MODULE 4 – OTHER FALL HAZARDS: LADDERS

Learning Objectives

- Describe why ladder safety in construction is important
- Describe the general requirements for ladder safety
- Explain the rules for use of a ladder
- Describe ladder inspection and maintenance requirements

Other Fall Hazards - Ladders

Other fall hazards like ladders or ladder systems contribute to falls and deaths on the job. The system includes a body harness, carabiner, carrier rail, and safety sleeve. Ladder safety devices are available as a cable (i.e., vertical lifeline) or fixed rail system.

The worker wears a body harness attached to the system by a carabiner. The system uses a cable/safety sleeve, shuttle, or cable grab specifically designed to attach the climber to the vertical line or rail. The cable grab or shuttle freely travels up or down the lifeline/rail as the worker ascends or descends the ladder, allowing the worker to maintain full contact with the ladder. If the worker falls, a locking cam or friction brake in the cable grab or shuttle locks onto the cable or rail and arrests the fall.

Typically, cable and fixed rail systems are permanently attached to the ladder or supporting structure. The cable (flexible carrier) or rail (rigid carrier) is attached by mountings at the top and bottom of the fixed ladder, with intermediate mountings or cable guides for added strength. Existing ladders may be retrofitted with commercially available ladder climbing systems.

A ladder climbing system should not be confused with a "climb assist" system, which consists of motorized equipment that ascends the ladder and partially bears the worker's weight. Some, but not all, climb assist systems incorporate fall protection features.

Stairs and Ladders

Working on and around stairways and ladders is hazardous. Stairways and ladders are major sources of injuries and fatalities among construction workers for example, and many of the injuries are serious enough to require time off the job. OSHA rules apply to all stairways and ladders used in construction, alteration, repair, painting, decorating and demolition of worksites covered by OSHA's construction safety and health standards.

General Requirements

These rules specify when employers must provide stairways and ladders. In general, the standards require the following:

- When there is a break in elevation of 19 inches or more and no ramp, runway, embankment or personnel hoist is available, employers must provide a stairway or ladder at all worker points of access. When there is only one point of access between levels, employers must keep it clear of obstacles to permit free passage by workers. If free passage becomes restricted, employers must provide a second point of access and ensure that workers use it.
- When there are more than two points of access between levels, employers must ensure that at least one point of access remains clear. In addition, employers must install all stairway and ladder fall protection systems required by these rules and ensure that their worksite meets all requirements of the stairway and ladder rules before employees use stairways or ladders. See 29 CFR 1926.1050-1060 for the details of the standard.
- Note: The standard does not apply to ladders specifically manufactured for scaffold access and egress, but does apply to job-made and manufactured portable ladders intended for general purpose use. Rules for ladders used on or with scaffolds are addressed in 29 CFR 1926.451 Subpart L.

Rules for Ladders

The following rules apply to all ladders:

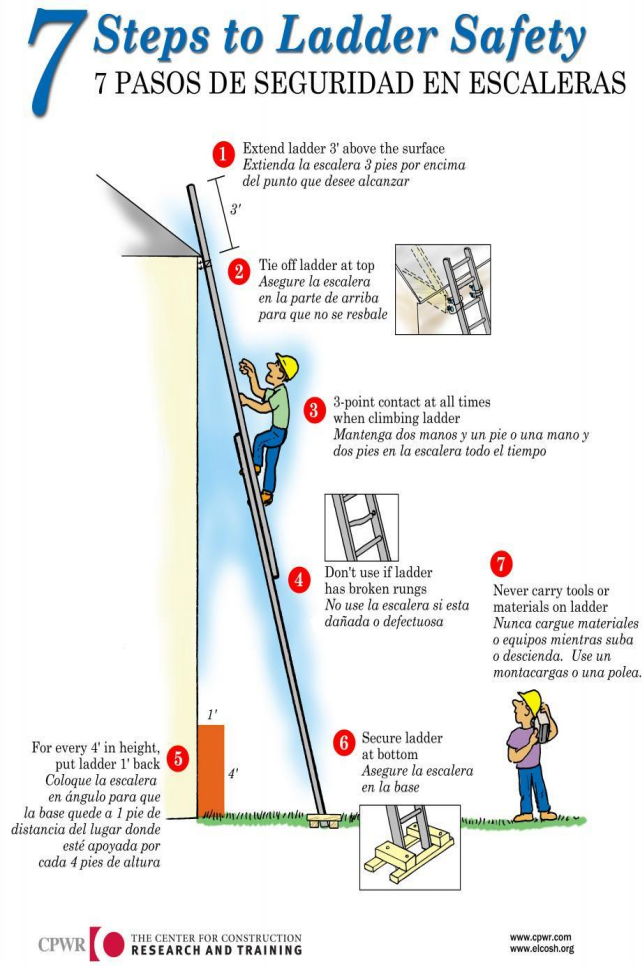
- Maintain ladders free of oil, grease and other slipping hazards.
- Do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity.
- Use ladders only for their designed purpose.
- Keep areas clear around the top and bottom of ladders.
- Do not move, shift or extend ladders while in use.
- Use ladders only on stable and level surfaces unless secured to prevent accidental movement.
- Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Do not use slip resistant feet as a substitute for exercising care when placing, lashing or holding a ladder upon slippery surfaces.
- Secure ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic to prevent accidental movement. Or use a barricade to keep traffic or activity away from the ladder.
- Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment.
- Face the ladder when moving up or down.
- Use at least one hand to grasp the ladder when climbing.
- Do not carry objects or loads that could cause loss of balance and falling.

In addition, the following general requirements apply to all ladders, including ladders built at the jobsite:

- Double-cleated ladders or two or more ladders must be provided when ladders are the only way to enter or exit a work area where 25 or more employees work or when a ladder serves simultaneous two-way traffic.
- Ladder rungs, cleats and steps must be parallel, level and uniformly spaced when the ladder is in position for use. Rungs, cleats and steps of portable and fixed ladders (except as provided

below) must not be spaced less than 10 inches apart, nor more than 14 inches apart, along the ladder's side rails.

- Rungs, cleats and steps of step stools must not be less than 8 inches apart, nor more than 12 inches apart, between center lines of the rungs, cleats and steps.
- Rungs, cleats and steps at the base section of extension trestle ladders must not be less than 8 inches nor more than 18 inches apart, between center lines of the rungs, cleats and steps. The rung spacing on the extension section must not be less than 6 inches nor more than 12 inches.
- Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.
- When splicing side rails, the resulting side rail must be equivalent in strength to a one-piece side rail made of the same material.
- Two or more separate ladders used to reach an elevated work area must be offset with a platform or landing between the ladders, except when portable ladders are used to gain access to fixed ladders.
- Ladder components must be surfaced to prevent snagging of clothing and injury from punctures or lacerations.
- Wood ladders must not be coated with any opaque covering except for identification or warning labels, which may be placed only on one face of a side rail.



Note: A competent person must inspect ladders for visible defects periodically and after any incident that could affect their safe use.

Specific Types of Ladders

Do not use single-rail ladders. Use non-self-supporting ladders at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.

Use wooden ladders built at the jobsite with spliced side rails at an angle where the horizontal distance is one-eighth of the working length of the ladder. In addition, the top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.

Stepladders

Do not use the top or top step of a stepladder as a step.

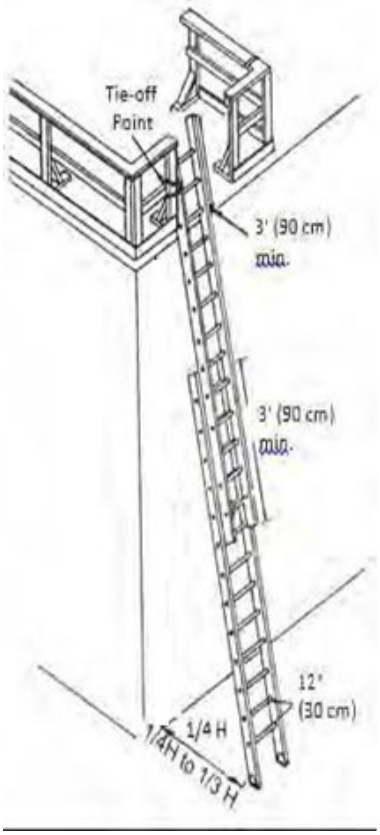
Do not use cross bracing on the rear section of stepladders for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections. Metal spreader or locking devices must be provided on stepladders to hold the front and back sections in an open position when ladders are being used.

Portable Ladders

The minimum clear distance between side rails for all portable ladders must be 11.5 inches. In addition, the rungs and steps of portable metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.

Non-self-supporting and self-supporting portable ladders must support at least four times the maximum intended load; extra heavy-duty type 1A metal or plastic ladders must sustain 3.3 times the maximum intended load. To determine whether a self-supporting ladder can sustain a certain load, apply the load to the ladder in a downward vertical direction with the ladder placed at a horizontal angle of 75.5 degrees.

When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. When such an extension is not possible, the ladder must be secured and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its supports.



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Fixed Ladders

If the total length of the climb on a fixed ladder equals or exceeds 24 feet, the ladder must be equipped with ladder safety devices; or self-retracting lifelines and rest platforms at intervals not to exceed 150 feet; or a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet. In addition, fixed ladders must meet the following requirements:

Fixed ladders must be able to support at least two loads of 250 pounds each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from using ladder safety devices. Individual rung/step ladders must extend at least 42 inches above an access level or landing platform either by the continuation of the rung spacing as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.

- Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds applied in the middle of the step or rung.

- Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches.

- Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.

- Rungs and steps of fixed metal ladders manufactured after March 15, 1991, must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.

- Minimum perpendicular clearance between fixed ladder rungs, cleats, and steps and any obstruction behind the ladder must be 7 inches, except that the clearance for an elevator pit ladder must be 4.5 inches. Minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats and steps, and any obstruction on the climbing side of the ladder must be 30 inches. If obstructions are unavoidable, clearance may be reduced to 24 inches, provided a deflection device is installed to guide workers around the obstruction.

- Step-across distance between the center of the steps or rungs of fixed ladders and the nearest edge of a landing area must be no less than 7 inches and no more than 12 inches. A landing platform must be provided if the step-across distance exceeds 12 inches.

- Fixed ladders without cages or wells must have at least a 15-inch clearance width to the nearest permanent object on each side of the centerline of the ladder.

- Fixed ladders must be provided with cages, wells, ladder safety devices or self-retracting lifelines where the length of climb is less than 24 feet but the top of the ladder is at a distance greater than 24 feet above lower levels.

- Side rails of through or side-step fixed ladders must extend 42 inches above the top level or landing platform served by the ladder. Parapet ladders must have an access level at the roof if the parapet is cut to permit passage through it. If the parapet is continuous, the access level is the top of the parapet.

- Steps or rungs for through-fixed-ladder extensions must be omitted from the extension; and the extension of side rails must be flared to provide between 24 inches and 30 inches clearance between side rails.

- When safety devices are provided, the maximum clearance distance between side rail extensions must not exceed 36 inches.

- Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.

Defective Ladders

Ladders needing repairs are subject to the following rules:

- Portable ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails, corroded components or other faulty or defective components—must immediately be marked defective or tagged with "Do Not Use" or similar language and withdrawn from service until repaired.

- Fixed ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or

split rails or corroded components— must be withdrawn from service until repaired.

- Defective fixed ladders are considered withdrawn from use when they are immediately tagged with "Do Not Use" or similar language or marked in a manner that identifies them as defective, or blocked—such as with a plywood attachment that spans several rungs.
- Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to use.

Wooden Ladders

Never paint wooden ladders. Paint hides signs of deterioration and may accelerate rotting by trapping moisture in the wood.

Coat them with a clear, non-toxic wood preservative or varnish. Inspect them frequently for splits, shakes, and cracks in the side rails and rungs, warping or loosening of rungs, loosing of metal hardware, and deformation of metal parts.

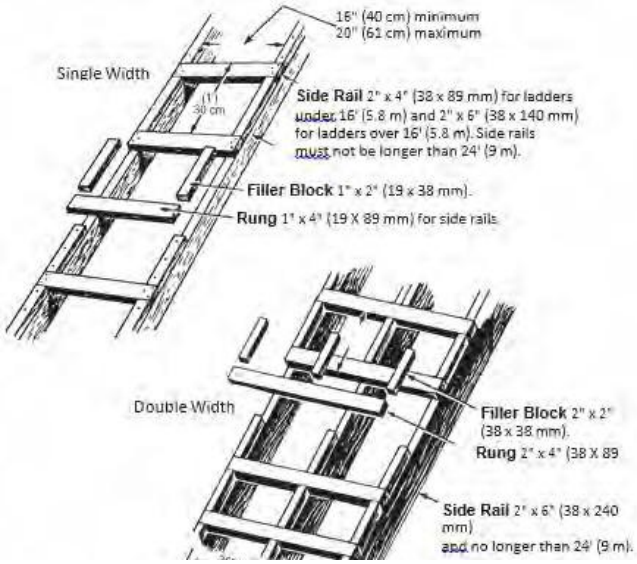
Aluminum Ladders

Treat aluminum ladders with care. They are more susceptible to damage than wooden ladders. Because they conduct electricity well, never use aluminum ladders where electrical contact is possible.

Check side rails and rungs regularly for dents, bends, and loose rungs. If repair by a qualified person is not possible, the ladder must be destroyed.

Job-Built Ladders

Wood used for job-built ladders should be straight-grained and free of loose knots, sharp edges, splinters, and shakes. The ladder should not be longer than 24 feet in working length. Used by many workers, job-built ladders deteriorate rapidly. They should be inspected every day and, if defective, repaired immediately or taken out of service and destroyed.



Ladder Use

Check ladder for defects before use.

Clear scrap and material away from the base and top of ladder. Secure the top and base against movement.

Set the ladder on a firm, level surface. On soft, uncompacted or rough soil, use a mud sill.

Make sure that rails on ladders extend at least 3 feet above the landing. This allows for secure grip while stepping on or off.

A ladder used as a regular means of access must:

- Extend 3 feet above the landing or floor.
- Have a clear toe space of at least 10 inches behind every rung.
- Have sufficient clearance from obstructions on the climbing side.
- Be located so that an adequate landing area is clear of obstructions at the top and bottom
- Be secured at the top and bottom to prevent movement.

Set straight or extension ladders one foot out for every 4 feet up, depending on length of ladder.

Before setting up ladders, always check for overhead power lines.

Do not position ladders against flexible or moveable surfaces.

Always face the ladder when climbing up or down and while working from it.

Maintain 3-point contact when climbing up or down. That means two hands and one foot or two feet and one hand on the ladder at all time.

Keep your center of gravity between the side rails. Your belt buckle should never be outside the side rails. When climbing up or down, do not carry tools or materials in your hands. Use a hoist rope instead.

Keep boots clean of mud, grease, or any slippery materials which could cause loss of footing. Never erect ladders on boxes, carts, tables, or other unstable surfaces.

Never use ladders horizontally as scaffolds planks, runaways, or for any other purpose for which they have not been designed.

Stand no higher than the third or fourth rung from the top. Maintain knee contact for balance.

Do not splice short ladders together to make a long ladder. The side rails will not be strong enough for the extra loads.

Do not use ladders for bracing. They are not designed for this type of loading.

Do not set up ladders in doorways, passageways, driveways, or any other location where they can be struck or knocked over.

Never rest a ladder on its rungs. Ladders must rest on their side rails.

To erect long, awkward or heavy ladders, get help to avoid injury from overexertion.

Ladder Inspection and Maintenance

Ladders shall be inspected by a competent person for visible defects on a periodic basis and after any occurrence that could affect their safe use.

Ladders should only be repaired by qualified persons.

Defective ladders must be taken out of service and both locked and tagged for repair or scrapped. Inspect ladders for structural rigidity.

Inspect non-skid feet for wear, imbedded material, and proper pivot action on swivel feet.

Replace frayed or worn ropes on extension ladders with types and sizes equal to manufacturer's original rope. Check aluminum ladders for dents and bends inside rails, steps, and rungs.

Do not use metal pipe to replace rungs.

Check wooden ladders for cracks, slits, and rot.

Check all ladders for grease, oil, caulking, imbedded stone and metal, or other materials that could make them unsafe.

Ladder Safety Checklist

To prevent falls from ladders, make sure you have the following controls in place:

- Use only ladders that are in good condition and designed to handle the climbing job that needs to be done.
- Train employees on proper ladder use.
- Make proper ladder use a performance requirement for the job.
- Require employees to complete a ladder inspection before each use.

Criteria for Ladder Purchase and Care

Check OSHA standards for the type of ladder you are using.

Use only Underwriter's Laboratory approved ladders (will have the UL seal).

Protect wood ladders with a clear sealer, such as varnish, shellac, linseed oil or wood preservative because paint can hide defects.

Module 4 Key Take-aways

- Ladder safety devices or systems used to climb fixed ladders include a body harness, carabiner, carrier rail, and safety sleeve.
- Stairways and ladders are major sources of injuries and fatalities among construction workers.
- When there is a break in elevation of 19 inches or more and no ramp, runway, embankment or personnel hoist is available, employers must provide a stairway or ladder at all worker points of access.
- Use ladders only for their designed purpose.
- Keep areas clear around the top and bottom of ladders. Do not move, shift or extend ladders while in use.
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