a metal plate to prevent this pulling.

- f. Halyard – Look for frayed or burned areas. Check for proper tension. Check the pin shackles that attach the halyard to the ladder locks, for tightness of the screw.
 - 1) When the ladder is on its side, the halyard should hang no lower than the lower beam assembly.
 - 2) Halyards should be loose enough to properly operate the ladder locks.
- g. Finish – Look for scratches throughout the varnish, loss of gloss, or peeling, and general condition.
 - 1) Spot finish any exposed/bare wood immediately.
 - 2) Lightly sand ladder areas that are no longer glossy.
 - 3) New varnish may be applied directly over the old varnish.

- b. Gouges are areas of missing material on ladders. Gouges larger than 1/8" wide and 1/8" deep shall be examined by the vendor. This is especially the case in the beams because of their load-bearing design. All other smaller gouges shall be sanded smooth and three coats of varnish shall be applied.
 - c. Dark streaks shall be checked for softness by using a flat headed screwdriver.
 - 1) A soft dark streak usually indicates wood rot or fungus. Ladders with soft dark streaks need repairs.
 - 2) A hard dark streak usually indicates that water has penetrated into the wood, or that a nearby metal fastener has stained the wood. This is not usually a cause for concern.
 - d. Black areas (char) shall be removed by sanding. Wood that is charred black in color becomes more porous, and therefore attracts moisture. If char is extensive, the ladder shall be sent for repair.
2. Extra care must be taken when ladders become dirty. Ladders may be occasionally washed off, but shall be hand dried, using towels or chamois. After hand drying, the ladder shall be allowed to stand upright to thoroughly air dry, e.g., against a fire station.
3. Prior to the start of the rainy season, when ladders may be exposed to moisture for extended periods of time, pay extra attention to the condition of the varnish. The varnish is a ladder's only protection against the elements.

The varnish used by manufacturers on the ladders, and which is also supplied in Pacoima Warehouse, is a tough, marine-grade spar varnish, designed for rough use in wet conditions. This varnish also has ultra-violet ray protection to guard the wood from the environmental factors.

- a. Use only Department-approved spar varnish for wood ladders. Mixing of brands of varnishes may cause the top coat to peel away from the undercoat.

- b. If the varnish is applied to bare wood, the first coat of varnish shall be thinned (25% mineral spirits and 75% varnish). This will allow the varnish to penetrate deeper into the wood. Additional coats of varnish shall be applied at full strength to provide the most durable finish possible.
4. Paint – Paint is not a good barrier for the wood surfaces of a ladder and it hinders visual inspection of the underlying wood. Paint covering large surface areas on wood ladders shall be removed.

D. Repair of Ladders

1. Stations with wooden ground ladders found to be in need of repair or inspection shall complete a Form 47, Transfer of Property and Material, listing the item in need of repair and have their battalion utility driver deliver the ladder to:

Alaco Ladder Company
5157 "G" Street, Chino, CA

2. Upon delivery to Alaco Ladder Company, utility drivers shall be given a repair tag number, which the driver will return to the station captain of origin.
3. The station captain shall e-mail the Department Ladder Coordinator, at Ladder@fire.lacounty.gov, and list the following:
 - a. Item(s) in need of repair on ladder.
 - b. Date ladder was delivered to Alaco.
 - c. Repair tag number.
4. The vendor will send the Department's Ladder Coordinator a repair quote. The Ladder Coordinator shall then either
 - a. Approve the repairs, or
 - b. Take the ladder out of service.
5. If a ladder is taken out of service (surveyed), the Ladder Coordinator shall notify the fire station and provide directions for ordering a replacement ladder.
6. Upon completion of repairs, the Ladder Coordinator shall arrange for the pick-up of repaired ladder(s) by battalion utility drivers.

7. Inquiries regarding the status of ladder repairs shall only be directed to the Ladder Coordinator. Personnel shall not directly contact Alaco Ladder Company.
8. Upon delivery of a repaired ladder, the station captain shall ensure all receipts are signed and delivered to the Financial Management Division – Accounts Payable Section.

E. Stenciling of Ladders

1. All ground ladders shall be stenciled in the following manner:
 - a. The assignment designation of the ladder shall be stenciled on the ladder in one-inch block style letters and numbers, six inches from the bottom of the spur. The designation shall consist of the letters and numbers as identified by the vehicle MDT designation, e.g., E214, Q126, T28.
 - 1) Engine companies shall have the identification on the bottom beam, working side, as the ladder is secured to the vehicle.
 - 2) Truck or Quint apparatus shall have the ladder length and type visible from the bottom beam, spur end, as the ladder is nested in the bed of the vehicle.

F. Ladder Construction Materials

1. Lumber Components
 - a. Make: All Department ladders are a Seagrave type. They have the rungs set directly into the beams and are of a tapered truss design for maximum strength.
 - b. Beams: Beams, truss blocks and diagonal braces of the ladder are made from clear, straight-grained West Coast Douglas Fir, with a moisture content of 13%.
 - c. Rungs: Rungs are made from kiln dried, clear, straight grained hickory and have a swelled center. They are mounted 12" on center and glued into the beams.
 - d. Other wood parts: The pulley block, cross beams, slide guides, and several other miscellaneous parts are made from kiln dried, straight grained Red Oak.

2. Metal Components

- a. Steel parts: Tie rods, tamper proof flush or crown nuts and bolts, ladder locks, end bands, spurs, carriage bolts, roof hook assemblies, and wood screws are made from cold-rolled steel and plated cadmium gold. This plating has proven very durable to resist rust and help the ladder maintain a good appearance.
- b. Stainless steel: Washers, nuts and bolts that connect the roof hooks and pulley block assemblies are 304-grade stainless steel. The use of stainless steel bolts for these critical components is essential for safety.
- c. Aluminum: The grooved pulley wheel for the halyard is constructed from one solid piece of aluminum.

3. Ladder Finishing/Varnish

- a. Wood ladders leave the factory with one coat of a marine-grade spar varnish, which is heated until thinned to penetrate into the wood. The first coat is also applied underneath all of the metal parts to prevent water penetration. When the first coat dries, the finish is lightly sanded. Then three more full strength coats of varnish are applied without heating, to provide the most durable finish possible.
- b. New ladders and ladders repaired by the manufacturer receive one additional full-strength coat of varnish prior to being placed into service. The only form of protection from the elements is the varnish.

G. Ladder Load Limits

1. Maximum load limits for wood fire ground ladders are set by the NFPA. The ladder manufacturer designs and tests the ladders to that standard.
2. Load limits are based upon a standard climbing angle of 75.5 degrees.
3. Load limits for ladders used for “bridging” are $\frac{1}{2}$ of the regular limit.
 - a. Personnel should attempt to use straight or roof ladders for bridging.
4. The following load limits shall be observed at all times:

Type

Load Limit

Roof ladders, supported

One person every other rung

Roof or straight ladders, unsupported

One person every three rungs

Attic ladder 10-foot

Two personnel

Type

Load Limit

Baby Bangor extended 14-foot

Two personnel

Extension ladder 24-foot

Three personnel

Extension ladder 35-foot

Four personnel

Combination ladder; extended or "A"
frame

Two personnel

APPENDIX A

DEFINITIONS

BASE:	The bottom of the ladder.
BASE SECTION:	Bottom or fixed portion of an extension ladder. Sometimes referred to as the “bed section.”
BEAM:	The two main structural assemblies of a ladder that determine the overall length of the ladder. See “TRUSS BEAM” and “RUNG BEAM.”
BEAM, BALANCE:	A strip of wood on the base section, secured to the inside rung beam, mounted between two rungs, at the midpoint between the spurs and the tip of an extension ladder. Installed for additional strength.
CADMIUM PLATING:	Chemical bonding of a highly durable material to the metal parts of the ladder, to alleviate corrosion.
CROSS BEAMS:	Wood that is placed diagonally between the rung beam and the truss beam and bolted to the truss blocks on 35-foot extension ladders to provide additional support for the entire truss assembly. Also called “diagonal bracing.”
DOGS:	See “LOCKS”
END BANDS:	Metal strapping used to hold the top end of truss ladders together.
FLY SECTION(S):	The section(s) of ladder that extend.
FEET:	A non-slip rubber material on the bottom of the attic and all “A” frame or combination ladders.
FOOT:	The bottom part of the ladder. See “SPUR.”
GUIDES:	Longitudinal strips of wood on the inner side of the beam assemblies on extension ladders that channel the fly section as the ladder is raised or lowered. Sometimes referred to as “slide guides.”
HALYARD:	The rope used to extend the fly section.

HOOKS, ROOF:	Folding steel hooks attached to the tip of the beams used to hold the ladder on steep pitches.
HINGE, RUNG:	Folding metal bracket at the bottom of the attic ladder that locks open to prevent the ladder from collapsing while being used.
LADDER:	A frame work device with long beams, which a person uses for ascending or descending.
LOCKS:	Device(s) that keeps the fly section from retracting. Sometimes referred to as the pawls or dogs.
MAIN SECTION:	This term is used for aerial ladders and refers to the base section.
NUTS, FLUSH:	Flat shaped heads to tie rods. The flat shape prevents snagging while the ladder is being used. These nuts have two holes to prevent tampering.
NUTS, CROWN:	Curved shaped heads to bolts that are used to secure the end bands, spurs, and the beams of attic ladders. These have two holes used for tightening.
PULLEY:	The aluminum grooved wheel near the top of the ladder that guides the halyard on extension ladders.
PULLEY BLOCK:	The piece of wood that supports the pulley assembly at the top of the ladder.
PAWLS:	NFPA recognized term. See "LOCKS."
PIN SHACKLES:	U-shaped metal fastener with a screw that closes the top of the "U," used to secure the halyard to the locks.
PLATE, ROOF HOOK:	A small metal plate used to prevent the roof hook bolts from penetrating into the wood.
RUNGS:	Cross members between the beams used as steps.
RUNG BEAM:	The long assembly that supports each rung of the ladder.
SCREWS, WOOD:	Used to stabilize the pulley guide and the end bands of wood ladders.

- SPURS:** Metal devices attached to the base of each beam to provide secured footing for the ladder. Straight ladders have spurs at both ends.
- STOPS:** Prevent the fly section(s) from extending out of the main section.
- TIE RODS:** Metal bars that run on the underside of some rungs that provide additional strength to hold the beams together.
- TIP:** The very top portion of the ladder.
- TRUSS ASSEMBLY:** The combination of the rung beam and truss beam placed together for maximum strength with a minimum of material.
- TRUSS BEAM:** The support assembly that runs the length of the ladder and forms a curved bow with the rung beam.
- TRUSS BLOCKS:** Small pieces of wood that run perpendicular to the rung beam and the truss beam to provide strength and support to the truss assembly.
- VARNISH, SPAR:** The good quality, durable, marine-grade protective finish placed on ladders to prevent water and sunlight damage to wood ladders.