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along the front rail from the floor to the platform.
(ii) [Reserved]
(b) [Reserved]
(c) Care and maintenance of ladders—
(1) General. To get maximum service-
ability, safety, and to eliminate unnec-
essary 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 equip-
ment and the safety of the user.
(2) Care of ladders.
(i)–(iii) [Reserved]
(iv) Ladders must be maintained in
good usable condition at all times.
(v) [Reserved]
(vi) If a ladder is involved in any of
the following, immediate inspection is
necessary:
(a) If ladders tip over, inspect ladder
for side rails dents or bends, or exces-
sively dented rungs; check all rung-to-
side-rail connections; check hardware
connections; check rivets for shear.
(b)–(c) [Reserved]
(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.
(vii) Ladders having defects are to be
marked and taken out of service until
repaired by either maintenance depart-
ment or the manufacturer.
(3) Use of ladders. (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 lad-
er.
(ii) Portable ladders are designed as a
one-man working ladder based on a 200-
 pound load.
(iii) The ladder base section must be
placed with a secure footing.
(iv) The top of the ladder must be
placed with the two rails supported,
unles equipped with a single support
attachment.
(v) When ascending or descending,
the climber must face the ladder.
(vi) Ladders must not be tied or fas-
tened together to provide longer sec-
tions. They must be equipped with the
hardware fittings necessary if the man-
ufacturer endorses extended uses.
(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 manufac-
turer.
(viii) See §1910.333(c) for work prac-
tices to be used when work is per-
formed 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 Fixed ladders.

(a) Design requirements—(1) Design
considerations. All ladders, appur-
tenances, and fastenings shall be de-
signed to meet the following load re-
quirements:
(i) The minimum design live load
shall be a single concentrated load of
200 pounds.
(ii) The number and position of addi-
tional concentrated live-load units of
200 pounds each as determined from an-
ticipated usage of the ladder shall be
considered in the design.
(iii) The live loads imposed by per-
sons occupying the ladder shall be con-
sidered to be concentrated at such
points as will cause the maximum
stress in the structural member being
considered.
(iv) The weight of the ladder and at-
tached appurtenances together with
the live load shall be considered in the
design of rails and fastenings.
(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.
(b) Specific features—(1) Rungs and
cleats. (i) All rungs shall have a min-
imum diameter of three-fourths inch
for metal ladders, except as covered in
paragraph (b)(7)(i) of this section and a
minimum diameter of 1½ inches for
wood ladders.
(ii) The distance between rungs,
cleats, and steps shall not exceed 12
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inches and shall be uniform throughout the length of the ladder.

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

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

(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.

(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.

(3) Fastenings. Fastenings shall be an integral part of fixed ladder design.

(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.

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

(6) Welding. All welding shall be in accordance with the “Code for Welding in Building Construction” (AWSD1.0–1966).

(7) Protection from deterioration. (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.

(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.

(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

(c) Clearance—(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.
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to the slope, except as provided in sub-
paragraphs (3) and (5) of this para-
graph.
(2) Ladders without cages or wells. A
clear width of at least 15 inches shall
be provided each way from the center-
line of the ladder in the climbing
space, except when cages or wells are
necessary.
(3) Ladders with cages or baskets. Lad-
ders equipped with cage or basket are
excepted from the provisions of sub-
paragraphs (1) and (2) of this para-
graph, but shall conform to the provi-
sions of paragraph (d)(1)(v) of this sec-
tion. 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.
(4) Clearance in back of ladder. The
distance from the centerline of rungs,
cleats, or steps to the nearest perma-
nent object in back of the ladder shall
be not less than 7 inches, except that
when unavoidable obstructions are en-
countered, minimum clearances as
shown in figure D-3 shall be provided.

MINIMUM LADDER CLEARANCES

Minimum Ladder Clearances

Figure D-3—Clearance for Unavoidable
Obstruction at Rear of Fixed Ladder

(5) Clearance in back of grab bar. The
distance from the centerline of the
grab bar to the nearest permanent ob-
ject in back of the grab bars shall be
not less than 4 inches. Grab bars shall
not protrude on the climbing side be-
yond the rungs of the ladder which
they serve.
(6) Step-across distance. The step-
across distance from the nearest edge
of ladder to the nearest edge of equip-
ment or structure shall be not more
than 12 inches, or less than 2½ inches
(fig. D-4).

Figure D-4—Ladder Far from Wall

(7) Hatch cover. Counterweighted
hatch covers shall open a minimum of
60 degrees from the horizontal. The dis-
tance 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
not protruding potential hazards with-
in 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 fig-
ure D-5. The relationship of a fixed lad-
der to an acceptable counterweighted
hatch cover is illustrated in figure D-6.

(d) Special requirements—(1) Cages or
wells. (i) Cages or wells (except on
chimney ladders) shall be built, as
shown on the applicable drawings, cov-
ered in detail in figures D-7, D-8, and
D-9, or of equivalent construction.
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(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.

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

(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.

(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.

(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-8—Clearance Diagram for Fixed Ladder in Well
(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.

(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 2½ inches.

(ii) All landing platforms shall be equipped with standard railings and toeboards, 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.

(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.

(3) Ladder extensions. 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 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 (fig. D–10).

(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.

(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.

(e) Pitch—(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](image)

(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.

(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.

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

(5) 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.

§ 1910.28. Safety requirements for scaffolding.

(a) General requirements for all scaffolds. (1) Scaffolds shall be furnished and erected in accordance with this standard for persons engaged in work that cannot be done safely from the ground or from solid construction, except that ladders used for such work shall conform to §1910.25 and §1910.26.

(2) The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.

(3) [Reserved]

(4) Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.

(5) Scaffolds and other devices mentioned or described in this section shall be maintained in safe condition. Scaffolds shall not be altered or moved horizontally while they are in use or occupied.

(6) Any scaffold damaged or weakened from any cause shall be immediately repaired and shall not be used until repairs have been completed.

(7) Scaffolds shall not be loaded in excess of the working load for which they are intended.

(8) All load-carrying timber members of scaffold framing shall be a minimum of 1,500 f. (Stress Grade) construction grade lumber. All dimensions are nominal sizes as provided in the American Lumber Standards, except that where rough sizes are noted, only rough or undressed lumber of the size specified will satisfy minimum requirements. (NOTE: Where nominal sizes of lumber are used in place of rough sizes, the nominal size lumber shall be such as to provide equivalent strength to that specified in tables D–7 through D–12 and D–16.)

(9) All planking shall be Scaffold Grade as recognized by grading rules for the species of wood used. The maximum permissible spans for 2- x 9-inch or wider planks are shown in the following table: