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Construction Stairways and Ladders



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- ✓ Oil & Gas Transmission / Distribution
- ✓ Utilities & Municipal
- ✓ Commercial & Residential Contracting
- ✓ Military Installations
- ✓ Trucking / Fleet Operations
- ✓ Environmental Management





Learning Outcomes

- Identify the terms and definitions in OSHA Subpart X
- Identify the general requirements of OSHA Subpart X
- Identify the OSHA regulations for ladders used in construction
- Identify OSHA's regulations for stairways
- Identify OSHA's stair rail requirements
- Identify OSHA's training requirements for stairways and ladders

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Terms and Definitions in OSHA Subpart X

Stairways and Ladders



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Common Terms – Ladders

- **Cleat** - ladder crosspiece, the part a person steps on.
- **Single-cleat ladder** - ladder consisting of a pair of side rails, connected together by cleats, rungs, or steps.
- **Double cleat ladder** - ladder similar in construction to a single-cleat ladder, but with a center rail to allow simultaneous two-way traffic.
- **Portable ladder** - a ladder that can be readily moved or carried.
 - **Non-self-supporting**
 - extension ladder or other leaning types
 - **Self-supporting**
 - stepladder, platform ladder, trestle ladder, or other foldout types
- **Fixed ladder** - ladder that cannot be readily moved or carried because it is an integral part of a building or structure.
 - **SIDE-STEP FIXED LADDER** is a fixed ladder that requires a person getting off at the top to step to the side of the ladder side rails to reach the landing.
 - **THROUGH FIXED LADDER** is 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.

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Maximum Intended Load

- Total load of all employees, equipment, tools, materials, transmitted loads, and other loads anticipated to be applied to a ladder component at any one time.

Type	Duty Rating	Use	Load
1AA	Special Duty	Plugged	375 lbs.
1A	Extra Heavy Duty	Industrial	300 lbs.
1	Heavy Duty	Industrial	250 lbs.
II	Medium Duty	Commercial	225 lbs.
III	Light Duty	Household	200 lbs.

Source for Types IA, I, II, III: Subpart X—Stairways and Ladders, Appendix A (American National Standards Institute (ANSI) 14.1, 14.2, 14.5 (1982)) of OSHA's Construction standards. Source for Type IAA: ANSI 14.1, 14.2, 14.5 (2009), which are non-mandatory guidelines.

Exceeding the load capacity may cause the ladder to collapse!!

LOAD CAPACITY*	DESCRIPTION	CSA CODE	ANSI CODE
200 lbs./91 kg	Household - Light Duty	Grade 3	Type III
225 lbs./102 kg	Tradesman and Farm - Medium Duty	Grade 2	Type II
250 lbs./113 kg	Construction and Industrial - Heavy Duty	Grade 1	Type I
300 lbs./136 kg	Construction and Industrial - Heavy Duty	Grade 1A	Type IA
375 lbs./170 kg	Construction and Industrial - Heavy Duty	Grade 1AA	Type IAA

*Includes user and materials



Beware!

Some, not all, ladder manufacturers try color matching side rails to the duty rating.

Always read the label.

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Combination Ladder

ANSI A14.1 (Portable Wood Ladders)
ANSI A14.2 (Portable Metal Ladders)
ANSI A14.5 (Portable Reinforced Plastic Ladder)

- A portable ladder capable of being used either as a stepladder or as a single or extension ladder.
 - **May be capable of use as a trestle ladder or stairwell ladder.**
 - **Components may be used as single ladders.**



Job Made Ladders

Pass or Fail?

Side Rails:

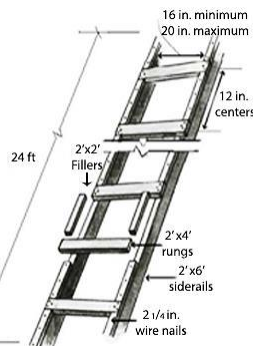
- Side rails of single-cleat ladders up to 24 ft. long should be made with **at least 2x6 in. lumber**.
- Single-rung ladder width should be at least 16 in., but not more than 20 in. btw. rails measured inside to inside.
- Rails should extend above the top landing between 36 in. (91.5 cm) and 42 in. to provide a handhold for mounting and dismounting, and **cleats must be eliminated above the landing level.**

Cleats:

- **Must be equally spaced 12 inches on center** from the top of one cleat to the top of the next cleat.
- Cleats should be fastened to each rail with three 12d common nails, nailed directly to the side rails.
- Cleats should be at least 1x4 in. for ladders 16 to 24 ft. long.

Filler Blocks:

- Minimum 2x2 in. wood strips inserted btw. cleats
- The ladder is complete when filler is nailed at the top of each rail.



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Common Terms - Stairways

- **Handrail** - used to provide employees with a handhold for support.
- **Stair rail system** - a vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels. The top surface of a stair rail system may also be a "handrail."
- **Unprotected sides and edges**
any side or edge (*except at entrances to points of access*) of a stairway where there is no stair rail system or wall 36 inches or more in height, and any side or edge (*except at entrances to points of access*) of a stairway landing, or ladder platform where there is no wall or guardrail system 39 inches or more in height.



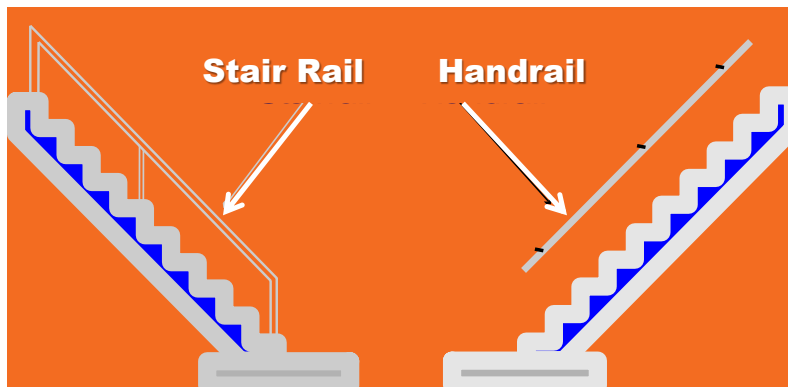
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Handrail vs. Stair Rail



Stairways with 4 or more risers or more than 30 inches high must have a stair rail along each unprotected side or edge.

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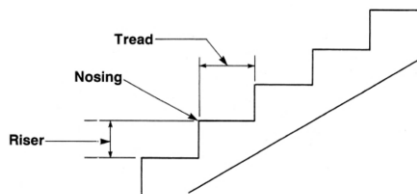
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Common Terms

- **Point of access** - all areas used by employees for work related passage from one area or level to another.
 - Includes doorways, passageways, stairway openings, studded walls, and various other permanent or temporary openings used for such travel.



- **Riser height** - vertical distance from the top of a tread to the top of the next higher tread or platform/landing or the distance from the top of a platform/landing to the top of the next higher tread or platform/landing.
 - Variations in riser height or tread depth shall not be greater than 1/4 inch
- **Tread depth** - horizontal distance from front to back of a tread, *excludes nosing*

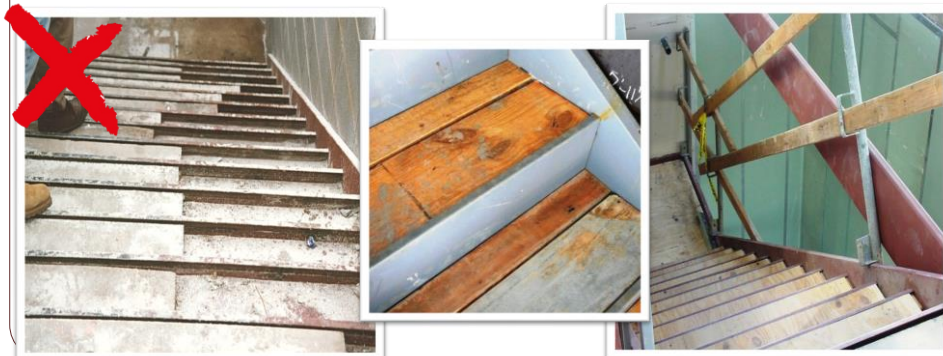
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Temporary Service Stairway

- Except during stairway construction, foot traffic is prohibited on stairways with pan stairs where the treads and/or landings are to be filled in with concrete or other material at a later date, **unless** the stairs are temporarily fitted with wood or other solid material at least to the top edge of each pan.
 - Temporary treads and landings shall be replaced when worn below the level of the top edge of the pan.
 - If pans are not filled, stairs should be barricaded from use.

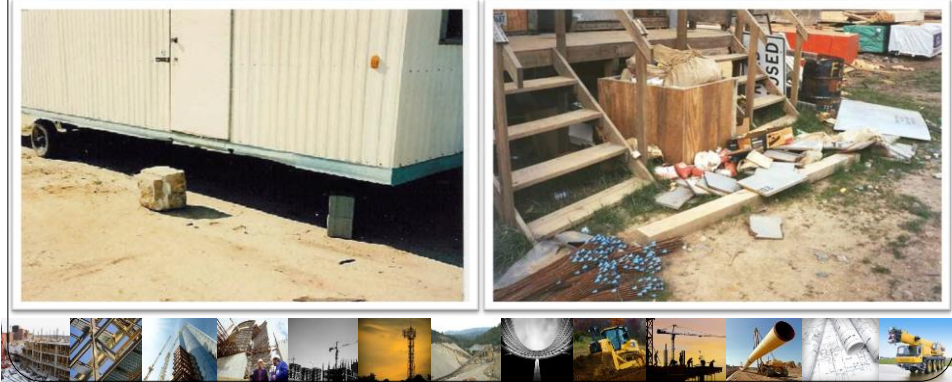




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General Requirements of OSHA Subpart X



Summary 29CFR1926 Subpart X

American National Standard Institute (ANSI)

ANSI ASC A14.1-2007

- American National Standards for Ladders - Wood Safety Requirements

ANSI ASC A14.2-2017

- Ladders - Portable Metal - Safety Requirements

ANSI ASC A14.3-2008

- American National Standards for Ladders - Fixed - Safety Requirements

ANSI ASC A14.4-2009

- American National Standard Safety Requirements for Job Made Wooden Ladders

ANSI ASC A14.5-2017

- Ladders - Portable Reinforced Plastic - Safety Requirements

ANSI ASC A14.7-2011

- Safety Requirements for Mobile Ladder Stands and Mobile Ladder Stand Platforms

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At Least 1 Point of Access Kept Clear

A stairway, ladder or ramp must be provided at points of access where there is an elevation break of **19 inches or more**.

Break in Elevation



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Clear Access btw. Levels



- 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.

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Common Compliance Concerns



Frequently Cited OSHA Violations

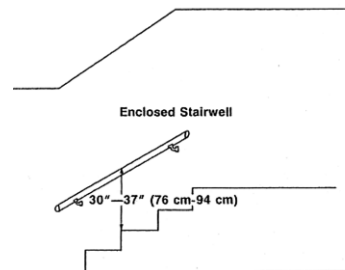
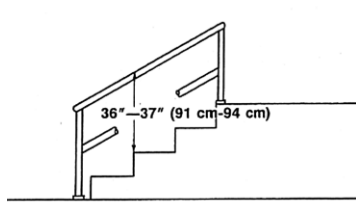
- **Not providing a handrail or stair rail system on stairs of four or more steps.** 1926.1052(c)(1)
- **Not securing a portable ladder or having it extended 3 feet above the upper landing before workers use it to reach an upper level.** 1926.1053(b)(1)
- **Not providing a safe means to gain access to a vertical rise in elevation of 19 inches or more.** 1926.1051(a)
- **Not providing a training program for workers on the proper construction, inspection, maintenance, care, use, and limitations of stairways and ladders.** 1926.1060(a)
- **Not marking or tagging a defective ladder so that it would not be used before it has been repaired.** 1926.1053(b)(16)



Preventing Common Stairway Violations

- All stairways of 4 steps or more need to have a handrail.
- If there is a fall hazard of 6 feet or more on an exposed side of the stairs, then a stair rail system must be provided to prevent workers from falling off.
 - Stairway landings 6 feet or more above the surrounding area need to be provided with a guardrail system along the exposed perimeters of the landing.

An example of the top member of a stair railing which also serves as the handrail is shown below.



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Preventing Common Ladder Violations

- When using a portable ladder, the top end must extend above the upper landing level by 3 feet or otherwise be tied off at the top to some secure point so that the ladder will not lose its position while a worker is using it.
- Portable ladders with structural defects are not to be used and shall be tagged or marked to indicate they are not to be used. Employees need to know what to look for to assure the ladder is safe to use before they put it in use.
- Train workers on:
 - **Overloading and prevention methods; fall protection features that need to be present when using ladders and stairways; correct procedures for erecting, using and disassembling stairways or ladders.**

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Necessary Precautions with
Predictable and Repeatable Results

Access to Another Level

- **Step Ladder** – *Working Platform*
- **Extension Ladder** – *Access to another Level*



Read All of
the Labels



Ladder Set-up

4 to 1 Ratio = 75° angle

Set-back ("S") needs to be 1-ft for each
4-ft of length ("L") to the upper support point

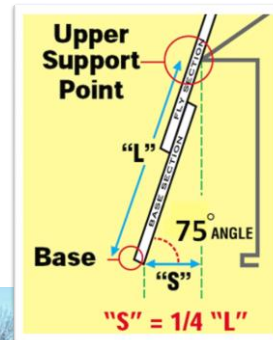
- *Example: if an extension ladder is extended 28' feet, then it's base should be 7' feet from the building.*

Practical Method:

Stand at the base of the ladder with your
toes touching the rails.

Extend arms straight out in front of you.

If the tips of your fingers just touch the
rung nearest your shoulder level, the angle
of your ladder has a 4:1 ratio.



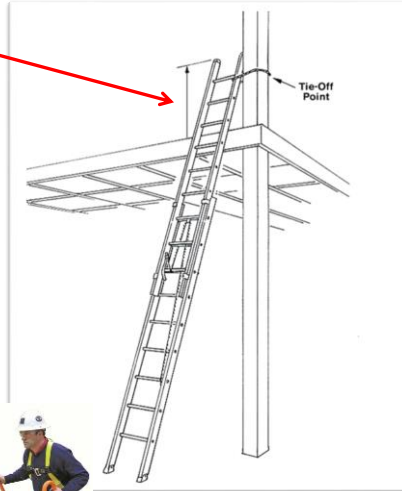
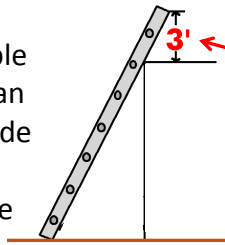
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Access to an Upper Landing

When using a portable ladder for access to an upper landing, the side rails must extend at least 3 feet above the upper landing



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.



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Solutions Exist....It's a Choice



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Ladder Landings and Fall Protection

- Unprotected sides and edges of ladder landings shall be provided with guardrail system

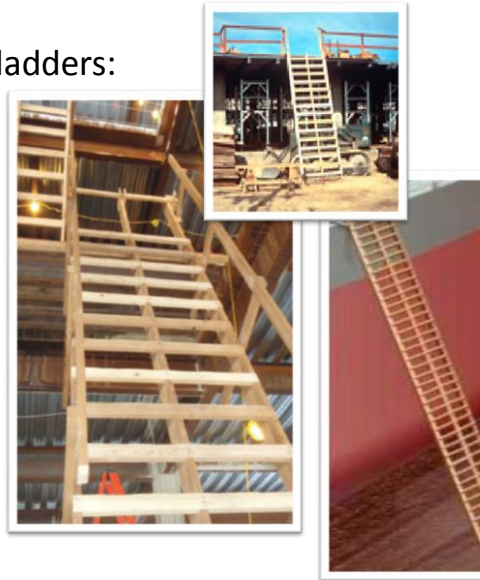
- **Subpart M**



Double-cleated Ladders

Use a double-cleated ladder (with center rail) or 2 or more ladders:

- **When ladders are the only way to enter or exit a working area with 25 or more employees**
- **When a ladder will serve simultaneous two-way traffic**



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Ladders used in Construction



Exemption to Subpart X

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.





Choosing the Correct Ladder

1. Select the type of ladder

- **Self-supporting**
 - stepladder, platform ladder, trestle ladder, or other foldout types
- **Non-self-supporting**
 - extension ladder or other leaning types

STEPLADDERS		EXTENSION LADDERS	
Ladder Height	*Maximum Reach	Ladder Height	*Maximum Reach
4'	3'	16'	15'
6'	10'	20'	19'
7'	11'	24'	23'
8'	12'	28'	27'
10'	14'	32'	31'
12'	16'	36'	34'
14'	18'	40'	37'

2. Working height and maximum reach

3. Necessary load capacity

4. Select material

- **Fiberglass**
- **Aluminum**

LOAD CAPACITY*	DESCRIPTION	CSA CODE	ANSI CODE
200 lbs./91 kg	Household - Light Duty	Grade 3	Type III
225 lbs./102 kg	Tradesman and Farm - Medium Duty	Grade 2	Type II
250 lbs./113 kg	Construction and Industrial - Heavy Duty	Grade 1	Type I
300 lbs./136 kg	Construction and Industrial - Heavy Duty	Grade 1A	Type IA
375 lbs./170 kg	Construction and Industrial - Heavy Duty	Grade 1AA	Type IAA

*Includes user and materials

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Read all Labels and Warnings



FIBERGLASS STEP

- Load Capacity
- Size/Length
- Maximum Working Length
- Highest Standing Level
- Necessary Precautions



FIBERGLASS EXTENSION

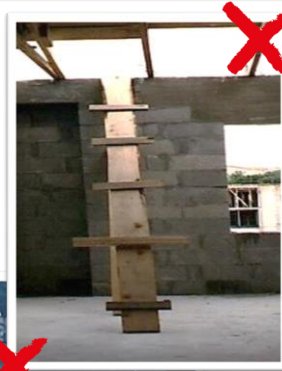


No "Single Rail" Ladders

- Ladders made by fastening cleats across a single rail shall not be used



No Chicken Ladders!



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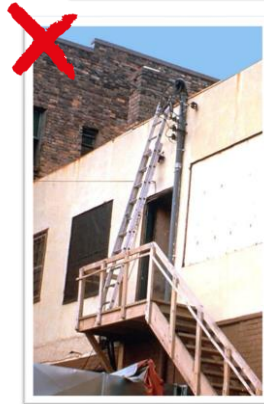
Inspect before Use

- Ladders shall be inspected by a competent person.
- Ladders with structural defects shall be tagged and removed from service.





Correct Set-up



Avoid using a metal ladder near power lines or exposed, energized equipment. A minimum safe distance is no less than 10 feet.



Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.



Step ladder is not set up properly to be self-supporting.

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Solid, Secure Footing



- Ladders shall be used only on stable and level surfaces unless secured to prevent accidental displacement.
- Never use any makeshift foundation such as drums, boxes, boards or blocks to get extra height.



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Prevent Displacement.....tip over

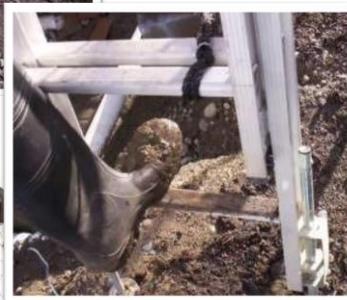


Oil, Mud, Sand, Grease, Snow, Ice...



As much as practical, clean your shoes/boots before climbing.

Consider a boot brush at high traffic areas.



Routinely inspect and clean ladder rungs of any oil, grease, mud or other slippery substances which could affect traction.

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Climbing or Descending a Ladder

- Both hands are free and you face the ladder.
 - **This allows for 3-points of contact with the ladder at all times and reduces the risk of falling.**
 - **3-points of contact = 2 hands & 1 foot or 1 hand & 2 feet**



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Climbing Cross Bracing?

- **Never use the cross bracing on the rear of a stepladder for climbing unless the ladder is specifically designed for that purpose.**

All Ladder Rungs are Designed and Rated for Climbing



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Ladders in Access Areas

- Secure ladder or barricade area to prevent displacement in pedestrian and vehicle traffic areas
- Do not place ladders in front of doors which open towards the ladder unless the door is locked or otherwise barricaded from opening and warning signs are posted.



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Ladders and Fall Protection

- **Straight, extension and step ladders are considered a "Safe Work Platform" when properly selected, inspected, set-up and used.**





Fall Protection and Portable Ladders

- Normally, fall arrest equipment **is not** required.
- Fall arrest equipment (*anchored to a suitable independent anchorage point*) should be used when working on/above the 3rd rung from the bottom of a ladder **and**:
 - a) **The employee cannot reposition the ladder and must work backwards.**
 - ✓ Facing away from the ladder
 - b) **The employee is using both hands to push, pull or handle tools, equipment or material that places the worker in a potentially unstable position.**
 - ✓ EXAMPLE - pulling on a wrench
 - c) **The worker must extend his/her waist beyond the side rail.**
 - d) **The portable ladder is used near a platform handrail, leading edge, or other similar area with significant differences in elevations.**
 - ✓ Fall arrest equipment must be anchored independently of the ladder to a suitable anchorage point.
 - e) **If any of the above cannot be met, then the ladder cannot be used and some other method must be selected such as the erection of scaffolding.**

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Misuse and Abuse

- **Ladders shall be used only for the purpose for which they were designed.**





Misuse and Abuse



Ladder designed for two people who follow directions. You can not stand on the first rung from the top



Only use step ladders when fully opened with spreader bars locked.

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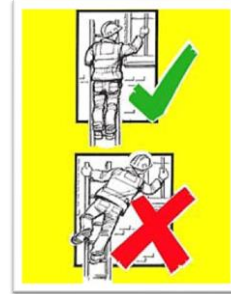
Misuse and Abuse





Common Causes of Injury & Death

- Overreaching
 - **Most injuries and fatalities are caused by overreaching**
 - **Precaution:** *keep your waist btw. both side rails*
- Waist above top cap of a step ladder
 - **Loss of balance**
- Incorrect ladder or ladder length
- Improper set-up, uneven ground, unsecured
 - **Tip over**
- Using broken or damaged ladders
- Carrying objects while climbing/descending



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Construction Stairways

Stairways Used During Construction

Temporary Stairs



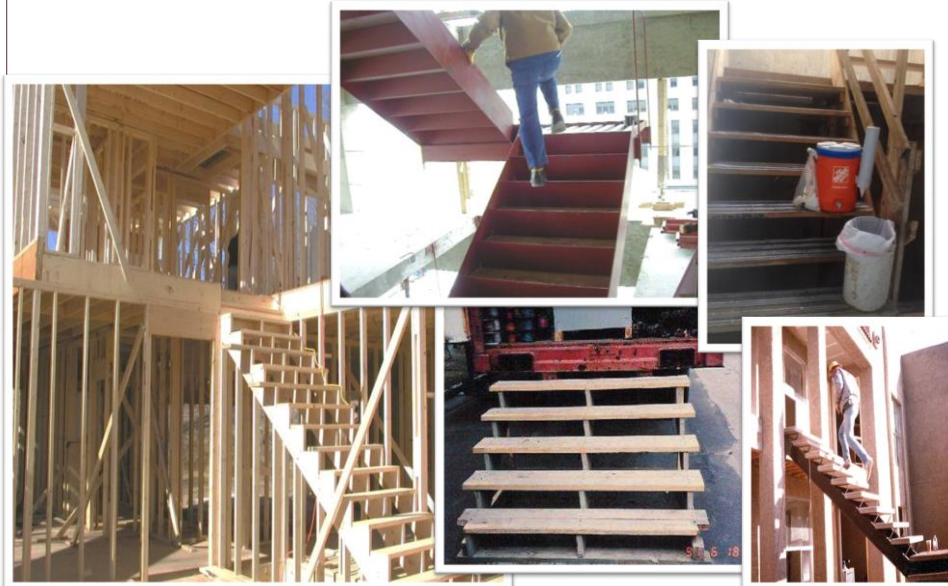


Rules for Stairways

- The rules covering stairways and their components generally depend on how and when stairs are used.
- Specifically, there are rules for stairs used during construction and stairs used temporarily during construction, as well as rules governing stair rails and handrails.



Hazard Recognition & Control

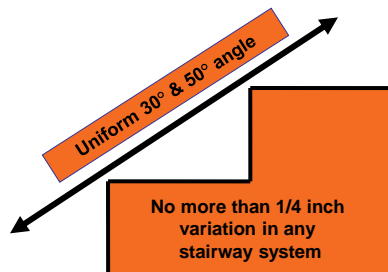




Stairways Used During Construction

The following requirements apply to all stairways that **will not** be a permanent part of the building under construction:

- Landings must be at least 30 inches deep and 22 inches wide at every 12 feet or less of vertical rise.
- Installed at least 30° but no more than 50° from the horizontal.
- Variations in riser height or stair tread depth must not exceed 1/4 inch in any stairway system.
 - Includes any Foundation Structure Used as One or More Treads of the Stairs.

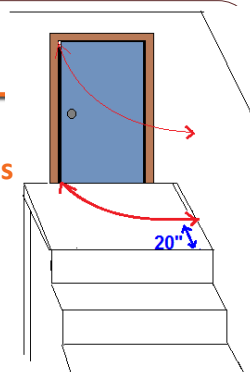


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Design Elements

- Doors and gates opening directly onto a stairway must have a platform extending **at least 20-inches** beyond the swing of the door or gate.
- A stairway with **4 or more risers**, or **higher than 30 inches**, must be equipped with **at least 1 handrail**.





Temporary Stairs



- Except during construction of the stairway, do not use stairways with metal pan landings and treads if the treads and/or landings have not been filled in with concrete or other material.
- Do not use skeleton metal frame structures and steps (where treads/landings will be installed later) 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.
- All treads and landings must be replaced when worn below the top edge of the pan.

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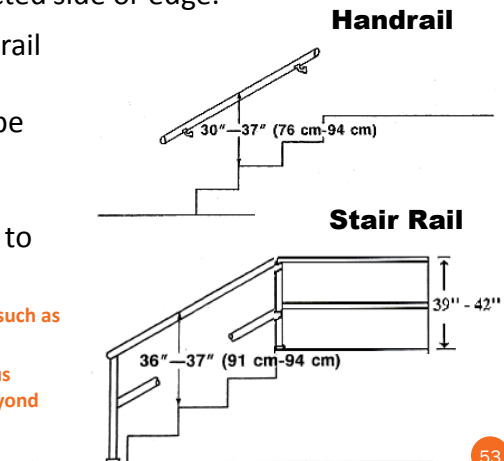
Stair Rail and Hand Rail Requirements





Stair Rail & Hand Rail Design Elements

- Stairways with **4 or more risers** or **rising more than 30 inches** in height— *whichever is less*—must have **at least 1** hand rail or stair rail installed along each unprotected side or edge.
- When the top edge of a stair rail also serves as a handrail, the height of the top edge must be **no more than 37 inches nor less than 36 inches** from the upper surface of the stair rail to the surface of the tread.
 - **Must be “surfaced” to prevent injuries such as punctures or lacerations.**
 - **Ends must be built to prevent dangerous projections, such as rails protruding beyond the end posts of the system.**



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Midrails and Stair Rail Systems

- Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members must be provided between the top rail and stairway steps to the stair rail system.
- When midrails are used, they must be located midway btw. the top of the stair rail system and the stairway steps.



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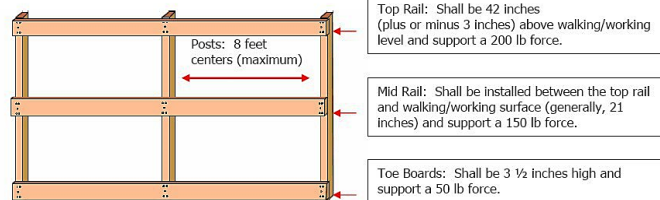
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Unprotected Sides and Edges

- Unprotected sides and edges of stairway landings must have standard 42-inch guardrail systems.



- **Intermediate vertical members**, such as balusters used as guardrails, must not be more than 19 inches apart.
- Other **intermediate structural members**, when used, must be installed so that no openings are more than 19 inches wide.

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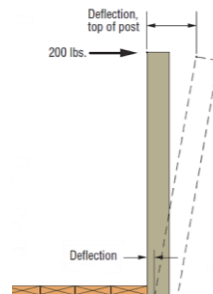
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Stair Rail & Hand Rail Strength

- Handrails and the top rails of the stair rail systems must be capable of withstanding, without failure, at least 200 pounds of weight applied within 2 inches of the top edge in any downward or outward direction, at any point along top edge.



Temporary handrails must have a minimum clearance of 3 inches between the handrail and walls, stair rail systems and other objects.



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OSHA's Training Requirements for Stairways and Ladders



OSHA's Perspective on Training

- Employers must train all employees to recognize hazards and instruct them to minimize stairway and ladder hazards.
 - **Employers must ensure that each employee is trained by a competent**
 - **Nature of fall hazards in the work area**
 - **Correct procedures for erecting, maintaining and disassembling the fall protection systems to be used**
 - **Proper construction, use, placement and care in handling of all stairways and ladders**
 - **Maximum intended load-carrying capacities of ladders used**

Note: Employers must retrain each employee as necessary to maintain their understanding and knowledge on the safe use and construction of ladders and stairs.

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In Closing...

- Discussed common terms and definitions in OSHA Subpart X
- General requirements of OSHA Subpart X
- OSHA's regulations for ladders used in construction
- OSHA's regulations for stairways
- OSHA's stair rail and hand rail requirements
- OSHA's training requirements for stairways and ladders



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