

General Safety & Health Standards
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Ladders 072

072. LADDERS

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072. LADDERS. (7-1-97)

01. Scope: (7-1-97)

a. Ladders shall conform to all other applicable requirements of this standard, as well as the following provisions. Nothing in this standard shall be construed to prohibit better or otherwise safer conditions than specified herein. (7-1-97)

b. This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of common types of portable wood ladders, in order to ensure 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 however the general provision shall apply. (7-1-97)

02. Definitions. For other definitions of terms used in this section, see sub-section 010 of this standard. (7-1-97)

a. Angle of Inclination is the pitch angle between seventy-five (75) to ninety (90) degrees from the vertical for portable non-self supporting ladders. (7-1-97)

b. Back Leg (Rear Rail) are 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. (7-1-97)

c. Cage is a guard that may be referred to as a cage or basket guard which is 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. (7-1-97)

d. Check is a lengthwise separation of wood, most of which occurs across the rings of annual growth. (7-1-97)

- e.** Cleats are ladder crosspieces of rectangular cross-section placed on edge on which a person may step in ascending or descending. (7-1-97)
- f.** Combination Ladder is a portable ladder capable of being used as a step ladder or single or extension ladder. It may also be capable of being used as a trestle ladder or a stairwell ladder. Its components may be used as single ladders. (7-1-97)
- g.** Compression Failure is a deformation (buckling) of the fibers due to excessive compression along the grain. (7-1-97)
- h.** Compression Wood is an aberrant (abnormal) and highly variable type of wood structure occurring in softwood species. The wood commonly has density somewhat higher than does normal wood, but somewhat lower stiffness and density strength for its weight in addition to high longitudinal shrinkage. (7-1-97)
- i.** Cross Grain (slope of grain) is a deviation of the fiber direction from a line parallel to the sides of the piece. (7-1-97)
- j.** Decay is disintegration of wood substance due to action of wood-destroying fungi. It is also known as dote or rot. (7-1-97)
- k.** Double Front Ladder is a self supporting ladder, non-adjustable in length, consisting of two (2) sections intended for climbing on both sides simultaneously, with steps for climbing hinged at the top to form angles with the base. (7-1-97)
- l.** Duty Rating is the combination of factors, including, but not limited to, ladder type and design features which imply service capability. (7-1-97)
- m.** Extension Ladder is 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. (7-1-97)
- n.** Extension Trestle Ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base. (7-1-97)
- o.** Fastenings are a device to attach a ladder to a structure, building or equipment. (7-1-97)
- p.** Fixed Ladder is a ladder permanently attached to a structure, building, or equipment. (7-1-97)
- q.** Grab Bars are individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder. (7-1-97)

- r.** Highest Standing Level is the vertical distance, expressed in feet and inches, from the uppermost step or rung the climber is allowed to use the horizontal plane of the ladder base support, with the portable ladder in the prescribed climbing position. (7-1-97)
- s.** Individual Rung Ladder is a fixed ladder each rung of which is individually attached to a structure, building, or equipment. (7-1-97)
- t.** Inside Clear Width is the distance between the inside flanges of the side rails of a ladder. (7-1-97)
- u.** Knot is a branch or limb, imbedded in the tree and cut through in the process of lumber milling, classified according to size, quality, and occurrence. The size of the knot is determined as the average diameter on the surface of the piece. (7-1-97)
- v.** Ladder is a device usually consisting of two (2) side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending. (7-1-97)
- w.** Ladder Foot, Shoe, or Skid Resistant Bearing Surface is that component of ladder support that is in contact with the lower supporting surface. (7-1-97)
- x.** Ladder Safety Device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments. (7-1-97)
- y.** Ladder Type is the designation that identifies the working load. (7-1-97)
- z.** Low-density Wood is that which is exceptionally light in weight and usually deficient in strength properties for the species. (7-1-97)
- aa.** Marking is any sign, label, stencil, or plate of a primary hazard or informational caricature, or both, affixed, painted, burned, stamped, or embossed on the ladder surface. (7-1-97)
- bb.** Maximum Extended Length or Maximum Working Length is the total length of the extension ladder when the middle or intermediate and top or fly sections are fully extended (maintaining the required overlap). (7-1-97)
- cc.** Permanent Deformation (set) is that deformation remaining in any part of a ladder after all loads have been removed. (7-1-97)
- dd.** Pitch. Pitch is the included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side. (7-1-97)
- ee.** Pitch and Bark Pockets is an opening extending parallel to the annual growth rings containing or that has contained, pitch, either solid or liquid. A bark pocket is an opening between annual growth rings that contains bark. (7-1-97)

ff. Platform is a landing surface that is used as a working or standing location. (7-1-97)

gg. Platform Ladder is a self-supporting ladder of fixed size with a platform provided at the working level. The size is determined by the distance along the front rail from the platform to the base of the ladder. (7-1-97)

hh. Portable Ladder is a ladder that can readily be moved or carried, usually consisting of side rails joined at intervals by steps, rungs, or rear braces. (7-1-97)

ii. Rail is the side members joined at intervals by either rungs or steps. (7-1-97)

jj. Rear Braces are crosspieces or diagonals (in the back section of a self supporting ladder) not intended for climbing, which may be spaced at any interval. (7-1-97)

kk. Rungs are ladder cross-pieces of circular or oval cross-section on which a person may step in ascending or descending. (7-1-97)

ll. Section: Bottom or Base Section is the lowest section of a non-self supporting portable ladder; Top or Fly Section is the uppermost section of a non-self supporting portable ladder; Middle or Intermediate Section is the section between the top (fly) and bottom (base) sections of a non-self supporting portable ladder. (7-1-97)

mm. Sectional Ladder is a non self-supporting ladder, non-adjustable in length, consisting of two (2) or more sections of ladder so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections. (7-1-97)

nn. Shake is a separation along the grain, most of which occurs between the rings of annual growth. (7-1-97)

oo. Ships Ladder is a cross between a ladder and stairs; typically it has handrails, steps, and a pitch of less than seventy-five (75) degrees from the vertical. (7-1-97)

pp. Side-step Ladder is one from which a man getting off at the top must step sideways from the ladder in order to reach the landing. (7-1-97)

qq. Side-rolling Ladder is a semi-fixed ladder, non-adjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also the plane of motion. (7-1-97)

rr. Single Ladder is a non self-supporting portable ladder, non-adjustable in length, consisting of but one (1) section. Its size is designated by the overall length of the side rails. (7-1-97)

ss. Special Purpose Ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses. (7-1-97)

tt. Steps are the flat cross-pieces of a ladder on which a person may step in ascending or descending. (7-1-97)

uu. 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. (7-1-97)

vv. Through Ladder is one from which a man getting off at the top must step through the ladder in order to reach the landing. (7-1-97)

ww. Trestle Ladder is a self-supporting portable ladder, non-adjustable in length, consisting of sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge. (7-1-97)

xx. Top Cap is the uppermost horizontal member of a portable stepladder. (7-1-97)

yy. Top Step is the first step below the top cap of a portable stepladder. Where a ladder is constructed without a top cap, the top step is the first step below the top of the rails. (7-1-97)

zz. Trolley Ladder is a semi-fixed ladder, non-adjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion. (7-1-97)

aaa. Wane is bark, or the lack of wood from any cause, on the corner of a piece. (7-1-97)

bbb. Well is a permanent complete enclosure around a fixed ladder, which is attached to the walls of the wells. Proper clearance for a well will give the person who must climb the ladder the same protection as a cage. (7-1-97)

ccc. Wood Characteristics are distinguishing features which by their extent and number determine the quality of a piece of wood. (7-1-97)

ddd. Wood Irregularities are natural characteristics in or on wood that may lower its durability, or utility. (7-1-97)

eee. Working Length is the length of a non-self supporting portable ladder measured along the rails from the base support point of the ladder to the point of bearing at the top. (7-1-97)

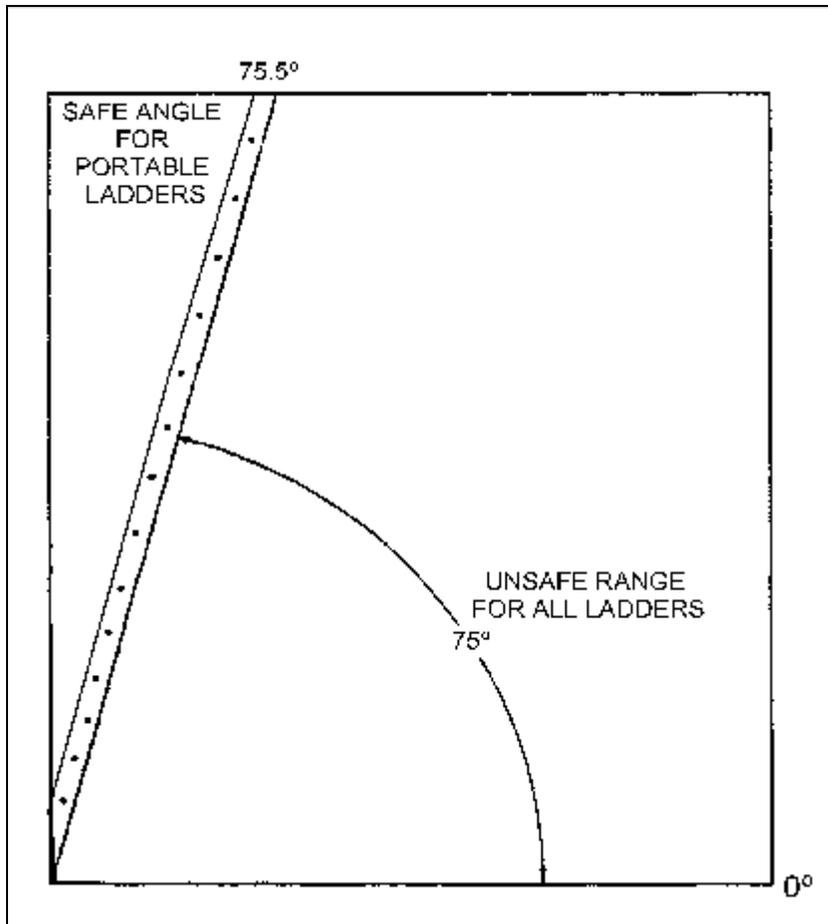
fff. Working Load is the maximum applied load, including the weight of the user, materials, and tools, which the ladder is to support for the intended use. (7-1-97)

03. General Requirements: (7-1-97)

a. Ladders as hereinafter specified shall be of three (3) types and shall be for the use herein specified: (7-1-97)

- i. TYPE I** - Industrial ladder, three (3) to twenty (20) feet for heavy duty use, such as utilities, contractors, and industrial use (three-hundred (300) pound maximum load limit); (7-1-97)
- ii. TYPE II** - Commercial ladder, three (3) to twelve (12) feet for medium duty use, such as painters, offices, and light industrial use (two-hundred and fifty (250) pound maximum load limit); (7-1-97)
- iii. TYPE III** - Household ladders, three (3) to six (6) feet for light duty use, such as light household use (two-hundred (200)-pound maximum load limit). These ladders are not authorized for use in the workplace. (7-1-00)
- b.** 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 shall be securely attached, and the movable parts shall operate freely without binding or undue play. (7-1-97)
- c.** Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated. (7-1-97)
- d.** Ropes or cables shall be inspected frequently and frayed or badly worn ropes or cables shall be replaced. (7-1-97)
- e.** Safety feet and other auxiliary equipment shall be kept in good condition to ensure proper performance. (7-1-97)
- f.** 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". (7-1-97)
- g.** Ladder rungs shall be kept free of grease and oil. If ladders are exposed to oil and grease, or slippery materials, they shall be cleaned as soon as possible. (7-1-97)
- h.** Portable non-self supporting and fixed rung and cleat ladders shall be erected at a pitch of seventy-five point five (75.5) degrees, (horizontal distance from the top support to the foot of the ladder is one-quarter (1/4) of the working length of the ladder) (the length along the ladder between the foot and the top support). (See Figure 072.03-A). (7-1-97)

FIGURE 072.03-A



- i.** Ladders shall be so placed as to prevent slipping, or it shall be lashed, or held in position. (0-0-00)
- j.** Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds. (7-1-97)
- k.** Ladders not designed and approved for use by more than one (1) person shall not be used by more than one (1) person. (7-1-97)
- l.** Portable ladders shall be so placed that the side rails have a secure footing. Safety shoes of good substantial design should be installed on all ladders. Where ladders with no safety shoes or spikes are used on hard, slick surfaces, a foot ladder board should be employed. (7-1-97)
- m.** The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load. (7-1-97)
- n.** Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded. (7-1-97)
- o.** Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height. (7-1-97)

- p.** Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used. (7-1-97)
- q.** Improvised repairs shall not be made to ladders. (7-1-97)
- r.** Short ladders shall not be spliced together to provide long sections. (7-1-97)
- s.** Ladders made by fastening cleats across a single rail shall not be used. (7-1-97)
- t.** Ladders shall not be used as guys, braces, or skids, or for other than their intended purposes. (7-1-97)
- u.** The tops of ordinary types of stepladders shall not be used as steps. (7-1-97)
- v.** On two (2) section extension ladders the minimum overlap for the two (2) sections in use shall be as indicated in Table 072.03-A. (7-1-97)

TABLE 072.03-A	
Size of ladder (ft)	Overlap (ft)
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

- w.** No portable ladder shall be used to gain access to a roof unless the top of the ladder shall extend at least three (3) feet above the point of support, at eave, gutter, or roof-line. When this is not practical, grab nails, which provide a secure grip for an employee moving to or from the point of access, shall be installed. (7-1-97)
- x.** The bracing on the back side of step ladders is designed solely for increasing stability and shall not be used for climbing. (7-1-97)
- y.** When working from a ladder, over twenty (20) feet from the ground or floor, the ladder shall be secured at both top and bottom. (7-1-97)
- z.** No type of work shall be performed on a ladder over twenty (20) feet from the ground or floor that requires the use of both hands to perform the work, unless personal fall protection is used. (7-1-97)
- aa.** See Figures 072.03-B and 072.03-C for typical ladder details. (7-1-97)

FIGURE 072.03-B

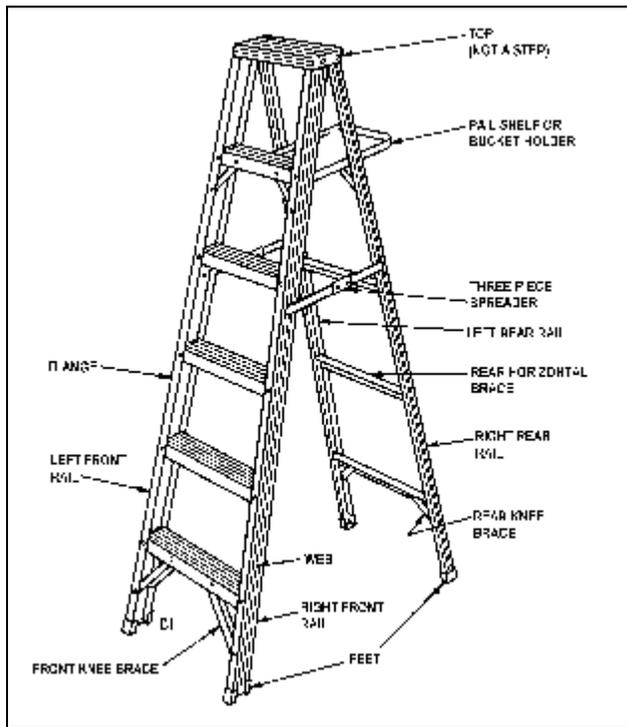
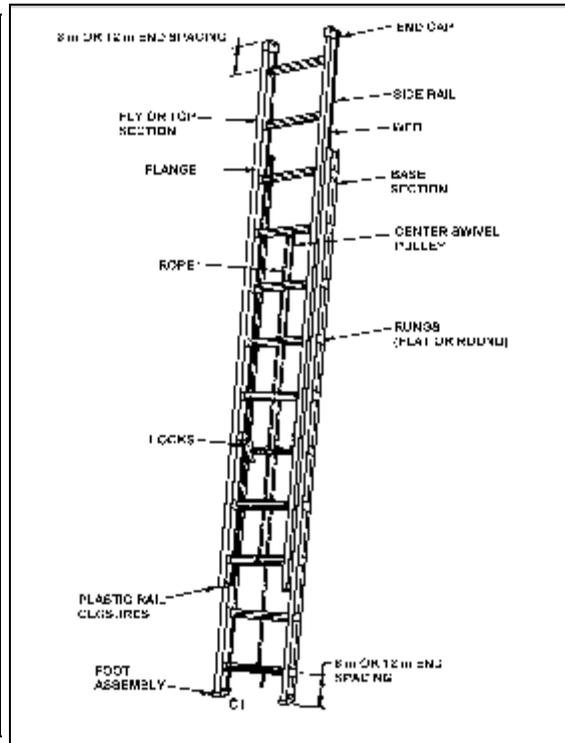


FIGURE 072.03-C



bb. Ladders shall be handled with care and not subject to unnecessary dropping, jarring, or misuse. (7-1-97)

cc. The area around the top and bottom of the ladder shall be kept clean. (7-1-97)

dd. When ascending or descending, the climber shall face the ladder. (7-1-97)

ee. Ships ladders are inherently dangerous and shall not be used. (7-1-97)

ff. Workers shall not ascend or descend ladders while carrying tools or materials which will interfere with the free use of both hands. (7-1-97)

04. Portable Wood Ladders: (7-1-97)

a. This subsection 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. (7-1-97)

b. All wood parts shall be free from sharp edges and splinters; sound and free by accepted visual inspection from shake, wane, compression failures, decay or other irregularities except as hereinafter provided. Low density wood shall not be used. (7-1-97)

c. Stepladders longer than twenty (20) feet shall not be supplied. (7-1-97)

- d.** A uniform step spacing shall be employed which shall be not more than twelve (12) inches. Steps shall be parallel and level when the ladder is in position for use. (7-1-97)
- e.** The minimum width between side rails at the top, inside to inside, shall be not less than eleven and one-half (11 1/2) inches. From top to bottom the side rails shall spread at least one (1) inch for each foot of length of stepladder. (7-1-97)
- f.** A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open position 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 confined in one (1) unit (the so called shelf-lock ladder). (7-1-97)
- g.** Single ladders longer than thirty (30) feet shall not be supplied. (7-1-97)
- h.** Two (2) section extension ladders longer than sixty (60) feet shall not be supplied. All ladders of this type shall consist of two (2) sections, one (1) to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered. (7-1-97)
- i.** Assembled combinations of sectional ladders longer than lengths specified in this subsection shall not be used. (7-1-97)
- j.** Trestle ladders, or extension sections or base sections of extension trestle ladders longer than twenty (20) feet shall not be supplied. (7-1-97)
- k.** Painters stepladders longer than twelve (12) feet shall not be supplied. (7-1-97)
- l.** A mason's ladder is a special type of single ladder intended for use in heavy construction work. Mason's ladders longer than forty (40) feet shall not be supplied. (7-1-97)
- m.** Trolley and side rolling ladders longer than twenty (20) feet shall not be supplied. (7-1-97)
- n.** Portable wood ladders with reinforced rails shall be used only with metal reinforcement on the under side. (7-1-97)
- o.** The middle and top sections of sectional or window cleaner's ladders shall not be used as a bottom section unless it is equipped with safety shoes. (7-1-97)
- p.** Portable rung ladders shall be equipped with non-slip bases when there is a possibility of slipping. Non-slip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used on a slippery surface. (7-1-97)
- q.** Job made ladders shall be constructed for a specific intended use. (7-1-97)
- r.** Job made ladders (single ladders) shall not exceed thirty (30) feet in length between supports (base and top landing). If ladders are to connect different landings, or if the length required exceeds this maximum length, two (2) or more separate ladders shall be used, offset with a

platform between each ladder. Guardrails and toe-boards shall be erected on the exposed sides of platforms. (7-1-97)

s. The width of single ladders shall be at least fifteen (15) inches, but not more than twenty (20) inches, between rails at the top. (7-1-97)

t. Side rails shall be parallel or flared top to bottom by not more than one-quarter (1/4) of an inch for each two (2) feet of length. (7-1-97)

u. Wood side rails of ladders having cleats shall be not less than one and one-half (1 1/2) inches thick and three and one-half (3 1/2) inches deep (two (2) inch x four (4) inch nominal) when made of Group two (2) or three (3) woods. (See Table 072.04-A) Wood side rails of group four (4) woods may be used in the same cross- section of dimensions for single ladders up to twenty (20) feet in length. (7-1-97)

TABLE 072.04-A			
SPECIES	DENSITY (lb./ft.)	SPECIES	DENSITY (lb./ft.)
GROUP I		GROUP III	
White Ash	41	Magnolia	35
Beech	48	Noble Fir	27
Birch	44	Norway Pine	31
Rock Elm	43	Poplar	28
Hickory	50	Redwood	25
Locust	47	Eastern Spruce	28
Hard Maple	42	Sitka Spruce	28
Red Maple	36	Sycamore	35
Red Oak	43	Tamarack	37
White Oak	46	Tupelo	35
Pecan	46	GROUP IV	
Persimmon	50	Aspen	27
GROUP II		Basswood	25
Douglas Fir (Coast Region)	34	Buckeye	25

Western Larch	38	Butternut	27
Southern Yellow Pine	37	Incense Cedar	25
GROUP III		Western Red Cedar	23
Red Alder	28	Black Cottonwood	24
Oregon Ash	38	White Fir	26
Alaska Cedar	31	Hackberry	37
Pumpkin Ash	37	Eastern Hemlock	28
Port Orchard Cedar	30	Holly	39
Cucumber	34	Soft Maple	33
Cypress	32	Lodgepole Pine	29
Soft Elm	36	Idaho White Pine	28
Douglas Fir (Rocky Mtn. Region)	30	Northern White Pine	25
Oregon Maple	34	Ponderosa Pine	28
Gum	34	Sugar Pine	26
West Coast Hemlock	30		

v. It is preferable that side rails be continuous. If splicing is necessary to attain the required length, however, the splice must develop the full strength of a continuous side rail of the same length. (7-1-97)

w. Two (2) inch by two (2) inch lumber shall be used for side rails of single ladders up to sixteen (16) feet long; three (3) inch by six (6) inch lumber shall be used for single ladders from sixteen (16) feet to thirty (30) feet in length. (7-1-97)

x. Wood Cleats shall have the following minimum dimensions when made of Group I woods (See Table 072.04-B). (7-1-97)

TABLE 072.04-B		
Length of Cleats (inches)	Thickness (inches)	Width (inches)

Up to and including 20	3/4	3
Over 20 and up to and including 30	3/4	3 3/4

y. Cleats may be made of species of any other group of wood (see Table 072.04-A) provided equal or greater strength is maintained. (7-1-97)

z. Cleats shall be inset into the edges of the side rails one-half (1/2) inch, or filler blocks shall be used on the rails between the cleats. The cleats shall be secured to each rail with three (3) ten penny (10d) common wire nails or other fasteners of equivalent strength. (7-1-97)

aa. Cleats shall be uniformly spaced twelve (12) inches top to top. This uniform spacing also includes the space between the platform or floor level and the lowest step and also the space between the top of the step and the platform, level, or landing. (7-1-97)

05. Portable Metal Ladders: (7-1-97)

a. Specific design and construction requirements are not a 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 and shall be protected against corrosion unless inherently corrosion resistant. (7-1-97)

b. A uniform step spacing shall be employed which shall be not more than twelve (12) inches. Steps shall be parallel and level when the ladder is in position for use. (7-1-97)

c. Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping. (7-1-97)

d. The minimum width between side rails of a straight ladder or any section of an extension ladder shall be twelve (12) inches. (7-1-97)

e. The length of single ladders or individual sections of ladders shall not exceed thirty (30) feet. Two (2) section ladders shall not exceed forty-eight (48) feet in length and over two (2) section ladders shall not exceed sixty (60) feet in length. (7-1-97)

f. Extension ladders shall be equipped with positive tops which will insure the overlap specified in Table 072.03-A. (7-1-97)

g. Metal stepladders shall not exceed twenty (20) feet in length. (7-1-97)

h. The bottoms of the rails (the base of the legs) are to be supplied with insulating non-slip material. (7-1-97)

- i. 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 metal stepladder. The spreader shall have all sharp points or edges covered or removed. (7-1-97)
- j. The length of a platform ladder shall not exceed twenty (20) feet. The length of a platform ladder shall be measured along the front rail from the floor to the platform. (7-1-97)
- k. Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than twenty (20) feet in length. (7-1-97)
- l. Complete ladder inspection shall be periodical. If a ladder is involved in any of the following, immediate inspection is necessary: if ladders tip over, inspect ladder for side rail dents or bends, or excessively dented rungs; check all rung to-side-rail connections; check hardware connections; check rivets for shear; if ladders are exposed to excessive heat as in the case of fire, the ladder should be inspected visually for damage and tested for deflection and strength characteristics. In doubtful cases, do not use the ladder. (7-1-97)
- m. If ladders are to be subjected to certain acids or alkali solutions, a protective coating, such as asphalt and varnish, shall be applied to the equipment. (7-1-97)
- n. Portable metal ladders shall not be used for electrical work or where they may contact electrical conductors. (7-1-97)
- o. Portable metal ladders shall have "ELECTROCUTION HAZARD, THIS LADDER CONDUCTS ELECTRICITY" stenciled or labeled on the ladder. See Figure 072.05-A. (7-1-97)

FIGURE 072.05-A

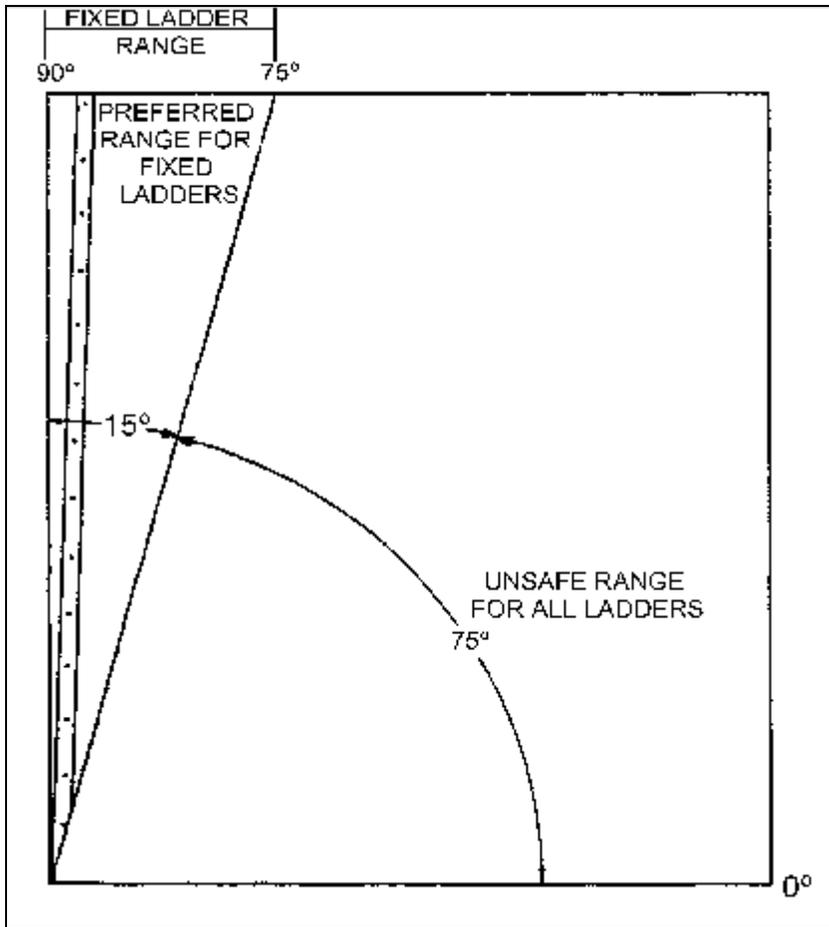


SAMPLE

06. Fixed Ladders: (7-1-97)

- a.** The minimum design live load for fixed ladders shall be a single concentrated load of two-hundred (200) pounds. (7-1-97)
- b.** The number and position of additional concentrated live load units of two-hundred (200) pounds each as determined from anticipated usage of the ladder shall be considered in the design. (7-1-97)
- c.** 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. (7-1-97)
- d.** The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings. (7-1-97)
- e.** Design stresses for fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range of seventy-five (75) degrees to ninety (90) degrees and intended for use by no more than one (1) person per section, single ladders as described in sub-sections 072.06.a. and 072.03.g of this section are acceptable. See Figure 072.06-A. (7-1-97)

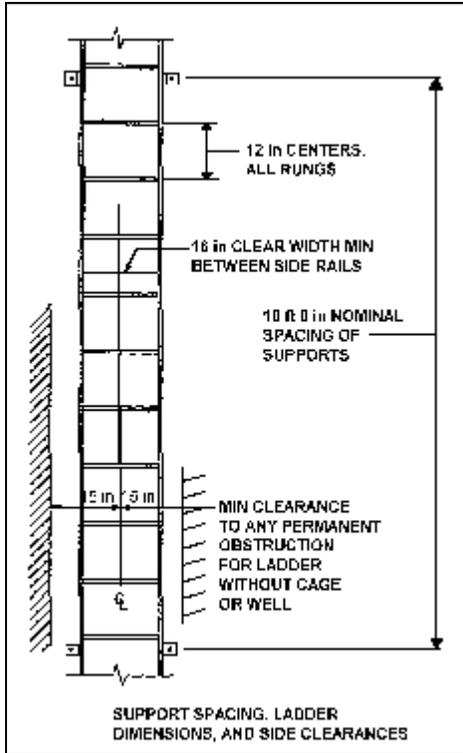
Figure 072.06-A



f. All rungs shall have a minimum diameter of three-fourths (3/4) inch for metal ladders, except as covered in sub-section 072.06.p of this section, and a minimum diameter of one and one-eighth (1 1/8) inches for wood ladders. (7-1-97)

g. The distance between rungs, cleats, and steps shall not exceed twelve (12)-inches and shall be uniform throughout the length of the ladder. See Figure 072.06-B. (7-1-97)

FIGURE 072.06-B

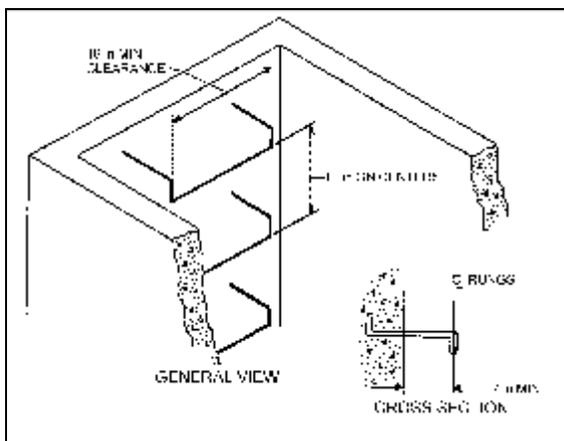


h. The minimum clear length of rungs or cleats shall be sixteen (16) inches. See Figure 072.06-B. (7-1-97)

i. Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard. (7-1-97)

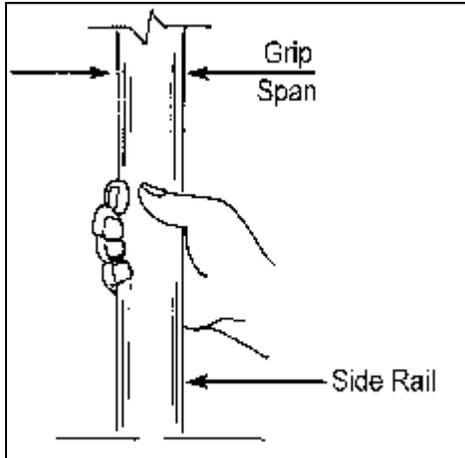
j. The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. (As shown in Figure 072.06-C). (7-1-97)

FIGURE 072.06-C



k. 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. See Figure 072.06-D. (7-1-97)

FIGURE 072.06-D



l. Fastenings shall be an integral part of fixed ladder design. (7-1-97)

m. All splices made by whatever means shall have smooth transition with original members and with no sharp or extensive projections. (7-1-97)

n. Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined. (7-1-97)

o. All welding shall be in accordance with the "Code for Welding in Building Construction" (AWS D1.0-1966). (7-1-97)

p. For protection from deterioration metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion 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 one (1) inch or shall be painted or otherwise treated to resist corrosion and rusting. (7-1-97)

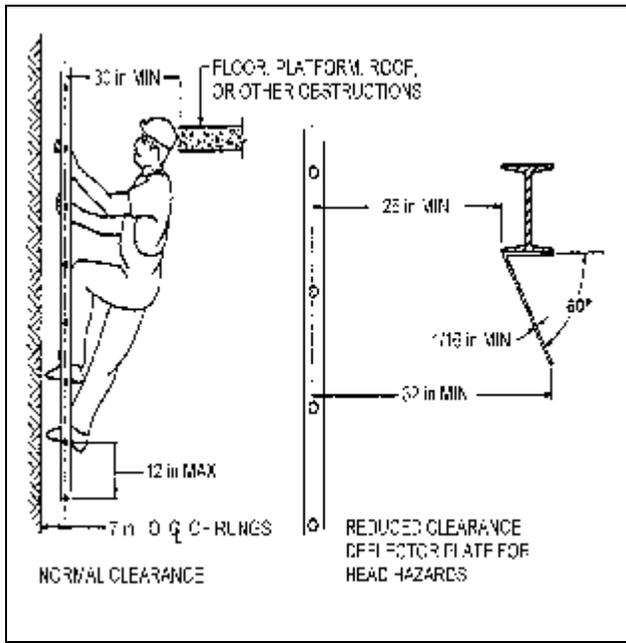
q. Wood ladders, when used under conditions where decay may occur, shall be treated with a nonirritating preservative, and the design shall be such as to prevent or minimize the accumulation of water on wood parts. (7-1-97)

r. When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no harmful affect one upon the other. (7-1-97)

s. 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 thirty-six (36) inches for a pitch of seventy-six (76) degrees, and thirty (30) inches for a pitch of ninety (90) degrees (Figure 072.06-

E of this subsection), with minimum clearance for intermediate pitches varying between these two (2) limits in proportion to the slope except as provided in sub-sections 072.06.v. and 072.06.w of this section. (7-1-97)

FIGURE 072.06-E



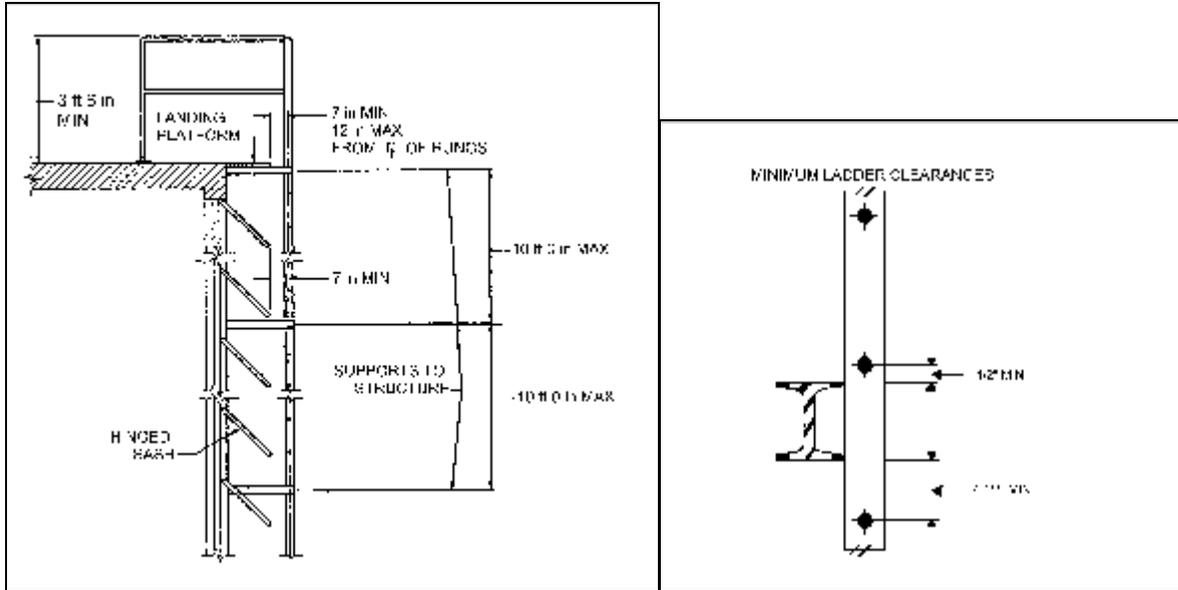
t. Ladders without cages or wells shall have a clear width of at least fifteen (15) inches shall be provided each way from the centerline of the ladder in the climbing space as shown

in Figure 072.06-B, except when cages or wells are necessary. (7-1-97)

u. Ladders equipped with cage or basket are exempted from the provisions of sub-sections 072.06.s. and 072.06.t. of this section, but shall conform to the provisions of sub-sections 072.06.z. through 072.06.dd. of this section. Fixed ladders in smooth-walled wells are exempted from the provisions of sub-section 072.06.a. of this section, but shall conform to the provisions of sub-section 072.06.ee of this section. (7-1-97)

v. 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 seven (7) inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in Figure 072.06-F shall be provided. (7-1-97)

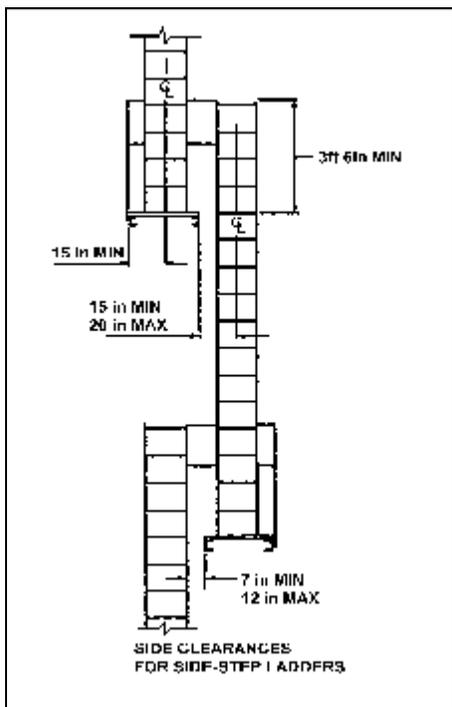
FIGURE 072.06-F



w. 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 four (4) inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve. (7-1-97)

x. The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than twelve (12) inches, or less than seven (7)-inches. (Figure 072.06-G) (7-1-97)

FIGURE 072.06-G



y. Counter weighted hatch covers shall open a minimum of sixty (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 twenty-six (26) inches for offset wells or thirty (30) inches for straight wells. There shall be no protruding potential hazards within twenty-six (26) inches of the centerline of rungs or cleats; any such hazards within thirty (30) inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of sixty (60) degrees from the horizontal as indicated in Figure 072.06-H. The relationship of a fixed ladder to an acceptable Counter weighted hatch cover is illustrated in Figure 072.06-I. Hatches shall have a fixed or telescoping ladder extension. (7-1-97)

FIGURE 072.06-H

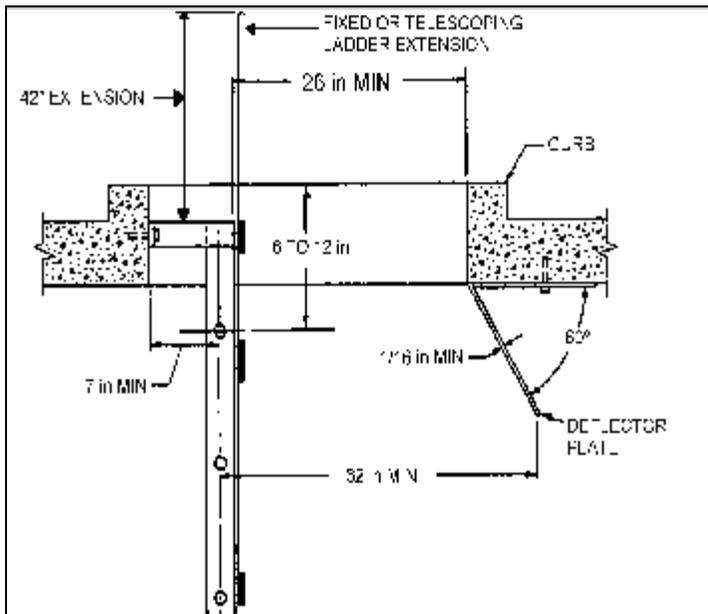
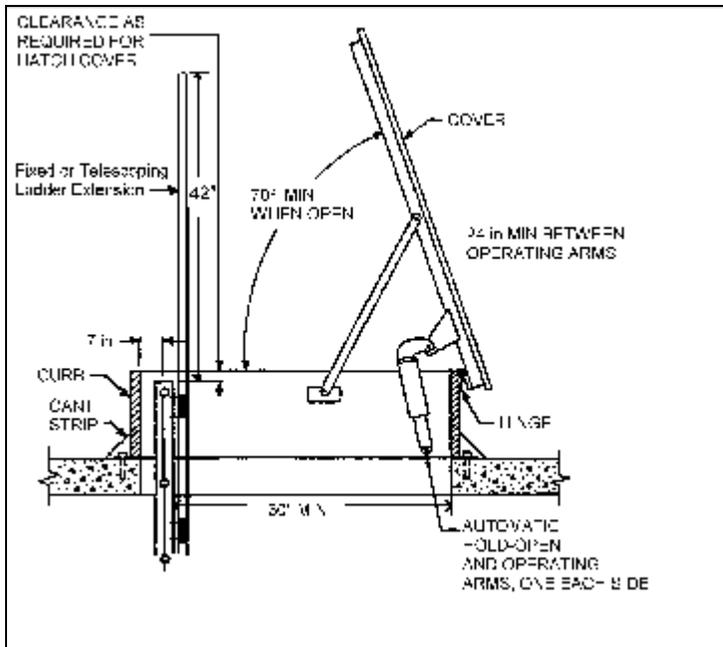


FIGURE 072.06-I



z. Cages or wells (except on chimney ladders) shall be built as shown in Figures 072.06-J and 072.06-K or of equivalent construction. (7-1-97)

FIGURE 072.06-J

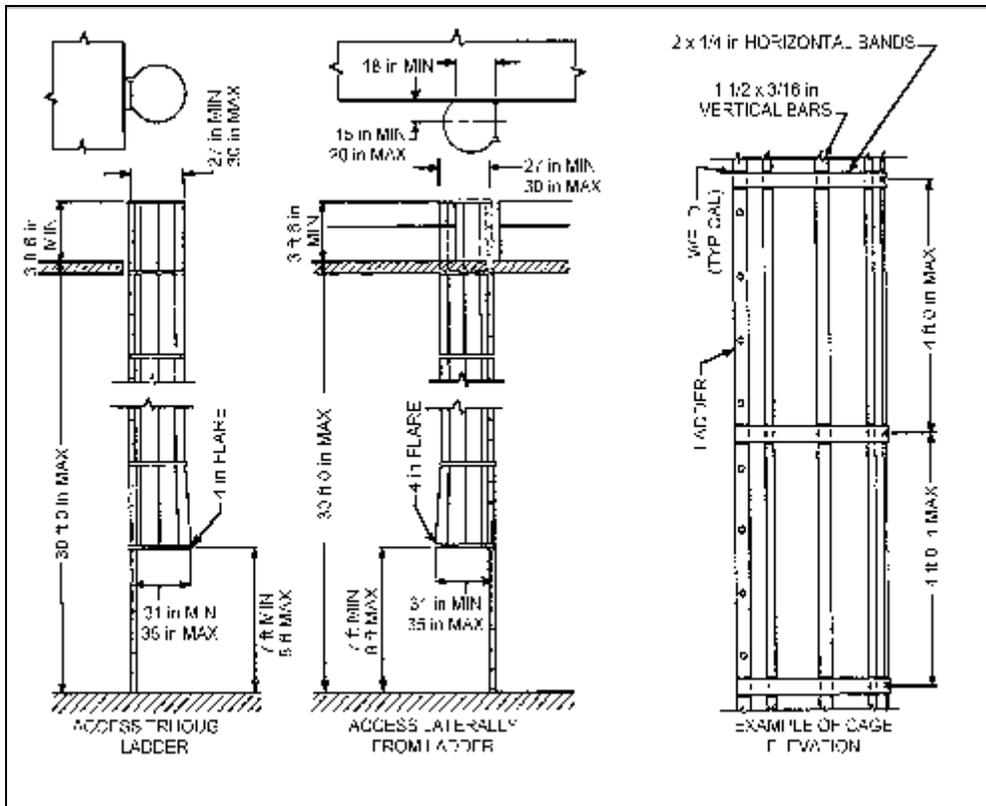
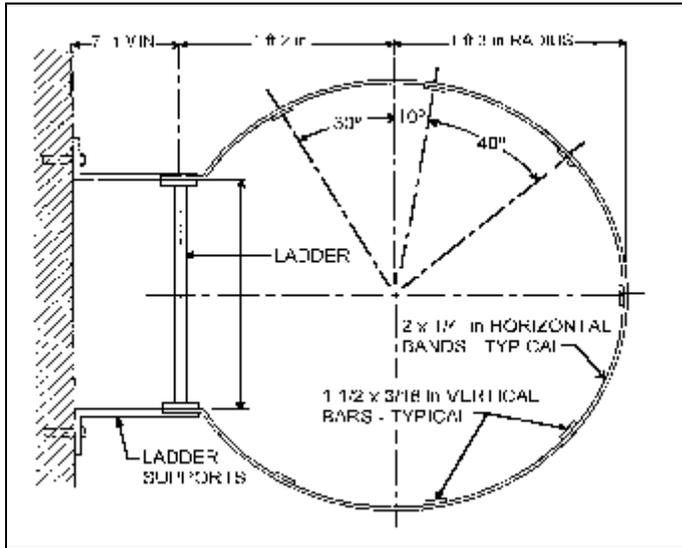


FIGURE 072.06-K



aa. Cages or wells (except as provided in sub-section 072.06.11. of this section) conforming to the dimensions shown in Figures 072.06-J and 072.06-K shall be provided on ladders of more than twenty (20) feet to a maximum unbroken length of thirty (30) feet. (7-1-97)

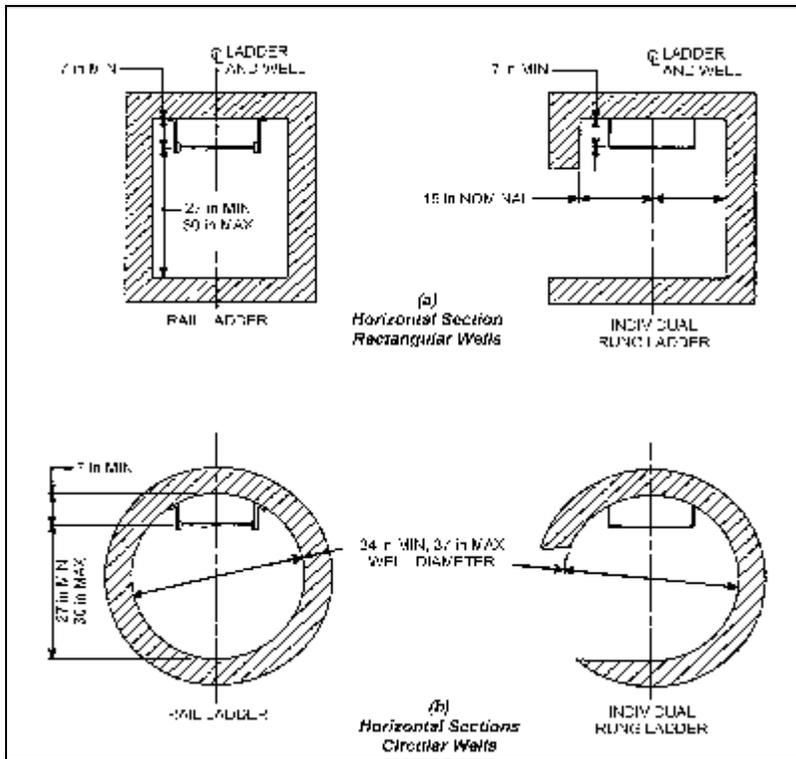
bb. Cages shall extend a minimum of forty-two (42) inches above the top of landing, unless other acceptable protection is provided. (7-1-97)

cc. Cages shall extend down the ladder to a point not less than seven (7) feet or 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. (7-1-97)

dd. Cages shall not extend less than twenty-seven (27) inches nor more than thirty (30) inches from the center line of the rungs of the ladder. Cage shall not be less than twenty-seven (27) inches in width. The inside shall be clear of projections. Vertical bars shall be located at a maximum spacing of forty (40) degrees around the circumference of the cage; this will give a maximum spacing of approximately nine and one-half (9 1/2) inches, center to center. (See Figure 072.06-K.) (7-1-97)

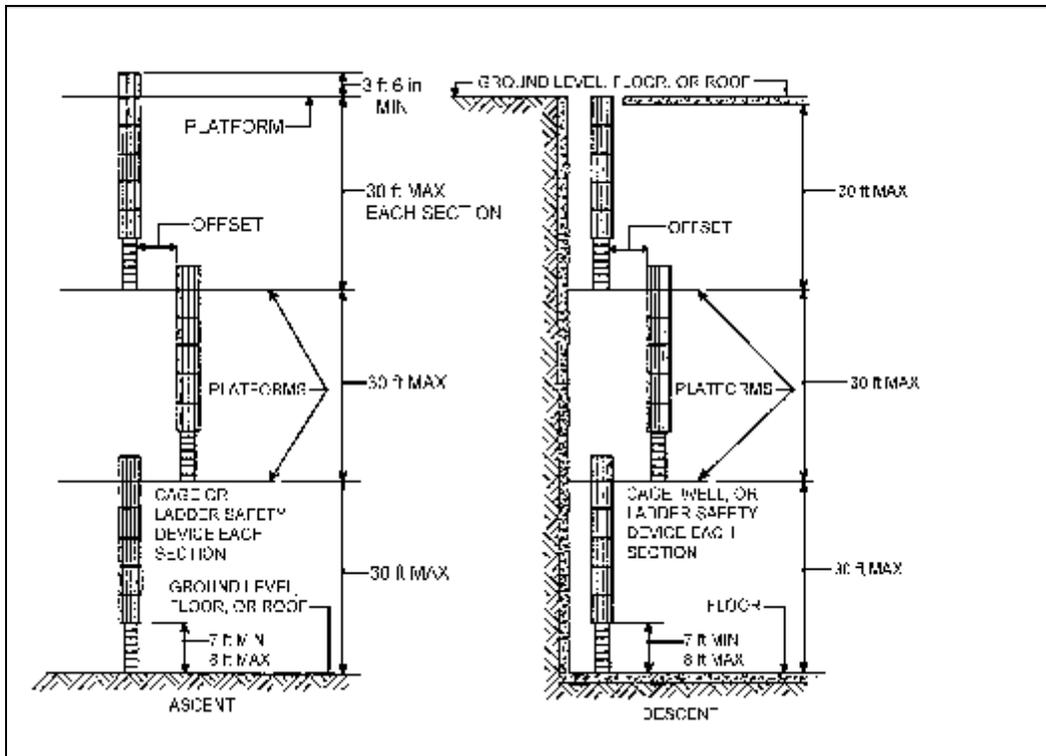
ee. Ladder wells shall have a clear width of at least fifteen (15) inches measured each way from the centerline of the ladder. Smooth walled wells shall be a minimum of twenty-seven (27) inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of thirty (30) inches from the centerline of the rungs. (See Figure 072.06-L.) (7-1-97)

FIGURE 072.06-L



ff. When ladders are used to ascend to heights exceeding twenty (20) feet (except on chimneys), landing platforms shall be provided for each thirty (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 twenty (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. (See Figure 072.06-M) (7-1-97)

FIGURE 072.06-M



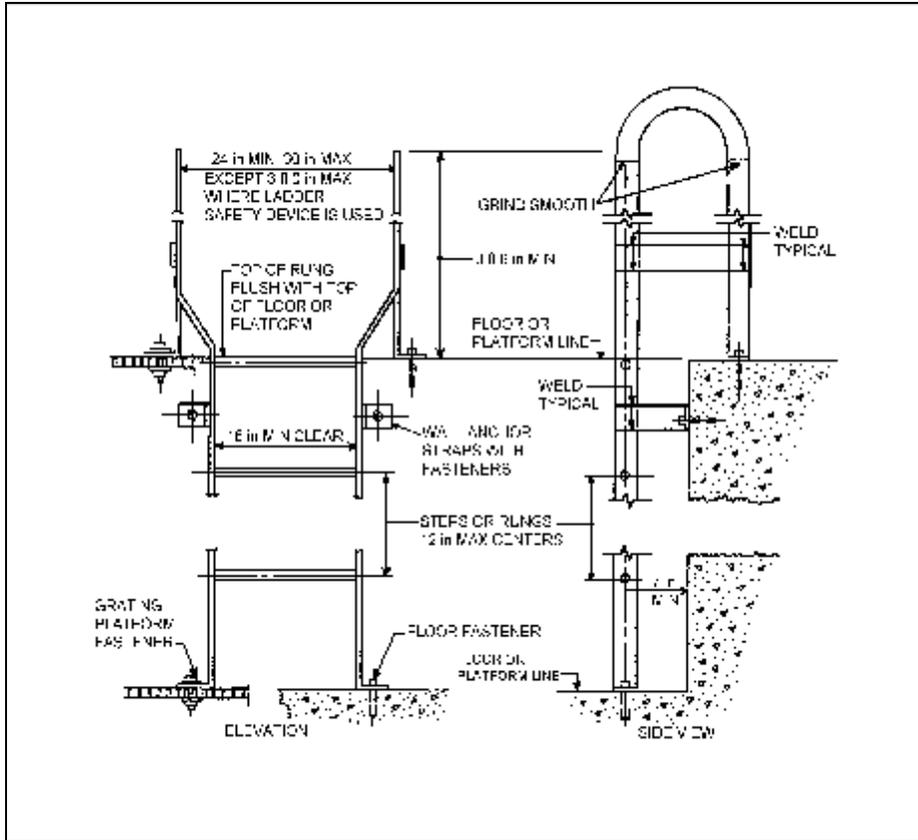
gg. Where a man has to step a distance greater than twelve (12) inches from the centerline of the rung structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be seven (7) inches. (7-1-97)

hh. All landing platforms shall be equipped with standard guard railing and toe-boards, so arranged as to give safe access to the ladder. Platforms shall be not less than twenty-four (24) inches in width and thirty (30) inches in length. (7-1-97)

ii. One (1) 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. (7-1-97)

jj. The side rail of through or side-step ladder extensions shall extend three and one-half (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 twenty-four (24) inches or more than thirty (30) inches clearance between rails. For sidestep or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the three and one-half (3 1/2) feet minimum (Figure 072.06-N). (7-1-97)

FIGURE 072.06-N

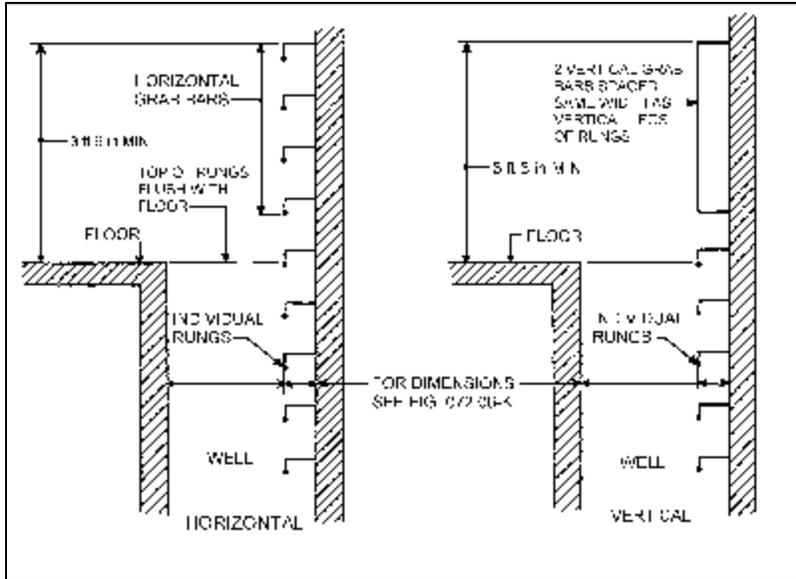


kk. Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab bar diameters shall be the equivalent of the round-rung diameters. (See Figure 072.06-O.) (7-1-97)

ll. Ladder safety devices may be used on tower, water tank, and chimney ladders over twenty (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 body harness friction brakes and sliding attachments shall meet the design requirements of the ladders which they serve. (7-1-97)

mm. The preferred pitch of fixed ladders shall be considered to come in the range of seventy-five (75) degrees and ninety (90) degrees with the horizontal (Figure 072.06-O). (7-1-97)

FIGURE 072.06-O



nn. Substandard Pitch. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of sixty (60) and seventy-five (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. (7-1-97)

oo. Ladders having a pitch in excess of ninety (90) degrees with the horizontal are prohibited. (7-1-97)