



# TEXAS WOMAN'S UNIVERSITY™

## Ladder Safety Program

Revised: 04/01/25

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## I. PURPOSE

This program contains requirements for the safe and proper use of ladders, including portable wooden, metal, reinforced plastic, and/or fiberglass, as well as fixed ladders, used at Texas Woman's University (TWU). The safety of all employees and students is the foremost objective of the program. This program complies with the requirements of Occupational Safety and Health Administration (OSHA) standards 29 CFR 1910.23, 1910.28, and 1910.29, and is promulgated in accordance with [TWU URP 04.430](#).

## II. SCOPE

This program describes the minimum requirements for the care and use of ladders to ensure employee and student safety. Portable ladders typically are comprised of wood, metal, fiberglass, or reinforced plastic. It is not the purpose of this program to specify all the details of construction for all portable ladders. Detailed requirements are provided in the OSHA standards cited above, and the American National Standard Institute (ANSI) standards A14.1-1994, ANSI A14.2-1990, et al.

## III. DEFINITIONS

*NOTE:* The most pertinent definitions for all ladder types are shown below. For the most comprehensive list, refer to the definitions found in ANSI A14.1-1994, A14.2-1990, A14.4-1992, A14.5-1992, and OSHA 29 CFR 1910.23, 1910.28, and 1910.29.

**Angle of inclination** - The preferred pitch of portable non-self-supporting ladders.

**Back leg (rear rail)** - The support members of a self-supporting portable ladder back section. The back legs are joined by rungs, bars, rear braces, or other bracing to form the back section.

**Cage** - An enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person who must climb the ladder. Also referred to as a cage or basketguard.

**Cleats** - Cleats are ladder crosspieces of a rectangular cross-section placed on an edge on which a person may step in while ascending or descending.

**Combination ladder** - A portable ladder capable of being used either as a stepladder or as a single or extension ladder.

**Double front ladder** - A self-supporting ladder, non-adjustable in length, consisting of two (2) sections intended for climbing on both sides.

**Duty rating** - The combination of factors, including but not limited to ladder type and design features, which imply service capability.

**Extension ladder** - A non-self-supporting portable ladder adjustable in length. It consists of two (2) or more sections traveling in guides or brackets so arranged as to permit

length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

**Fastenings** - A device to attach a ladder to a structure, building, or equipment.

**Fixed ladder** - A ladder permanently attached to a structure, building, or equipment.

**Grab bars** - Individual handholds placed adjacent to or as an extension above ladders to provide access beyond the limits of the ladder.

**Individual-rung ladder** - A fixed ladder, each rung of which is individually attached to a structure, building, or equipment.

**Inside clear width** - The distance between the inside flanges of the side rails of a ladder.

**Ladder** - A ladder is an appliance usually consisting of two (2) side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step while ascending or descending.

**Ladder foot (shoe or skid-resistant bearing surface)** - That component of ladder support that is in contact with the lower supporting surface.

**Ladder safety system**- System designed to eliminate or reduce the possibility of falling from a ladder. This usually consists of a carrier, safety sleeve, lanyard, connectors, and body harnesses. Cages and wells are not ladder safety systems.

**Marking** - Any sign, label, stencil, or plate of a primary hazard or informational character or both, affixed, painted, burned, stamped, or embossed on the ladder surface.

**Maximum extended length (or maximum working length)** - The total length of the extension ladder when the middle or intermediate and top or fly sections are fully extended (maintaining the required overlap).

**Mobile ladder (AKA stand platform)** - A mobile, fixed-height, self-supporting unit having one or more standing platforms that are provided with means of access or egress

**Mobile stairs** - A mobile, fixed-height, self-supporting ladder that usually consists of wheels or casters on a rigid base and steps leading to a top step. A mobile ladder stand may also have handrails and is designed for use by one employee at a time.

**Permanent deformation (set)** - That deformation remains in any part of a ladder after all loads have been removed.

**Pitch** - The included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side.

**Railings** - A standard railing is a vertical barrier erected along exposed edges of floor openings, wall openings, ramps, platforms, and runways to prevent falls of persons.

**Rail ladder** - A fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.

**Reinforced plastic ladder** - A device whose side rails are constructed of reinforced plastics. The crosspieces, called steps, rungs, or cleats, may be constructed of metal, reinforced plastics, or other suitable materials. This term does not denote the absence of all metallic elements, because even in ladders with side rails and crosspieces manufactured of reinforced plastics, the hardware and fasteners may be metallic.

**Rungs** - Rungs are ladder crosspieces of circular or oval cross-section on which a person may step while ascending or descending.

**Side-step ladder** - A ladder from which a person getting off at the top must step sideways from the ladder to reach the landing.

**Stepladder** - A stepladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

**Single ladder** - A single ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of but one (1) section. Its size is designated by the overall length of the side rail.

**Special-purpose ladder** - A portable ladder that represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, to adapt the ladder to special or specific uses.

**Steps** - Steps are the flat crosspieces of a ladder on which a person may step while ascending or descending.

**Step stool (ladder type)** - A self-supporting, foldable, portable ladder, nonadjustable in length, 32 inches or less in overall size, with flat steps and without a pail shelf, designed so that the ladder top cap, as well as all steps, can be climbed on. The side rails may continue above the top cap.

**Through ladder** - A ladder from which a person getting off at the top must step through the ladder in order to reach the landing.

**Visual damage** - Damage evident by visual inspection.

**Well** - A permanent complete enclosure around a fixed ladder that attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage.

**Working load** - The maximum applied load, including the weight of the user, materials, and tools, which the ladder is to support for the intended use.

#### IV. CARE AND USE OF LADDERS

To ensure safety and serviceability, the following precautions in the care of ladders shall be observed:

- Ladders shall always be maintained in good condition, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the movable parts shall operate freely without binding or undue play.
- Metal bearings of locks, wheels, pulleys, etc., shall be lubricated as necessary to ensure proper function.
- Frayed or badly worn rope shall be replaced.
- Safety feet and other auxiliary equipment shall be kept in good condition to ensure proper performance.
- Ladders shall be inspected frequently, and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "Dangerous, Do Not Use."
- Rungs should be kept free of grease and oil. Clean mud and other slippery substances off your shoes/boots before climbing.
- If a ladder is involved in any of the following, immediate inspection is necessary:
  - If ladders tip over, inspect ladder for side rails dents or bends or excessively dented rungs. Check all rung-to-side-rail connections; check hardware connections and rivets for shear.
  - If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or other slippery materials.
  - Ladders having defects are to be marked (as indicated above) and taken out of service until repaired as per the manufacturer requirements.
- Portable ladders shall be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter ( $\frac{1}{4}$ ) of the working length of the ladder (the length along the ladder between the foot and the point the ladder contacts the structure it is placed against).
- The ladder shall be so placed as to prevent slipping, or it shall be lashed or held in position.
- Three points of contact must be maintained with the ladder at all times (e.g. one hand and two feet, or two hands and one foot when climbing). Thus, carrying tools/materials in your hands while climbing ladders is prohibited (raise or lower items with a hand line or winch). You may use both hands to

do light work from a ladder once you have ascended, as long as you are facing the ladder and your body stays between the side rails.

- Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.
- Ladders designed for one (1) person shall not be used by more than one person at a time nor with ladder jacks and scaffold planks when use by more than one (1) person is anticipated.
- Portable ladders shall be so placed that the side rails have a secure footing. The structures upon which the top of the ladder is placed against shall be reasonably rigid and shall have ample strength to support any applied load.
- Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, and/or guarded.
- Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height.
- Ladders with broken or missing steps, rungs, cleats, broken side rails, or other faulty equipment shall not be used. Improvised repairs shall not be made.
- Short ladders shall not be spliced together to provide long sections.
- Ladders made by fastening cleats across a single rail shall not be used.
- Ladders shall not be used as guys, braces, or skids, or for anything other than their intended purpose.
- Tops of the ordinary types of stepladders shall not be used as steps.
- Portable ladders with reinforced rails shall be used only with the metal reinforcement on the underside.
- No ladder should be used to gain access to a platform or roof unless the top of the ladder extends at least three (3) feet above the point of support (e.g., eave, gutter, or roofline).
- The user should equip all portable ladders with nonslip bases when there is a hazard of slipping.
- Nonslip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, or slippery surfaces.

- On two-section extension ladders, the minimum overlap for the two (2) sections in use shall be as follows:

Size of ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

- The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing. To avoid injury, do not climb, step upon, or otherwise use the bracing for leverage.
- Portable ladders are designed as a one-person working ladder based on a 200-pound load.
- The top of the ladder must be placed with the two (2) rails supported unless equipped with a single support attachment. When ascending or descending, the climber must be facing the ladder.
- Tying or fastening ladders together is strictly prohibited. If an extension is necessary, an extension ladder must be used so long as it is equipped with the hardware fittings necessary.
- Ladders should not be used as a brace, skid, guy or gin pole, gangway, or for uses other than for which they were intended unless specifically recommended for use by the manufacturer.
- Portable ladders must be selected that are rated for the expected load (person plus tools).
- All portable ladders must be labeled indicating rating/weight capacity and that it meets ANSI, OSHA, and other applicable standards.

## V. PORTABLE WOODEN LADDERS

Wooden ladders may not be painted, as it would impede the inspection of the wood for cracks, damage, and/or deterioration. All wood parts should be smooth, and otherwise free from sharp edges and splinters; they should likewise be sound and free from shake, wane, compression failures, decay, or other irregularities. Low-density wood shall not be used. Wood stepladders shall be no longer than 20 feet.

The general requirements for wood stepladders are:

- A uniform step spacing shall be employed which shall be not more than 14 inches. Steps shall be parallel and level when the ladder is in position for use.
- The minimum width between side rails at the top, inside to inside, shall be not less than 11½ inches. From top to bottom, the side rails shall spread at least one (1) inch for each foot of the length of a stepladder.
- A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all sharp points covered or removed to protect the user. For Type III ladders, the pail shelf and spreader may be combined in one unit (i.e., the shelf-lock ladder).
- Single ladders shall be no longer than 30 feet.
- Two-section extension ladders shall be no longer than 60 feet. All ladders of this type shall consist of two (2) sections, one to fit within the side rails of the other and arranged in such a manner that the upper section can be raised and lowered.

## VI. PORTABLE METAL LADDERS

The spacing of rungs or steps shall be on 12-inch centers. Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping. The minimum width between the side rails of a straight ladder or any section of an extension ladder shall be 12 inches. The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two-section ladders shall not exceed 48 feet in length, and over two-section ladders shall not exceed 60 feet in length.

Based on the nominal length of the ladder, each section of a multi-section ladder shall overlap the adjacent section by at least the number of feet stated in the following:

Normal length of ladder (feet)	Overlap (feet)
Up to and including 36	3
Over 36, up to and including 48	4
Over 48, up to 60	5

Extension ladders shall be equipped with positive stops, which will ensure the overlap specified in the table above.

## **VII. MOBILE STAIRS**

Mobile stairs must have a step width of at least 16 inches.

Steps must be slip-resistant; if not provided as an integral part of their design, then it must be done as a secondary process or operation.

Mobile stairs must be capable of supporting at least four times their maximum intended load and wheels and casters must be capable of supporting their proportional share of four times the maximum load plus the unit weight.

The maximum work-surface height of mobile stairs does not exceed four times the shortest base dimension without additional support. For greater heights, outriggers, counterweights, or comparable means that stabilize and prevent overturning must be used.

Unless otherwise stated in CFR 1910.23, mobile stairs with a top step height of 4 feet or above must have handrails with a vertical height of 29.5 inches to 37 inches measured from the front edge of a step. Removable gates or non-ridged members, such as chains, may be used instead of handrails in special-use applications.

Mobile stairs must have wheel casters equipped with a system to impede horizontal movement when an employee is on the mobile stairs.

No mobile stairs can be moved when the employee is on it.

All mobile stairs must meet the design requirements as specified in CFR 1910.23.

## VIII. STEP LADDERS

The length of a stepladder is measured by the length of the front rail. To be classified as a standard-length ladder, the measured length shall be within plus or minus one-half ( $\frac{1}{2}$ ) inch of the specified length.

- Stepladders shall not exceed 20 feet in length.
- The bottoms of the four (4) rails are to be supplied with insulating non-slip material for the safety of the user.
- A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed to protect the user.

## IX. FIXED LADDERS

According to updated OSHA regulations, CFR 1910.28 (b)(9), fixed ladders over 24 feet installed before November 19, 2018, must be equipped with a personal fall arrest system, ladder safety system, cage, or well. Replacements to any section of these ladders require that a personal fall arrest system or ladder safety system be installed at that time. Fixed ladders over 24 feet installed on or after November 19, 2018, must be equipped with a personal fall arrest system or ladder safety system. Ladder safety systems must be used on ALL fixed ladders over 24 feet after November 18, 2036.

- The minimum design live load shall be a single concentrated load of 200 pounds.
- The number and position of additional concentrated live load units of 200 pounds each as determined from anticipated usage of the ladder shall be considered in the design.
- The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such points as will cause the maximum stress in the structural member being considered.
- The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.
- For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range of  $75^{\circ}$  to  $90^{\circ}$  and intended for use by no more than one (1) person per section, single ladders of less than 30 feet are acceptable.
- All rungs shall have a minimum diameter of three-fourths ( $\frac{3}{4}$ ) inch for metal ladders and a minimum diameter of  $1\frac{1}{8}$  inches for wood ladders.
- The distance between rungs, cleats, and steps shall not exceed 14 inches and shall be uniform throughout the length of the ladder.

- The minimum clear length of rungs or cleats shall be 16 inches.
- Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.
- The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end.
- Side rails which might be used as a climbing aid shall be of such cross-sections as to afford adequate gripping surface without sharp edges, splinters, or burrs.
- Fastenings shall be an integral part of fixed ladder design.
- Splicing is not allowed.
- No welding shall be allowed on any metal ladders.
- The preferred pitch of fixed ladders shall be in the range of 75° and 90° with the horizontal. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60° and 75° with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.
- Ladders having a pitch in excess of 90° with the horizontal are prohibited.
- All ladders shall be maintained in a safe condition. All ladders shall be inspected regularly, with the intervals between inspections being determined by use and exposure.

## **X. PORTABLE REINFORCED PLASTIC LADDERS**

Plastic, reinforced plastic ladders are a newer type of ladders on the market that follow the same basic requirements as wooden and metal ladders.

The ladder shall have sufficient strength and stiffness to meet the performance requirements of ANSI Standard A14.5-1992 and shall produce a ladder without structural defects and hazards such as sharp edges, burrs, and the like.

## **XI. SAFE USE OF LADDERS ON/AROUND ELECTRICAL EQUIPMENT**

Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts when work is performed near or on equipment or circuits that may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards. Further information is found in OSHA [29 CFR 1910.333](#) and the [TWU Electrical Work Safety Program](#).

Metallic or metal-type ladders shall NOT be used around electrical energy, components, and sources. Portable ladders shall have nonconductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

## **XII. PROTECTION OF LADDERS FROM DETERIORATION**

Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands. Ladders formed by individual metal rungs embedded in concrete, which serves as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase rung life in such an atmosphere, individual metal rungs shall have a minimum diameter of one (1) inch or shall be painted or otherwise treated to resist corrosion and rusting.

Wood ladders, when used under conditions where decay may occur, shall be treated with a nonirritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no deleterious effect one upon the other.

## **XIII. CLEARANCE AND THE CLIMBING SIDE OF FIXED LADDERS**

- **Fixed Ladders:** The perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76°, and 30 inches for a pitch of 90°, with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope.
- **Ladders without Cages or Wells:** A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary. A minimum perpendicular distance of 30 inches from the centerline of the steps or rungs to the nearest object is required, however, if unavoidable obstructions occur this distance may be reduced to 24 inches provided deflector plates are installed.
- **Clearance in Back of Ladder:** The distance from the centerline of rungs, cleats, or steps to the nearest permanent object in the back of the ladder shall be not less than seven (7) inches, except when unavoidable obstructions are encountered.
- **Clearance in Back of Grab Bar:** The distance from the centerline of the grab bar to the nearest permanent object in the back of the grab bars shall be not less than seven (7) inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder that they serve.
- **Step-Across Distance:** The step-across distance from the centerline of the rungs or steps of the ladder to the nearest edge of equipment or structure shall be not more than 12 inches or less than 7 inches for through ladders.

The step-across distance for side-step ladders is not more than 20 inches and not less than 15 inches to the access points of the platform edge.

- Hatch Cover: Counterweighted hatch covers shall open a minimum of 70° from the horizontal. The distance from the centerline of rungs or cleats to the edge of the hatch opening on the climbing side shall be not less than 24 inches for offset wells or 30 inches for straight wells.

#### **A. Special Requirements for Cages or Wells**

Cages shall extend a minimum of 42 inches above the top of landing unless other acceptable protection is provided.

Cages and wells must be continuous throughout the length of the ladder, except for access, egress, and other transfer points.

Cages and wells must be constructed and maintained to contain employees during a fall and to direct them to a lower landing.

Cages shall not extend less than 27 inches nor more than 28 inches from the centerline of the rungs of the ladder. Cages shall not be less than 27 inches in width. The inside shall be clear of projections. Vertical bars shall be located at a maximum spacing of 40° around the circumference of the cage; this will give a maximum spacing of approximately 9½ inches, center to center.

Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth-walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the centerline of the rungs.

### **XIV. SPECIAL REQUIREMENTS FOR LANDING PLATFORMS**

When ladders are used to ascend to heights exceeding 24 feet (except on chimneys and similar structures), landing platforms shall be provided for each 50 feet of height or fraction thereof, except, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 24 feet of height or fraction thereof. Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset.

Where a person has to step a distance greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of the structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2½ inches.

All landing platforms shall be equipped with a guardrail system and toe boards, with a self-closing gate or offset used at entrances of the ladderway floor or platform holes.

Chains cannot be used instead of a self-closing gate or offset. Platforms shall be not less than 24 inches in width and 30 inches in length.

One (1) rung of any section of the ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.

## **XV. LADDER EXTENSIONS AND GRAB BARS**

The side rails of through or side-step ladder extensions shall extend 3½ feet above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 inches nor more than 24 inches clearance between rails.

For side-step or offset fixed ladder sections, at landings the side rails and rungs shall be carried to the next regular rung beyond or above the 3½ feet minimum.

Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab bar diameters shall be the equivalent of the round-rung diameters.

## **XVI. SPECIAL REQUIREMENTS FOR LADDER SAFETY SYSTEMS**

Each ladder safety system must allow the employee to climb up and down using both hands and does not require that the employee continuously hold, push, or pull any part of the system while climbing.

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

Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings spaced, as necessary, along the entire length of the carrier so the system has the strength to stop employee falls.

Mountings for flexible carriers must be attached at each end of the carrier and cable guides for flexible carriers are installed at least 25 feet (7.6 m) apart but not more than 40 feet (12.2 m) apart along the entire length of the carrier.

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

Ladder safety systems and their support systems must be capable of withstanding, without failure, a drop test consisting of an 18-inch (41-cm) drop of a 500-pound (227-kg) weight.

The ladder safety system must protect the entire vertical distance of the ladder, including all ladder sections. The ladder must have rest platforms provided at maximum intervals of 150 feet. Ladder sections with a cage or well must be offset from adjacent

sections and have landing platforms provided at maximum intervals of 50 feet. The cage or well cannot interfere with the operation of the ladder safety system.

Contact Risk Management for assistance with these types of systems.