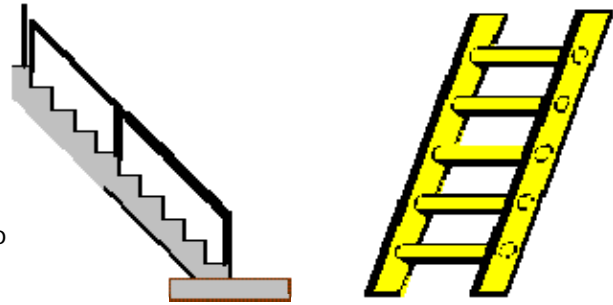


Stairways and Ladders

INTRODUCTION

Stairways and ladders are a major source of injuries and fatalities among construction workers.

OSHA estimates that there are 24,882 injuries and as many as 36 fatalities per year due to falls from stairways and ladders used in construction. Nearly half of these injuries are serious enough to require time off the job--11,570 lost workday injuries and 13,312 non-lost workday injuries occur annually due to falls from stairways and ladders used in construction. These data demonstrate that work on and around ladders and stairways is hazardous. More importantly, they show that compliance with OSHA's requirements for the safe use of ladders and stairways could have prevented many of these injuries.



This discussion serves as a quick and easy reference for use on job sites. The requirements of OSHA safety regulations for the safe use of ladders and stairs (Subpart X, Title 29 Code of Federal Regulations, Part 1926.1050 through 1926.1060) are explained in this discussion.

SCOPE AND APPLICATION

The OSHA rules apply to all stairways and ladders used in construction, alteration, repair (including painting and decorating), and demolition of work sites covered by OSHA's construction safety and health standards. They also specify when stairways and ladders must be provided. They do not apply to ladders that are specifically manufactured for scaffold access and egress, but do apply to job-made and manufactured portable ladders intended for general purpose use and which are then used for scaffold access and egress.

GENERAL REQUIREMENTS

- A stairway or ladder must be provided at all worker points of access where there is a break in elevation of 19 inches (48 cm) or more **and** no ramp, runway, embankment, or personnel hoist is provided.
- When there is only one point of access between levels, it must be kept clear to permit free passage by workers. If free passage becomes restricted, a second point of access must be provided and used.
- When there are more than two points of access between levels, at least one point of access must be kept clear.
- All stairway and ladder fall protection systems required by these rules must be installed and all duties required by the stairway and ladder rules must be performed before employees begin work that requires them to use stairways or ladders and their respective fall protection systems.

STAIRWAYS

The following general requirements apply to all stairways used during the process of construction, as indicated:

- Stairways that will not be a permanent part of the structure on which construction work is performed must have landings at least 30 inches deep and 22 inches wide (76 x 56 cm) at every 12 feet (3.7 m) or less of vertical rise.

- Stairways must be installed at least 30 degrees, and no more than 50 degrees, from the horizontal.
- Variations in riser height or stair tread depth must not exceed 1/4 inch in any stairway system, including any foundation structure used as one or more treads of the stairs.
- Where doors or gates open directly onto a stairway, a platform must be provided that is at least 20 inches (51 cm) in width beyond the swing of the door.
- Metal pan landings and metal pan treads must be secured in place before filling.
- All stairway parts must be free of dangerous projections such as protruding nails.
- Slippery conditions on stairways must be corrected.
- Spiral stairways that will not be a permanent part of the structure may not be used by workers.

The following requirements apply to stairs in temporary service during construction:

- Except during construction of the actual stairway, stairways with metal pan landings and treads must not be used where the treads and/or landings have not been filled in with concrete or other material, unless the pans of the stairs and/or landings are temporarily filled in with wood or other material. All treads and landings must be replaced when worn below the top edge of the pan.
- Except during construction of the actual stairway, skeleton metal frame structures and steps must not be used (where treads and/or landings are to be installed at a later date) unless the stairs are fitted with secured temporary treads and landings.
- Temporary treads must be made of wood or other solid material and installed the full width and depth of the stair.

STAIRRAILS AND HANDRAILS

The following general requirements apply to all stairrails and handrails:

Stairways having four or more risers, or rising more than 30 inches (76 cm) in height, whichever is less, must have at least one handrail. A stairrail also must be installed along each unprotected side or edge. When the top edge of a stairrail system also serves as a handrail, the height of the top edge must not be more than 37 inches (94 cm) nor less than 36 inches (91.5 cm) from the upper surface of the stairrail to the surface of the tread.

Winding or spiral stairways must be equipped with a handrail to prevent using areas where the tread width is less than 6 inches (15 cm).

Stairrails installed after March 15, 1991, must not be less than 36 inches (91.5 cm) in height.

Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members must be provided between the top rail and stairway steps of the stairrail system.

Midrails, when used, must be located midway between the top of the stairrail system and the stairway steps.

Screens or mesh, when used, must extend from the top rail to the stairway step, and along the opening between top rail supports.

Intermediate vertical members, such as balusters, when used, must not be more than 19 inches (48 cm) apart.

Other intermediate structural members, when used, must be installed so that there are no openings of more than 19 inches (48 cm) wide.

Handrails and the top rails of the stairrail systems must be capable of withstanding, without failure, at least 200 pounds (890 n) of weight applied within 2 inches (5 cm) of the top edge in any downward or outward direction, at any point along the top edge.

The height of handrails must not be more than 37 inches (94 cm) nor less than 30 inches (76 cm) from the upper surface of the handrail to the surface of the tread.

The height of the top edge of a stairrail system used as a handrail must not be more than 37 inches (94 cm) nor less than 36 inches (91.5 cm)⁽¹⁾ from the upper surface of the stairrail system to the surface of the tread.

Stairrail systems and handrails must be surfaced to prevent injuries such as punctures or lacerations and to keep clothing from snagging.

Handrails must provide an adequate handhold for employees to grasp to prevent falls.

The ends of stairrail systems and handrails must be constructed to prevent dangerous projections such as rails protruding beyond the end posts of the system.

Temporary handrails must have a minimum clearance of 3 inches (8 cm) between the handrail and walls, stairrails systems, and other objects.

Unprotected sides and edges of stairway landings must be provided with standard 42-inch (1.1 m) guardrail systems.

LADDERS

The following general requirements apply to all ladders, including job-made ladders:

A double-cleated ladder or two or more ladders must be provided when ladders are the only way to enter or exit a work area having 25 or more employees, 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 (25 cm) apart, nor more than 14 inches (36 cm) apart, along the ladder's side rails.

Rungs, cleats, and steps of step stools must not be less than 8 inches (20 cm) apart, nor more than 12 inches (31 cm) 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 (20 cm) nor more than 18 inches (46 cm) apart, between center lines of the rungs, cleats, and steps. The rung spacing on the extension section must not be less than 6 inches (15 cm) nor more than 12 inches (31 cm).

Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.

A metal spreader or locking device must be provided on each stepladder to hold the front and back sections in an open position when the ladder is being used.

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 injury from punctures or lacerations, and prevent snagging of clothing.

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.

Portable Ladders

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. The ability of a self-supporting ladder to sustain loads must be determined by applying the load to the ladder in a downward vertical direction. The ability of a non-self-supporting ladder to sustain loads must be determined by applying the load in a downward vertical direction when the ladder is placed at a horizontal angle of 75.5 degrees.

The minimum clear distance between side rails for all portable ladders must be 11.5 inches (29 cm).

The rungs and steps of portable metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.

Fixed Ladders

A fixed ladder must be capable of supporting at least two loads of 250 pounds (114 kg) 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 the use of ladder safety devices.

Individual rung/step ladders must extend at least 42 inches (1.1 m) above an access level or landing platform either by the continuation of the rung spacings 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 capable of supporting a load of at least 250 pounds (114 kg) applied in the middle of the step or rung.

The minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches (41 cm).

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

The rungs and steps of fixed metal ladders manufactured after January 14, 1991, must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.

The minimum perpendicular clearance between fixed ladder rungs, cleats, and steps, and any obstruction behind the ladder must be 7 inches (18 cm), except that the clearance for an elevator pit ladder must be 4.5 inches (11 cm).

The 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 (76 cm). If obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm), provided a deflection device is installed to guide workers around the obstruction.

The 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 (18 cm) and no more than 12 inches (30 cm). A landing platform must be provided if the step-across distance exceeds 12 inches (30 cm).

Fixed ladders without cages or wells must have at least a 15-inch (38 cm) clear 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 (7.3 m) but the top of the ladder is at a distance greater than 24 feet (7.3 m) above lower levels.

If the total length of a climb on a fixed ladder equals or exceeds 24 feet (7.3 m), the following requirements must be met: fixed ladders must be equipped with either (a) ladder safety devices; (b) self-retracting lifelines, and rest platforms at intervals not to exceed 150 feet (45.7 m); or (c) a cage or well, and multiple ladder sections, each ladder section not to exceed 50 feet (15.2 m) in length. These ladder sections must be offset from adjacent sections, and landing platforms must be provided at maximum intervals of 50 feet (15.2 m).

The side rails of through or side-step fixed ladders must extend 42 inches (1.1 m) above the top level or landing platform served by the ladder. For a parapet ladder, the access level must be 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 (61 cm) and 30 inches (76 cm) clearance between side rails.

When safety devices are provided, the maximum clearance between side rail extensions must not exceed 36 inches (91 cm).

Cages for Fixed Ladders

Horizontal bands must be fastened to the side rails of rail ladders, or directly to the structure, building, or equipment for individual-rung ladders.

Vertical bars must be on the inside of the horizontal bands and must be fastened to them.

Cages must not extend less than 27 inches (68 cm), or more than 30 inches (76 cm) from the centerline of the step or rung, and must not be less than 27 inches (68 cm) wide.

The inside of the cage must be clear of projections.

Horizontal bands must be spaced at intervals not more than 4 feet (1.2 m) apart measured from centerline to centerline.

Vertical bars must be spaced at intervals not more than 9.5 inches (24 cm) apart measured from centerline to centerline.

The bottom of the cage must be between 7 feet (2.1 m) and 8 feet (2.4 m) above the point of access to the bottom of the ladder. The bottom of the cage must be flared not less than 4 inches (10 cm) between the bottom horizontal band and the next higher band.

The top of the cage must be a minimum of 42 inches (1.1 m) above the top of the platform, or the point of access at the top of the ladder. Provisions must be made for access to the platform or other point of access.

Wells for Fixed Ladders

Wells must completely encircle the ladder.

Wells must be free of projections.

The inside face of the well on the climbing side of the ladder must extend between 27 inches (68 cm) and 30 inches (76 cm) from the centerline of the step or rung.

The inside width of the well must be at least 30 inches (76 cm).

The bottom of the well above the point of access to the bottom of the ladder must be between 7 feet (2.1 m) and 8 feet (2.4 m).

Ladder Safety Devices and Related Support Systems for Fixed Ladders

All safety devices must be capable of withstanding, without failure, a drop test consisting of a 500-pound weight (226 kg) dropping 18 inches (41 cm).

All safety devices must permit the worker to ascend or descend without continually having to hold, push, or pull any part of the device, leaving both hands free for climbing.

All safety devices must be activated within 2 feet (.61 m) after a fall occurs, and limit the descending velocity of an employee to 7 feet/second (2.1 m/sec) or less.

The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches (23 cm) in length.

Mounting Ladder Safety Devices for Fixed Ladders

Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings, spaced along the entire length of the carrier, to provide the necessary strength to stop workers' falls.

Mountings for flexible carriers must be attached at each end of the carrier. Cable guides for flexible carriers must be installed with a spacing between 25 feet (7.6 m) and 40 feet (12.2 m) along the entire length of the carrier, to prevent wind damage to the system.

The design and installation of mountings and cable guides must not reduce the strength of the ladder.

Side rails, and steps or rungs for side-step fixed ladders must be continuous in extension.

USE OF ALL LADDERS (INCLUDING JOB-MADE LADDERS)

When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet (.9 m) 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 support.

Ladders must be maintained free of oil, grease, and other slipping hazards.

Ladders must not be loaded beyond the maximum intended load for which they were built nor beyond their manufacturer's rated capacity.

Ladders must be used only for the purpose for which they were designed.

Non-self-supporting ladders must be used 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. Wood job-made ladders with spliced side rails must be used at an angle where the horizontal distance is one-eighth the working length of the ladder.

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

Ladders must be used only on stable and level surfaces unless secured to prevent accidental movement.

Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip-resistant feet must not be used as a substitute for the care in placing, lashing, or holding a ladder upon slippery surfaces.

Ladders placed in areas such as passage-ways, doorways, or driveways, or where they can be displaced by workplace activities or traffic must be secured to prevent accidental movement, or a barricade must be used to keep traffic or activities away from the ladder.

The area around the top and bottom of the ladders must be kept clear.

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.

Ladders must not be moved, shifted, or extended while in use.

Ladders must have nonconductive siderails if they are used where the worker or the ladder could contact exposed energized electrical equipment.

The top or top step of a stepladder must not be used as a step.

Cross-bracing on the rear section of stepladders must not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.

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

Single-rail ladders must not be used.

When ascending or descending a ladder, the worker must face the ladder.

Each worker must use at least one hand to grasp the ladder when moving up or down the ladder.

A worker on a ladder must not carry any object or load that could cause the worker to lose balance and fall.

STRUCTURAL DEFECTS

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 (a) immediately tagged with "Do Not Use" or similar language; (b) marked in a manner that identifies them as defective; or (c) 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.

TRAINING REQUIREMENTS

Under the provisions of the standard, employers must provide a training program for each employee using ladders and stairways. The program must enable each employee to recognize hazards related to ladders and stairways and to use proper procedures to minimize these hazards. For example, employers must ensure that each employee is trained by a competent person in the following areas, as applicable:

The nature of fall hazards in the work area;

The correct procedures for erecting, maintaining, and disassembling the fall protection systems to be used;

The proper construction, use, placement, and care in handling of all stairways and ladders; and

The maximum intended load-carrying capacities of ladders used. In addition, retraining must be provided for each employee, as necessary, so that the employee maintains the understanding and knowledge acquired through compliance with the standard.

GLOSSARY

CLEAT - A ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.

DOUBLE-CLEAT LADDER - A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending.

FAILURE - Load refusal, breakage, or separation of components.

FIXED LADDER - A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

HANDRAIL - A rail used to provide employees with a handhold for support.

JOB-MADE LADDER - A ladder that is fabricated by employees, typically at the construction site; not commercially manufactured.

LOAD REFUSAL - The point where the structural members lose their ability to carry the load.

POINT OF ACCESS - All areas used by employees for work-related passage from one area or level to another.

PORTABLE LADDER - A ladder that can be readily moved or carried.

RISER HEIGHT - The vertical distance from the top of a tread or platform/landing to the top of the next higher tread or platform/landing.

SIDE-STEP FIXED LADDER - A fixed ladder that requires a person to get off at the top to step to the side of the ladder side rails to reach the landing.

SINGLE-CLEAT LADDER - A ladder consisting of a pair of side rails connected together by cleats, rungs, or steps.

STAIRRAIL SYSTEM - A vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels.

TEMPORARY SERVICE STAIRWAY - A stairway where permanent treads and/or landings are to be filled in at a later date.

THROUGH FIXED LADDER - A fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.

TREAD DEPTH - The horizontal distance from front to back of a tread, excluding nosing, if any.

1. ¹ If installed before March 15, 1991, not less than 30 inches (76 cm).