Ladder Safety Procedure

Environmental Health and Safety

Revised-10-01-14

Ball State University

Environmental Health and Safety

LADDER SAFETY PROCEDURE

PURPOSE
The purpose of this program is to establish the minimum requirements for the safe and proper use of ladders (including wooden, metal, and fiberglass ladders) and the minimum requirements for the care and use of portable and fixed ladders in order to ensure safety under normal conditions of use at Ball State University.

SCOPE
This program is inclusive of Ball State University employees, including faculty, staff and student employees. Intended for those who are required to use ladders to perform any work activities.

RESPONSIBILITIES

Environmental Health and Safety (EHS)

- Provide ladder safety training to affected employees
- Provide technical support and consultation to departments of affected employees to interpret requirements and establish safe practices
- Maintain training records

Managers/Supervisors

- Provide the proper type, rated and ANSI-compliant ladders for employees, students, and faculty
- Ensure that employees are conducting ladder inspections
- Contacting EHS for technical support when questions arise regarding compliance and safe procedures
- Ensuring that proper safety equipment is supplied to their affected employees where needed
- Making sure that employees attend all required training
- Ensuring that designated employees perform documented portable ladder inspections
- Keeping records for when refresher Ladder Safety Training is needed

Employees

- Employees are responsible for ensuring ladders are safe before usage
- Comply with the manufactures instructions
- Reporting damaged ladders and tagging them out of service
- Conduct visual inspections of ladders before each use
- Document ladder inspections annually
- Notify their supervisor when questions arise surrounding safe procedures, the need for safety equipment, and difficulties complying with these requirements

Contractors

- Contractors working on campus are required to comply with all applicable OSHA workplace safety regulations
- Contractors should not use Ball State University ladders

PORTABLE LADDERS

All ladders at Ball State University must be constructed and used in accordance with OSHA regulations and ANSI standards. All commercially manufactured ladders must have a label indicating it meets the requirements of the ANSI standard. When selecting a ladder, the user must consider the proper duty rating, ladder type and length to safely accommodate the combined weight of the user and material.

General Requirements

- Ladders are only to be used for their intended purpose and not for platforms or as walk-boards;
- Ladders shall be visually inspected before each use and after any occurrence which could affect their safe use
- Ladders which are damaged shall not be used and must tagged: "Out of Service".
- Rungs shall be kept free of grease and oil
- Ladders shall be equipped with non-slip bases when the ladder is placed on a slippery surface and there is a hazard of slipping
- Ladders cannot be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded
- Ladders cannot be placed on boxes, barrels, or other unstable bases or spliced together to obtain additional height
- Ladders shall not be moved, shifted, or extended while occupied
- The tops of ladders (unless using a stepladder) must rest against a solid, fixed surface; When ascending or descending, the climber must face the ladder
- When used to access an upper landing surface, the ladder side rails must extend at least three (3) feet above the upper landing surface
- When setting up non-self-supporting ladders, the base of the ladder should be placed at a distance from the wall that is equal to 1/4 of the height that the ladder is extended (i.e., a ladder that is extended twenty (20) ft. high should have its base approximately five (5) ft. from the wall)

STEPLADDERS

The bracing on the back legs of stepladders is designed solely for increasing stability and cannot be used for climbing

A metal spreader or locking device of sufficient size and strength to securely hold the ladder in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed

The tops two steps of a step ladder are not to be used for standing/stepping

Stepladder selection and use must be in accordance with the following rating:

LADDER TYPE	DUTY RATING	LOAD CAPACITY	TYPICAL USE
Type IAA	Special Duty	375 pounds	3 ft. - 20 ft. for heavy duty, such as utilities, contractors, and industrial use
Type IA	Extra Heavy Duty	300 pounds	3ft - 20ft for heavy duty, such as utilities, contractors, and industrial use
Type I	Heavy Duty (Industrial)	250 pounds	3ft - 20ft for heavy duty, such as utilities, contractors, and industrial use
Type II	Medium Duty (Commercial)	225 pounds	3ft - 12ft for medium duty, such as painters, office and light industrial use
Type III	*Light Duty (Household)*	*200 pounds*	*3ft - 6ft for light duty, such as light household use*

SINGLE LADDERS

Single ladders and individual sections of ladders shall not exceed thirty (30 ft.) in length.

EXTENSION LADDERS

Two-section extension ladders must not exceed forty-eight (48) ft. in length
Extension ladders with more than two-sections must not exceed sixty (60) ft. in length
When employees are on extension ladders at heights of 20 feet or higher, either a second person is present to steady the ladders base or the top of the ladder is effectively tied off to a sound anchor point

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

Size of Ladder (Overlap by ft.)

Up to and including 36 ft.	Overlap by 3 ft.
Over 36 ft., up to and including 48 ft.	Overlap by 4 ft.
Over 48 ft., up to and including 60 ft.	Overlap by 5 ft.

Special Ladders / Restrictions

TYPE OF LADDER	**RESTRICTION**
Trestle, extension or base sections of extension trestle ladders	Equal to or less than 20 ft.
Painter's stepladders	Equal to or less than 12 ft.
Mason's ladders	Equal to or less than 40 ft.
Trolley	Equal to or less than 20 ft.
Side-Rolling Ladders	

FIXED LADDERS

All fixed ladders greater than 20 ft. in length are required to be equipped with cages. When the length exceeds 30 ft. in unbroken length, rest platforms or ladder landings are required.

Requirements

- Fixed ladders must be able to support a minimum load of 200 pounds
- Fixed ladders must be secured to the object to which they are attached
- All ladders shall be maintained in a safe condition
- All ladders shall be inspected before each use per training
- Defects in fixed ladders must be repaired as soon as possible
- When a defect is not repairable, the ladder must be tagged as out of service
- 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 an employee's foot cannot slide off the end

- The preferred pitch of fixed ladders shall be considered to come in the range of 75° and 90° with the horizontal

- Ladders having a pitch in excess of 90° with the horizontal are prohibited

Requirements for Cages and Wells

- Cages or wells shall be provided on ladders of 20 feet to a maximum unbroken length of 30 feet;
- Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided
- Cages shall extend down the ladder to a point not less than seven (7) feet nor more than eight (8) feet above the base of the ladder, with bottom flared not less than four (4) inches, or portion of cage opposite ladder shall be carried to the base

Requirements for Landing Platforms

- When ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platforms shall be provided for each 30 feet of height, except where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 20 feet of height
- 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 structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2 1/2 inches
- All landing platforms shall be equipped with standard railings and toe boards
- Platforms shall not be less than 24 inches in width and 30 inches in length

SAFE USE OF LADDERS ON OR AROUND ELECTRICAL EQUIPMENT

Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contact when work is performed near or on equipment or circuits which 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. Metallic or metal type ladders **shall NOT** be used around electrical energy, components and sources. Only fiberglass or wood ladders shall be used around electrical sources.

MAINTENANCE REQUIREMENTS

Portable and fixed ladders with structural defects must be withdrawn from service until repaired. Ladders are considered withdrawn from use when they are immediately tagged with “Do Not Use” or marked in a manner that identifies them as defective. Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to service.

All ladder repairs must be made by a qualified person trained and familiar with the design and proper procedures for making repairs.

INSPECTIONS

When conducting ladder inspections ensure that:

- All side rails are free of dents or bends
- All step-to-side rail connections are intact
- All rivets are in good condition
- All hardware connections are intact
- The stepping surfaces are free of oil, grease or other slippery substances

Note:
A ladder must be inspected immediately whenever tipped over or after an occurrence that affects its safe use
Examine each ladder for signs of damage, deterioration and other indications of excessive wear prior to each use

TRAINING and RECORDS

Ladder Safety training will be conducted by the Environmental Health and Safety Department. Each employee will be required to inspect each ladder before use. Certifications and Records will be retained by the Environmental Health and Safety Department.

REFERENCES

OSHA Walking-Working Surfaces Portable and Fixed Ladders 29 CFR 1910.25-27; Subpart D.
OSHA 2003 Walking and Working Surfaces; Personal Protective Equipment (Fall Protection Systems) Proposed Rule.
OSHA Electrical Standard- Selection and Use of Work Practices 29 CFR 19 10.333

APPENDIX 1
Ball State University
Ladder Inspection Form

Ladder Inspection Form

Inspection Date:	Employee Name:
Department:	Location of Ladder:
Type of Ladder: ( ) Extension ( ) Step ( ) Fixed	Ladder Material: ( ) Wood ( )Metal ( ) Fiberglass

General Step-ladder	Condition OK	Needs Repaired	Not Applicable
Loose steps or rungs (can be moved by hand)			
Loose nails, screws, bolts, or other materials			
Cracked, split, or broken uprights, braces, steps, or rungs			
Rungs or steps missing			
Free from grease, oil, or slippery materials			
Side rails tight, free of cracks			
Movable parts operate freely			
Damaged or worn non-slip bases			
Labels are affixed and in good condition			
Other			
General Extension Ladder	**Condition OK**	**Needs Repaired**	**Not Applicable**
Loose, broken, or missing extension locks			
Frayed or worn rope			
Loose steps or rungs (can be moved by hand)			
Rungs or steps missing			
Side rails tight, free of cracks			
Damaged or worn non-slip bases			
Free from grease, oil, or slippery materials			
Labels are affixed and in good condition			
Other			
General Fixed Ladder	**Condition Ok**	**Needs Repaired**	**Not Applicable**
Loose, steps or rungs (can be moved by hand)			
Loose nails, screws, bolts, or other materials			
Side rails tight, free of cracks			
Cage secure and free of damage			
Area around bottom of ladder free of tripping hazards			
Free from grease, oil, or slippery material			
Other			

Comments:_____

APPENDIX 2

Part Number:	1910
• Part Title:	Occupational Safety and Health Standards
• Subpart:	D
• Subpart Title:	Walking-Working Surfaces
• Standard Number:	1910.25-1910.27
• Title:	Ladders

1910.25(a)

"Application of requirements." This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage. Other types of special ladders, fruit picker's ladders, combination step and extension ladders, stockroom step ladders, aisle-way step ladders, shelf ladders, and library ladders are not specifically covered by this section.

1910.25(b)

"Materials" -

1910.25(b)(1)

"Requirements applicable to all wood parts."

1910.25(b)(1)(i)

All wood parts shall be free from sharp edges and splinters; sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities. Low density wood shall not be used.

1910.25(c)

"Construction requirements."

1910.25(c)(1)

[Reserved]

..1910.25(c)(2)

1910.25(c)(2)

"Portable stepladders." Stepladders longer than 20 feet shall not be supplied. Stepladders as hereinafter specified shall be of three types:

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Type I   - Industrial stepladder, 3 to 20 feet for heavy
duty, such
          as utilities, contractors, and industrial use.
Type II  - Commercial stepladder, 3 to 12 feet for medium
duty, such
          as painters, offices, and light industrial use.
Type III - Household stepladder, 3 to 6 feet for light
duty, such as
          light household use.
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1910.25(c)(2)(i)

"General requirements."

1910.25(c)(2)(i)(a)

[Reserved]

1910.25(c)(2)(i)(b)

A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.

1910.25(c)(2)(i)(c)

The minimum width between side rails at the top, inside to inside, shall be not less than 11 1/2 inches. From top to bottom, the side rails shall spread at least 1 inch for each foot of length of stepladder.

1910.25(c)(2)(i)(d)

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1910.25(c)(2)(i)(e)

[Reserved]

1910.25(c)(2)(i)(f)

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 ladder, the pail shelf and spreader may be combined in one unit (the so-called shelf-lock ladder).

..1910.25(c)(3)

1910.25(c)(3)

"Portable rung ladders."

1910.25(c)(3)(i)

[Reserved]

1910.25(c)(3)(ii)

"Single ladder."

1910.25(c)(3)(ii)(a)

Single ladders longer than 30 feet shall not be supplied.

1910.25(c)(3)(iii)

"Two-section ladder."

1910.25(c)(3)(iii)(a)

Two-section extension ladders longer than 60 feet shall not be supplied. All ladders of this type shall consist of two 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.

1910.25(c)(3)(iv)

"Sectional ladder."

1910.25(c)(3)(iv)(a)

Assembled combinations of sectional ladders longer than lengths specified in this subdivision shall not be used.

1910.25(c)(3)(v)

"Trestle and extension trestle ladder."

1910.25(c)(3)(v)(a)

Trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet shall not be supplied.

..1910.25(c)(4)

1910.25(c)(4)

"Special-purpose ladders."

1910.25(c)(4)(i)

[Reserved]

1910.25(c)(4)(ii)

"Painter's stepladder."

1910.25(c)(4)(ii)(a)

Painter's stepladders longer than 12 feet shall not be supplied.

1910.25(c)(4)(iii)

"Mason's ladder." A mason's ladder is a special type of single ladder intended for use in heavy construction work.

1910.25(c)(4)(iii)(a)

Mason's ladders longer than 40 feet shall not be supplied.

1910.25(c)(5)

"Trolley and side-rolling ladders" -

1910.25(c)(5)(i)

"Length." Trolley ladders and side-rolling ladders longer than 20 feet should not be supplied.

1910.25(d)

"Care and use of ladders" -

1910.25(d)(1)

"Care." To insure safety and serviceability the following precautions on the care of ladders shall be observed:

..1910.25(d)(1)(i)

1910.25(d)(1)(i)

Ladders shall be maintained in good condition at all times, 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.

1910.25(d)(1)(ii)

Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.

1910.25(d)(1)(iii)

Frayed or badly worn rope shall be replaced.

1910.25(d)(1)(iv)

Safety feet and other auxiliary equipment shall be kept in good condition to insure proper performance.

1910.25(d)(1)(v)-(ix)

[Reserved]

1910.25(d)(1)(x)

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."

1910.25(d)(1)(xi)

Rungs should be kept free of grease and oil.

1910.25(d)(2)

"Use." The following safety precautions shall be observed in connection with the use of ladders:

..1910.25(d)(2)(i)

1910.25(d)(2)(i)

Portable rung and cleat ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support). The ladder shall be so placed as to prevent slipping, or it shall be lashed, or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds;

1910.25(d)(2)(ii)

Ladders for which dimensions are specified should not be used by more than one man at a time nor with ladder jacks and scaffold planks where use by more than one man is anticipated. In such cases, specially designed ladders with larger dimensions of the parts should be procured;

1910.25(d)(2)(iii)

Portable ladders shall be so placed that the side rails have a secure footing. The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load;

1910.25(d)(2)(iv)

Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked upon, locked, or guarded;

1910.25(d)(2)(v)

Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height;

1910.25(d)(2)(vi)-(vii)

[Reserved]

1910.25(d)(2)(viii)

Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made;

..1910.25(d)(2)(ix)

1910.25(d)(2)(ix)

Short ladders shall not be spliced together to provide long sections;

1910.25(d)(2)(x)

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

1910.25(d)(2)(xi)

Ladders shall not be used as guys, braces, or skids, or for other than their intended purposes;

1910.25(d)(2)(xii)

Tops of the ordinary types of stepladders shall not be used as steps;

1910.25(d)(2)(xiii)

On two-section extension ladders the minimum overlap for the two 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

1910.25(d)(2)(xiv)

Portable rung ladders with reinforced rails (see paragraphs (c)(3) (ii)(c) and (iii)(d) this section) shall be used only with the metal reinforcement on the under side;

1910.25(d)(2)(xv)

No ladder should be used to gain access to a roof unless the top of the ladder shall extend at least 3 feet above the point of support, at eave, gutter, or roofline;

1910.25(d)(2)(xvi)

[Reserved]

..1910.25(d)(2)(xvii)

1910.25(d)(2)(xvii)

Middle and top sections of sectional or window cleaner's ladders should not be used for bottom section unless the user equips them with safety shoes;

1910.25(d)(2)(xviii)

[Reserved]

1910.25(d)(2)(xix)

The user should equip all portable rung 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;

1910.25(d)(2)(xx)

The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49744, Oct. 24, 1978; 49 FR 5321, Feb. 10, 1984]

1910.26(a)

"Requirements" -

1910.26(a)(1)

"General." Specific design and construction requirements are not part of this section because of the wide variety of metals and design possibilities. However, the design shall be such as to produce a ladder without structural defects or accident hazards such as sharp edges, burrs, etc. The metal selected shall be of sufficient strength to meet the test requirements,

and shall be protected against corrosion unless inherently corrosion-resistant.

1910.26(a)(1)(i)

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1910.26(a)(1)(ii)

[Reserved]

1910.26(a)(1)(iii)

The spacing of rungs or steps shall be on 12-inch centers.

1910.26(a)(1)(iv)

[Reserved]

1910.26(a)(1)(v)

Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.

..1910.26(a)(2)

1910.26(a)(2)

"General specifications - straight and extension ladders."

1910.26(a)(2)(i)

The minimum width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.

1910.26(a)(2)(ii)

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.

1910.26(a)(2)(iii)

Based on the nominal length of the ladder, each section of a multisection 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

1910.26(a)(2)(iv)

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

1910.26(a)(3)

"General specifications - step ladders."

1910.26(a)(3)(i)-(ii)

[Reserved]

1910.26(a)(3)(iii)

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 inch of the specified length. Stepladders shall not exceed 20 feet in length.

1910.26(a)(3)(iv)-(vi)

[Reserved]

..1910.26(a)(3)(vii)

1910.26(a)(3)(vii)

The bottoms of the four rails are to be supplied with insulating non-slip material for the safety of the user.

1910.26(a)(3)(viii)

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.

1910.26(a)(4)

"General specifications - trestles and extension trestle ladders."

1910.26(a)(4)(i)

Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than 20 feet in length.

1910.26(a)(5)

"General specifications - platform ladders."

1910.26(a)(5)(i)

The length of a platform ladder shall not exceed 20 feet. The length of a platform ladder shall be measured along the front rail from the floor to the platform.

1910.26(b)

[Reserved]

..1910.26(c)

1910.26(c)

"Care and maintenance of ladders" -

1910.26(c)(1)

"General." To get maximum serviceability, safety, and to eliminate unnecessary damage of equipment, good safe practices in the use and care of ladder equipment must be employed by the users.

The following rules and regulations are essential to the life of the equipment and the safety of the user.

1910.26(c)(2)

"Care of ladders."

1910.26(c)(2)(i)-(iii)

[Reserved]

1910.26(c)(2)(iv)

Ladders must be maintained in good usable condition at all times.

1910.26(c)(2)(v)

[Reserved]

1910.26(c)(2)(vi)

If a ladder is involved in any of the following, immediate inspection is necessary:

1910.26(c)(2)(vi)(a)

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; check rivets for shear.

1910.26(c)(2)(vi)(b)-

(c)

[Reserved]

1910.26(c)(2)(vi)(d)

If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or slippery materials. This can easily be done with a solvent or steam cleaning.

..1910.26(c)(2)(vii)

1910.26(c)(2)(vii)

Ladders having defects are to be marked and taken out of service until repaired by either maintenance department or the manufacturer.

1910.26(c)(3)

"Use of ladders."

1910.26(c)(3)(i)

A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder.

1910.26(c)(3)(ii)

Portable ladders are designed as a one-man working ladder based on a 200-pound load.

1910.26(c)(3)(iii)

The ladder base section must be placed with a secure footing.

1910.26(c)(3)(iv)

The top of the ladder must be placed with the two rails supported, unless equipped with a single support attachment.

1910.26(c)(3)(v)

When ascending or descending, the climber must face the ladder.

1910.26(c)(3)(vi)

Ladders must not be tied or fastened together to provide longer sections. They must be equipped with the hardware fittings necessary if the manufacturer endorses extended uses.

1910.26(c)(3)(vii)

Ladders should not be used as a brace, skid, guy or gin pole, gangway, or for other uses than that for which they were intended, unless specifically recommended for use by the manufacturer.

1910.26(c)(3)(viii)

See 1910.333(c) for work practices to be used when work is performed on or near electric circuits.

[39 FR 23502, June 27, 1974, as amended at 43 FR 49745, Oct. 24, 1978; 49 FR 5321, Feb. 10, 1984; 55 FR 32014, Aug. 6, 1990]

1910.27(a)

"Design requirements" -

1910.27(a)(1)

Design considerations. All ladders, appurtenances, and fastenings shall be designed to meet the following load requirements:

1910.27(a)(1)(i)

The minimum design live load shall be a single concentrated load of 200 pounds.

1910.27(a)(1)(ii)

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.

1910.27(a)(1)(iii)

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.

1910.27(a)(1)(iv)

The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.

1910.27(a)(2)

"Design stresses." Design stresses for wood components of ladders shall not exceed those specified in 1910.25. All wood parts of fixed ladders shall meet the requirements of 1910.25(b).

For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range 75 degrees to 90 degrees, and intended for use by no more than one person per section, single ladders as described in 1910.25(c)(3)(ii) are acceptable.

..1910.27(b)

1910.27(b)

"Specific features" -

1910.27(b)(1)

"Rungs and cleats."

1910.27(b)(1)(i)

All rungs shall have a minimum diameter of three-fourths inch for metal ladders, except as covered in paragraph (b)(7)(i) of this section and a minimum diameter of 1 1/8 inches for wood ladders.

1910.27(b)(1)(ii)

The distance between rungs, cleats, and steps shall not exceed 12 inches and shall be uniform throughout the length of the ladder.

1910.27(b)(1)(iii)

The minimum clear length of rungs or cleats shall be 16 inches.

1910.27(b)(1)(iv)

Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.

1910.27(b)(1)(v)

The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. A suggested design is shown in figure D-1.

FIGURE D-1. - Suggested design for rungs on individual-rung ladders.
(For Figure D-1, Click Here)

1910.27(b)(2)

"Side rails." 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.

1910.27(b)(3)

"Fastenings." Fastenings shall be an integral part of fixed ladder design.

..1910.27(b)(4)

1910.27(b)(4)

"Splices." All splices made by whatever means shall meet design requirements as noted in paragraph (a) of this section. All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

1910.27(b)(5)

"Electrolytic action." Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined.

1910.27(b)(6)

"Welding." All welding shall be in accordance with the "Code for Welding in Building Construction" (AWSD1.0-1966).

1910.27(b)(7)

"Protection from deterioration."

1910.27(b)(7)(i)

Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands. Ladders formed by individual metal rungs imbedded in concrete, which serve 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 atmosphere, individual metal rungs shall have a minimum diameter of 1 inch or shall be painted or otherwise treated to resist corrosion and rusting.

1910.27(b)(7)(ii)

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.

1910.27(b)(7)(iii)

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.

FIGURE D-2. - Rail Ladder With Bar Steel Rails and Round Steel Rungs
(For Figure D-2, Click Here)

1910.27(c)

"Clearance" -

1910.27(c)(1)

"Climbing side." On 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 degrees, and 30 inches for a pitch of 90 degrees (fig. D-2 of this section), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope, except as provided in subparagraphs (3) and (5) of this paragraph.

1910.27(c)(2)

"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.

1910.27(c)(3)

"Ladders with cages or baskets." Ladders equipped with cage or basket are excepted from the provisions of subparagraphs (1) and (2) of this paragraph, but shall conform to the provisions of paragraph (d)(1)(v) of this section. Fixed ladders in smooth-walled wells are excepted from the provisions of subparagraph (1) of this paragraph, but shall conform to the

provisions of paragraph (d)(1)(vi) of this section.

..1910.27(c)(4)

1910.27(c)(4)

"Clearance in back of ladder." The distance from the centerline of rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than 7 inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in figure D-3 shall be provided.

Minimum Ladder Clearances

FIGURE D-3. - Clearance for Unavoidable Obstruction at Rear of Fixed Ladder
(For Figure D-3, Click Here)

1910.27(c)(5)

"Clearance in back of grab bar." The distance from the centerline of the grab bar to the nearest permanent object in back of the grab bars shall be not less than 4 inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.

1910.27(c)(6)

"Step-across distance." The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 inches, or less than 2 1/2 inches (fig. D-4).

FIGURE D-4. - Ladder Far from Wall
(For Figure D-4, Click Here)

..1910.27(c)(7)

1910.27(c)(7)

"Hatch cover." Counterweighted hatch covers shall open a minimum of 60 degrees 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. There shall be no protruding potential hazards within 24 inches of the centerline of rungs or cleats; any such hazards within 30 inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of 60 degrees from the horizontal as indicated in figure D-5. The relationship of a fixed ladder to an acceptable counterweighted hatch cover is illustrated in figure D-6.

1910.27(d)

"Special requirements" -

1910.27(d)(1)

"Cages or wells."

1910.27(d)(1)(i)

Cages or wells (except on chimney ladders) shall be built, as shown on the applicable drawings, covered in detail in figures D-7, D-8, and D-9, or of equivalent construction.

1910.27(d)(1)(ii)

Cages or wells (except as provided in subparagraph (5) of this paragraph) conforming to the dimensions shown in

figures D-7, D-8, and D-9 shall be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.

FIGURE D-5. - Deflector Plates for Head Hazard
(For Figure D-5, Click Here)

FIGURE D-6. - Relationship of Fixed Ladder to a Safe Access Hatch
(For Figure D-6, Click Here)

1910.27(d)(1)(iii)

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

1910.27(d)(1)(iv)

Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder, with bottom flared not less than 4 inches, or portion of cage opposite ladder shall be carried to the base.

..1910.27(d)(1)(v)

1910.27(d)(1)(v)

Cages shall not extend less than 27 nor more than 28 inches from the centerline of the rungs of the ladder. Cage 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 degrees around the circumference of the cage; this will give a maximum spacing of approximately 9 1/2

inches, center to center.

1910.27(d)(1)(vi)

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.

FIGURE D-7. - Cages for Ladders More Than 20 Feet High
(For Figure D-7, Click Here)

FIGURE D-8. - Clearance Diagram for Fixed Ladder in Well
(For Figure D-8, Click Here)

FIGURE D-9. - Cages-Special applications.
(For Figure D-9, Click Here)

1910.27(d)(2)

"Landing platforms." When ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platforms shall be provided for each 30 feet of height or fraction thereof, except that, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 20 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.

1910.27(d)(2)(i)

Where a man has to step a distance greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2 1/2 inches.

..1910.27(d)(2)(ii)

1910.27(d)(2)(ii)

All landing platforms shall be equipped with standard railings and toe boards, so arranged as to give safe access to the ladder. Platforms shall be not less than 24 inches in width and 30 inches in length.

1910.27(d)(2)(iii)

One rung of any section of 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.

1910.27(d)(3)

"Ladder extensions." The side rails of through or side-step ladder extensions shall extend 3 1/2 feet above parapets and

landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 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 3 1/2 feet minimum (fig. D-10).

FIGURE D-10. - Offset Fixed Ladder Sections
(For Figure D-10, Click Here)

1910.27(d)(4)

"Grab bars." 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.

..1910.27(d)(5)

1910.27(d)(5)

"Ladder safety devices." Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate lifebelts, friction brakes, and sliding attachments shall meet the design requirements of

the ladders which they serve.

1910.27(e)

"Pitch" -

1910.27(e)(1)

"Preferred pitch." The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal (fig. D-11).

FIGURE D-11. - Pitch of Fixed Ladders
(For Figure D-11, Click Here)

1910.27(e)(2)

"Substandard pitch." Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 and 75 degrees 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.

1910.27(e)(3)

"Scope of coverage in this section." This section covers only fixed ladders within the pitch range of 60 degrees and 90 degrees with the horizontal.

1910.27(e)(4)

"Pitch greater than 90 degrees." Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.

1910.27(f)

"Maintenance." 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.