

**STANDARDS PRESENTATION**  
**TO**  
**CALIFORNIA OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD**

TITLE 8, DIVISION 1, CHAPTER 4

Subchapter 7. General Industry Safety Orders  
Group 1. General Physical Conditions and Structures  
Article 1. Definitions

Amend Section 3207 to add the following definitions within the existing definitions in alphabetical order:

§3207. Definitions.

Loading Ramp. [No change in text]

Lower Level. A surface or area to which an employee could fall. Such surfaces or areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, materials, water, equipment, and similar surfaces and structures, or portions thereof. §1910.21(b)

Maximum Intended Load. The total load (weight and force) of all employees, equipment, vehicles, tools, materials, and other loads the employer reasonably anticipates to be applied to a walking-working surface at any one time. §1910.21(b)

Mercantile Occupancy. [No change in text]

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Tread Run. [No change in text]

Walking-Working Surface. Any surface on or through which an employee walks, works, or gains access to a work area or workplace location. Walking-working surfaces include, but are not limited to, floors, ladders, stairways, steps, roofs, ramps, runways, aisles, scaffolds, dock plates, and step bolts. Walking-working surfaces include horizontal, vertical, and inclined or angled surfaces. §1910.21(b)

Wall Opening. [No change in text]

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NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

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Subchapter 7. General Industry Safety Orders  
Group 1. General Physical Conditions and Structures  
Article 4. Access, Work Space, and Work Areas

Amend Section 3277 as follows:

**§3277 Fixed Ladders.**

~~(a) All fixed ladders shall be approved as defined in Section 3206 of the General Industry Safety Orders.~~ Application. This section covers all fixed ladders, except when the ladder is: 1910.23(a)

(1) Used in emergency operations such as firefighting, rescue, and tactical law enforcement operations, or training for these operations; or 1910.23(a)(1)

(2) Designed into or is an integral part of machines or equipment. 1910.23(a)(2)

(b) Definitions.

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Carrier. [No change in text]

~~Cleats. Cleats are ladder crosspieces of rectangular cross section placed on edge on which a person may step in ascending or descending.~~ (See Rung, Step, or Cleat). §1910.21(b)

Fastenings. [No change in text]

~~Fixed Ladder. A fixed ladder is a ladder permanently attached to a structure, building, or equipment. Ladders referred to in this code shall be construed to be fixed ladders.~~ A ladder with rails or individual rungs that is permanently attached to a structure, building, or equipment. Fixed ladders include individual-rung ladders, but not ship stairs (ship ladder), step bolts, or manhole steps. §1910.21(b)

Grab Bars. [No change in text]

~~Individual-Rung Ladder. An individual-rung ladder is a fixed ladder each rung of which is individually attached to a structure, building, or equipment.~~ A ladder that has rungs individually attached to a building or structure. An individual-rung ladder does not include manhole steps. §1910.21(b)

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~~Ladder. A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending. A device with rungs, steps, or cleats used to gain access to a different elevation.~~  
§1910.21(b)

Ladder Safety System. An approved assembly of components whose function is to arrest the fall of a user. The ladder safety system shall include the carrier and its associated attachment elements (brackets, fasteners, etc.), safety sleeve, full body harness and connectors, wherein the carrier is permanently attached to the climbing face of the ladder or immediately adjacent to the structure. Cages and wells are not ladder safety systems. §1910.21(b)

Pitch. [No change in text]

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Railings. [No change in text]

~~Rungs. Rungs are ladder crosspieces on which a person may step in ascending or descending.~~  
Rung, Step, or Cleat. The crosspiece of a ladder on which an employee steps to climb up and down. §1910.21(b)

Safety Sleeve. [No change in text]

Side-Step Ladder. A side-step ladder is one from which a person getting off at the top must step sideways from the ladder in order to reach the landing a walking-working surface, such as a landing, such as shown in Fig. 3.

~~Steps. Steps are the flat crosspieces of a ladder on which a person may step in ascending or descending. (See Rung, Step, or Cleat).~~

Through Ladder. A through ladder is one from which a person getting off at the top must step through the ladder in order to reach the landing a walking-working surface, such as shown in Fig. 2.

Well. A well is a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage. (See ~~(g)(6)(h)(9)~~ and Fig. 1.)

*[The following deleted text is reorganized under design requirements (d)]*

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~~(e) Design Considerations. All ladders, appurtenances, and fastenings shall be designed to meet the following load requirements:~~

~~(1) The minimum design live load shall be a single concentrated load of 200 pounds.~~

~~(2) 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.~~

~~(3) The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such point or points as will cause the maximum stress in the structural member being considered.~~

~~(4) The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.~~

~~(5) All wood parts of fixed ladders shall meet the design and construction requirements for portable wood ladders in Section 3276(c).~~

~~(6) 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 or cleat ladders as described in Section 3276 are acceptable.~~

~~(c) Approval. All fixed ladders shall be approved as defined in Section 3206 of these Orders. Step bolts (pole steps), manhole steps, and underground vaults steps shall comply with Section 3279 of these Orders.~~

~~(d) Specific Features. (d) Design Requirements.~~

~~(1) Ladder rungs, steps, and cleats shall be parallel, level, and uniformly spaced. §1910.23(b)(1)~~

~~(2) All fixed ladders shall be capable of supporting their maximum intended load. §1910.23(d)(1)~~

~~(3) The minimum design live load shall be a single concentrated load of 200 pounds.~~

~~(4) 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.~~

~~(5) All wood parts of fixed ladders shall meet the design and construction requirements for portable wood ladders in Section 3276(c).~~

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(6) 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 or cleat ladders as described in Section 3276 are acceptable.

~~(4)~~(7) All rungs shall have a minimum diameter of 3/4 inch for metal ladders, except as covered in (e)(1) and a minimum diameter of 1-1/8 inches for wood ladders. Materials other than steel, aluminum, and wood are acceptable provided the design, fabrication, and erection are in accordance with recognized design practice and meet the design requirements of Sections 3277~~(e)~~(d)(1) - (6) and Section 3277(d)(12) when applicable.

~~(2)~~(8) The distance between the top surfaces of rungs, cleats, and steps shall not be less than 10 inches nor exceed 12 inches and shall be uniform throughout the length of the ladder.  
§1910.23(b)(2)

EXCEPTIONS:

1. Manholes Ladders and Underground Vaults Ladders. Step spacing shall not exceed 16 inches between the top surfaces of rungs and shall be uniform throughout the length of the ladder.

2. The vertical distance of the first rung from ground level may be as high as 14 inches.

~~(3)~~(9) Width. The minimum clear ~~length~~ width of rungs or cleats shall be 16 inches.

EXCEPTION: Manholes Ladders and Underground Vaults Ladders. Clear ~~length~~ width of rungs or cleats shall not be less than 14 inches.

~~(4)~~(10) Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard. §1910.23(b)(7)

~~(5)~~(11) The rungs of an individual-rung ladder shall be so designed that the climber's foot cannot slide off the end of a rung. A suggested design for metal rungs is shown in Fig. 4.  
§1910.23(d)(10)

~~(6)~~ (12) 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.

~~(7)~~ (13) Fastenings. Fastenings shall be an integral part of fixed ladder design.

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~~(8)~~ (14) Splices. All splices made by whatever means shall meet design requirements as noted in ~~(e)~~(d)(1) – (6). All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

~~(9)~~ (15) Electrolytic Action. Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined.

~~(10)~~ (16) Welding. All welding shall be in accordance with procedures of the American Welding Society, or equivalent.

~~(11)~~ Embedment. Individual rungs of ladders installed in manholes and underground vaults having a wall thickness which will not permit at least 6 inches of embedment shall have anchoring devices that will provide the minimum design load requirements of Section 3277(e) in addition to the following requirements: *[This language is moving to new Section 3279]*

~~(A)~~ The minimum design live load shall be a single concentrated load of 300 pounds.

~~(B)~~ Steps or rungs shall be embedded in the wall a minimum distance of 3 inches.

(17) The side rails of through or sidestep ladders shall extend at least 42 inches (1.1 m) above the top of the access level or landing platform served by the ladder. For parapet ladders, the access level is: §1910.23(d)(4)

(A) The roof, if the parapet is cut to permit passage through the parapet; or §1910.23(d)(4)(i)

(B) The top of the parapet, if the parapet is continuous. §1910.23(d)(4)(ii)

(18) For through ladders, the steps or rungs shall be omitted from the extensions, and the side rails shall be flared to provide not less than 24 inches (61 cm) and not more than 30 inches (76 cm) of clearance. When a ladder safety system is provided, the maximum clearance between side rails of the extension shall not exceed 36 inches (91 cm). §1910.23(d)(5)

(19) For side-step ladders, the side rails, rungs, and steps shall be continuous in the extension (see Figure 3 of this section). §1910.23(d)(6)

(20) The step-across distance for side-step ladders from the centerline of the rungs or steps shall be not less than 15 inches (38 cm) and not more than 20 inches (51 cm) to the access points of the platform edge. §1910.23(d)(12)

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(21) Grab bars shall extend 42 inches (1.1 m) above the access level or landing platforms served by the ladder. §1910.23(d)(7)

(22) 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 to the round-rung diameters. [Moved from 3277 (j)(l)]

(e) Protection from Deterioration.

(1) Metal. 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. §1910.23(b)(6)

(2) Wood. 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. Wood ladders shall not be painted but may be coated with a clear sealant after inspection has assured that all requirements of ~~3278~~ 3276 have been met. §1910.23(b)(5)

NOTE: ~~Paint does not act as a wood preservative.~~

(3) Combined Materials. 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.

(f) Clearance.

(1) On fixed ladders, the perpendicular distance from the center line 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. 5), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope, except as provided in (3) and (7). §1910.23(d)(13)(ii)

EXCEPTION: Manholes Ladders and Underground Vaults Ladders.

(2) 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. (See (g)(2)(3) and Fig. 5.) §1910.23(d)(13)

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EXCEPTION: Manholes Ladders and Underground Vaults Ladders.

(3) Ladders equipped with cage or basket shall be excepted from the provisions of (1) and (2), but shall conform to the provisions of (g)~~(5)~~(9). Fixed ladders in smooth-walled wells shall be excepted from the provisions of (1), but shall conform to the provisions of (g)~~(6)~~(10).

(4) The distance from the center line of rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than 7 inches (Fig. 5), except that when unavoidable obstructions are encountered, minimum clearances as shown in Fig. 6 shall be provided.

EXCEPTIONS:

1. Manholes Ladders and Underground Vaults Ladders. The clearance from the center line of rungs or steps shall not be less than 5 inches.
2. Obstructions. At those locations where unavoidable obstructions are encountered, minimum clearances shall be as shown in Figure 6.

(5) The distance from the center line of the grab bar to the nearest permanent object in back of the grab bars shall be not less than ~~4~~ 7 inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve. §1910.23(d)(3)

(6) 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. 7). §1910.23(d)(12)

(7) All hatch covers shall open a minimum of 60 degrees from the horizontal. The distance from the center line 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 center line of rungs or cleats; any such hazards within 30 inches of the center line 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. 8. The relationship of a fixed ladder to an acceptable hatch cover is illustrated in Fig. 9. §1910.23(d)(9)

(g) Cages or Wells. (Refer to Subsection (k) for ladder safety system phase-in requirements)

- (1) Construction. Cages or wells shall be built as shown on the applicable drawings, covered in detail in Figs. 1, 10, and 11, or of equivalent construction. §1910.29(g)(1)



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EXCEPTION: Chimney ~~H~~adders, and ~~m~~anholes Ladders, and ~~u~~nderground ~~v~~aults Ladders.

(2) Cages and wells shall be continuous throughout the length of the fixed ladder, except for access, egress, and other transfer points; §1910.29(g)(2)

~~(2)~~ (3) Dimensions and Maximum Length. Cages or wells conforming to the dimensions shown in Figs. 1, 10, and 11 shall be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.

Exceptions EXCEPTIONS to (g)(3):

1. Fixed ladders on fire hose drying towers are not required to have a cage, well, offset platform, or ladder safety device if they do not exceed 30 feet in length and provided their use is restricted to trained fire fighters or others equally trained in ladder use.

~~2. Fixed ladders on outdoor advertising structures covered by Article 11.~~

~~3.~~ 2. Ladders equipped with ladder safety systems as provided under Subsection ~~(m)~~(l).

(4) Cages and wells shall be designed, constructed, and maintained to contain employees in the event of a fall, and to direct them to a lower landing; §1910.29(g)(3)

(5) A cage or well in combination with a personal fall arrest system or ladder safety system may be provided such that the cage or well does not interfere with the operation of the system. §1910.28(b)(9)(iv)

(6) Platforms used with fixed ladders shall provide a horizontal surface of at least 24 inches by 30 inches (61 cm by 76 cm). §1910.29(g)(4)

~~(3)~~ (7) Top of Cage. Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided.

~~(4)~~ (8) Bottom of Cage. 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 the bottom flared not less than 4 inches. When the ladder terminates on a landing platform or ~~walkway~~ walking-working surface at an elevation greater than 30 inches above the ground, a ladder cage extension shall be provided from the bottom of the cage to the top of the guardrail when the distance from the plane of the ladder rungs to the guardrail is equal to or less than that shown in Figure 11, "Ladder Cages at Elevated Locations."

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(A) When the guardrail is located at a distance greater than that shown in Figure 11, a ladder cage extension need not be provided.

(B) The ladder cage extension or equivalent shall be constructed as follows:

1. The ladder cage extension or equivalent shall be capable of withstanding a force of at least 200 pounds applied horizontally at any point.

2. The ladder cage extension or equivalent shall be of solid construction, grille work with vertical bars located at a maximum spacing of 9-1/2 inches, center-to-center, or of slat-work with openings between slats not more than 4 vertical inches.

3. The ladder cage extension or equivalent shall be free of hazardous projections.

4. The ladder cage extension or equivalent shall be provided not less than two feet each side of the ladder center line where there is an exposure.

5. Vertical guardrail extensions may be used as equivalent construction for the ladder cage extension provided they are as high as the bottom of the cage opening and they comply with the provisions of ~~(g)(4)(8)(B)1.-5.~~

~~(5)~~ (9) Size of Cage. Cages shall not extend less than 27 nor more than 30 inches from the center line of the rungs of the ladder. The 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 9-1/2 inches, center-to-center around the circumference.

~~(6)~~ (10) Ladder Wells. Ladder wells shall have a clear width of at least 15 inches measured each way from the center line of the ladder. (See Fig.1.) Smooth-walled wells shall be a minimum of 27 inches and a maximum of 30 inches from the center line 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 center line of the rungs.

(h) Pitch.

(1) Preferred Pitch. The preferred pitch of fixed ladders shall be considered to come in the range of 75 to 90 degrees with the horizontal. (See Fig. 12.)

(2) Substandard Pitch. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 to 75 degrees with the horizontal. Substandard fixed

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ladders shall be permitted only where it is found necessary to meet conditions of installation. (See Fig. 12.) This substandard pitch range shall be considered as a critical range to be avoided, if possible.

(3) Scope of Coverage in This Code. This code covers only fixed ladders within the pitch range of 60 to 90 degrees with the horizontal. (See Fig. 12.)

(4) Pitch Greater Than 90 Degrees. Ladders having a pitch in excess of 90 degrees with the horizontal shall not be permitted. *§1910.23(d)(11)*

**EXCEPTION:** Manholes Ladders and Underground Vaults Ladders. Individual rung ladders installed in the walls of conical top sections of manholes and underground vaults shall be allowed to exceed a pitch of 90 degrees for a distance of not more than 2 rungs or steps in the conical top sections. The deviation from 90 degrees shall not exceed 6 inches. (See Figure 13.)

(i) 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 inspected before initial use in each work shift, and more frequently as necessary, to identify any visible defects that could cause employee injury. *1910.23(b)(9)*

(1) Any ladder with structural or other defects shall be immediately tagged “Dangerous: Do Not Use” and removed from service until repaired or replaced. When any correction or repair involves the structural integrity of the ladder, a qualified person shall perform or supervise the correction or repair. *1910.23(b)(10)*

(j) Landing Platforms.

(1) When ladders are used to ascend to heights exceeding 20 feet landing platforms shall be provided as follows: (See Subsection (k) for requirements of ladders higher than 24 feet)

(A) Where no cage, well, or ladder safety system is provided, landing platforms shall be provided for each 20 feet of height or fraction thereof.

(B) Where a cage or well is provided and no ladder safety system is provided, landing platforms shall be provided for each 30 feet of height or fraction thereof. *§1910.28(b)(9)(B)*

(C) Each ladder section shall be offset from adjacent ladder sections at each landing. *§1910.28(b)(9)(A)*

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(D) Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset [See ~~§~~subsection ~~(m)~~(l)].

EXCEPTIONS to subsection (j)(1):

1. Ladders used primarily in construction operations, fire escape ladders, and ladders equipped with treads.
2. Ladders on high-voltage transmission towers, chimneys, smoke stack ladders, water tower ladders and similar fixed ladders on permanent installations which are used either infrequently or for emergency only, provided the employee who uses the ladder is supplied with and wears approved personal fall protection equipment, which can be utilized if a rest period is required.
3. Ladders in underground mines as covered by the Mine Safety Orders.

(2) Where an employee has to step a distance greater than 12 inches from the center line 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 (Figure 7).

(3) All landing platforms shall be equipped with guardrails 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.

(4) 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 (Figure 10).

~~(k) 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 (Figure 2). 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 (Figure 3).~~

(k) Fixed ladders that extend more than 24 feet (7.3 m) above a lower level shall comply with the following: §1910.28(b)(9)

(1) Requirements for fixed ladders that extend more than 24 feet (7.3 m) above a lower level: §1910.28(b)(9)(i)

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(A) Existing fixed ladders. Each fixed ladder installed before [2 years after OAL effective date] shall be equipped with a personal fall arrest system, ladder safety system, cage, or well;  
*§1910.28(b)(9)(i)(A)*

(B) New fixed ladders. Each fixed ladder installed on and after [2 years after OAL effective date] shall be equipped with a personal fall arrest system or a ladder safety system;  
*§1910.28(b)(9)(i)(B)*

(C) Replacement. When a fixed ladder, cage, or well, or any portion of a section thereof, is replaced, a personal fall arrest system or ladder safety system shall be installed in at least that section of the fixed ladder, cage, or well where the replacement is located; and  
*§1910.28(b)(9)(i)(C)*

(D) Final deadline. On and after November 18, 2036, all fixed ladders shall be equipped with a personal fall arrest system or a ladder safety system. *§1910.28(b)(9)(i)(D)*

(2) When a one-section fixed ladder is equipped with a personal fall protection or a ladder safety system or a fixed ladder is equipped with a personal fall arrest or ladder safety system on more than one section: *§1910.28(b)(9)(ii)*

(A) The personal fall arrest system or ladder safety system shall provide protection throughout the entire vertical distance of the ladder, including all ladder sections; and *§1910.28(b)(9)(ii)(A)*

(B) The ladder shall have rest platforms provided at maximum intervals of 150 feet (45.7 m).  
*§1910.28(b)(9)(ii)(B)*

~~(l) 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. [Moved to 3277 (d)(22)].~~

~~(m) Ladder Safety Systems. Ladder safety systems may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform shall be required in these cases. All ladder safety systems shall meet the design requirements of the ladders which they serve [See Subsection (e)].~~

(l) Ladder Safety Systems.

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(1) Each ladder safety system shall allow the employee to climb up and down using both hands and shall not require that the employee continuously hold, push, or pull any part of the system while climbing. 1910.29(i)(1)

(2) The connection between the carrier or lifeline and the point of attachment to the body harness or belt shall not exceed 9 inches (23 cm). 1910.29(i)(2)

(3) Mountings for rigid carriers shall be attached at each end of the carrier, with intermediate mountings spaced, as necessary, along the entire length of the carrier so the system has the strength to stop employee falls. 1910.29(i)(3)

(4) Mountings for flexible carriers shall be attached at each end of the carrier and cable guides for flexible carriers shall be installed at least 25 feet (7.6 m) apart but not more than 40 feet (12.2 m) apart along the entire length of the carrier. 1910.29(i)(4)

(5) The design and installation of mountings and cable guides shall not reduce the design strength of the ladder. 1910.29(i)(5)

(6) Ladder safety systems and their support systems shall be capable of withstanding, without failure, a drop test consisting of an 18-inch (41-cm) drop of a 500-pound (227-kg) weight. 1910.29(i)(6)

(7) Ladder safety systems may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. All ladder safety systems shall meet the design requirements of the ladders which they serve. [Moved from 3277(m)].

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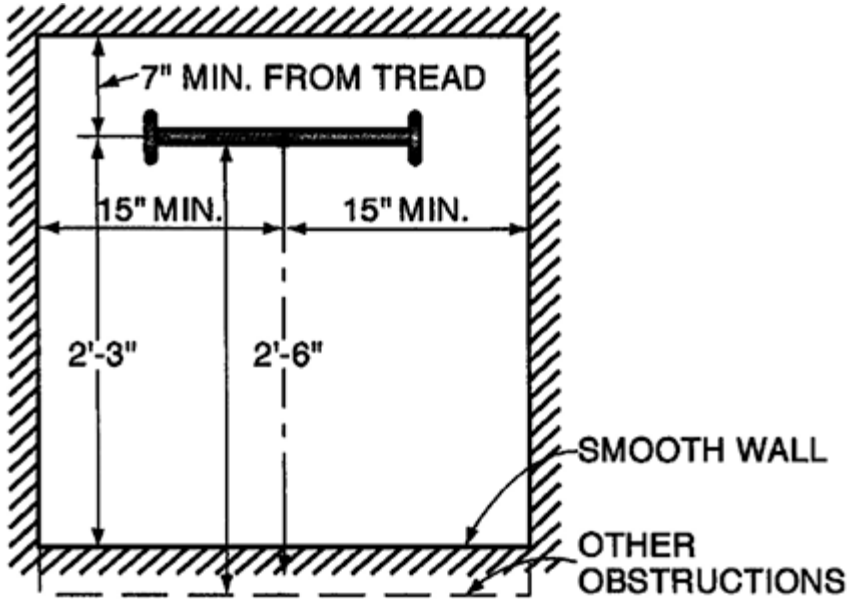
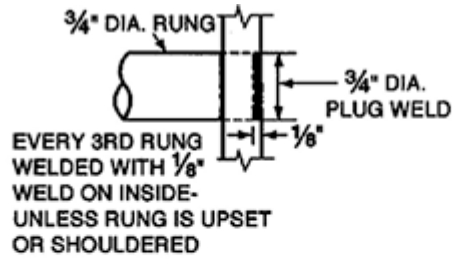


Fig. 1: Clearance Diagram for Fixed Ladder in Well

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Section A-A

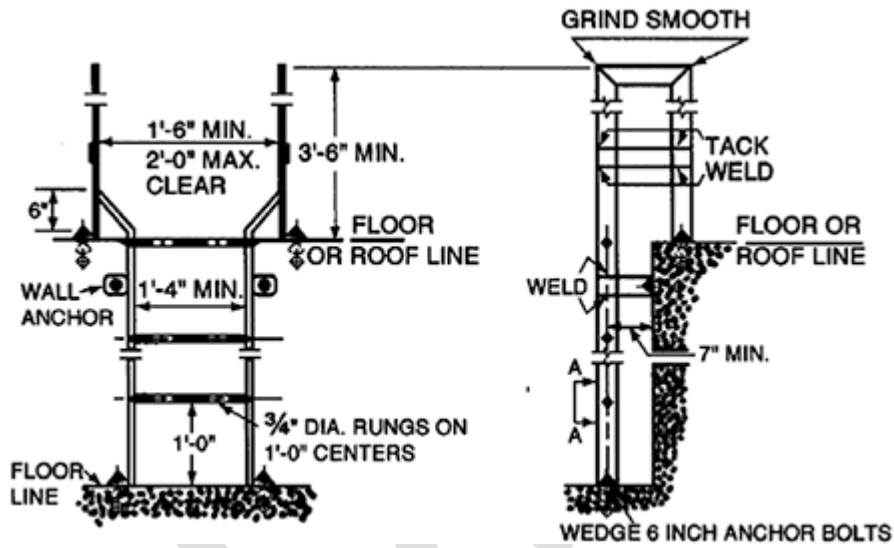


Fig. 2: Roof Ladder



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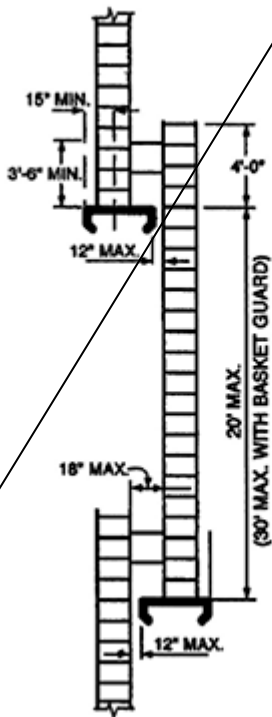


Fig. 3  
Offset Fixed Ladder Sections

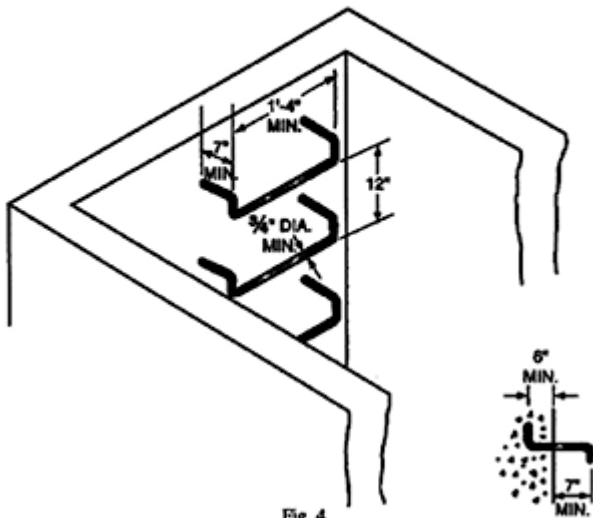


Fig. 4  
Suggested Design for Rungs on Individual-Rung Ladders

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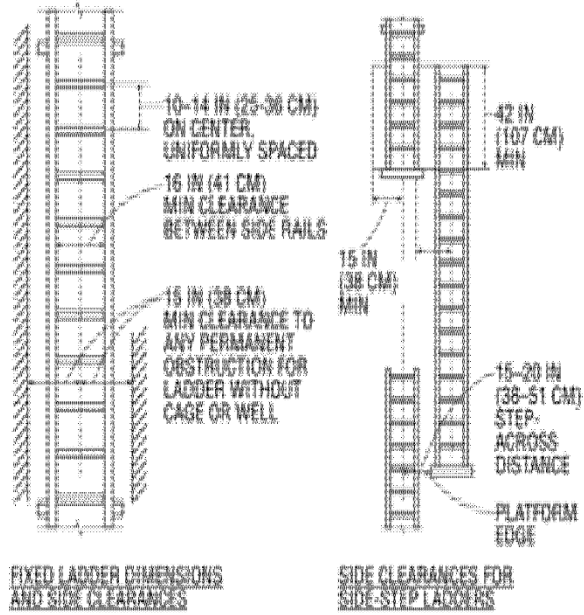
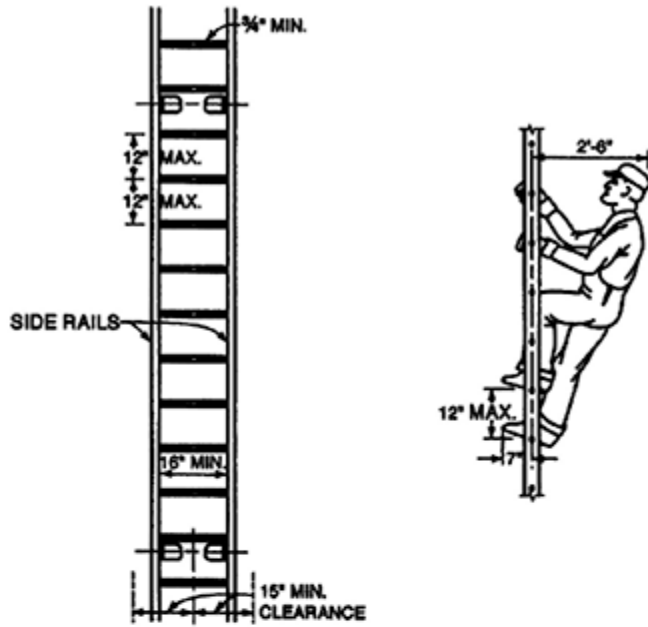


Fig. 3 Side-Step Fixed Ladder Sections

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RAIL LADDER WITH BAR STEEL RAILS  
AND ROUND STEEL RUNGS

Fig. 5  
Minimum Ladder Clearance

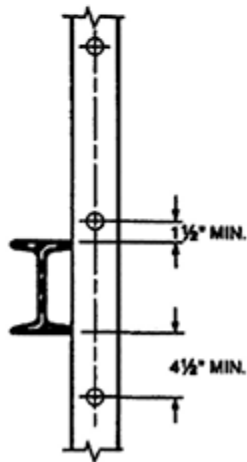


Fig. 6  
Clearance for Unavoidable Obstruction

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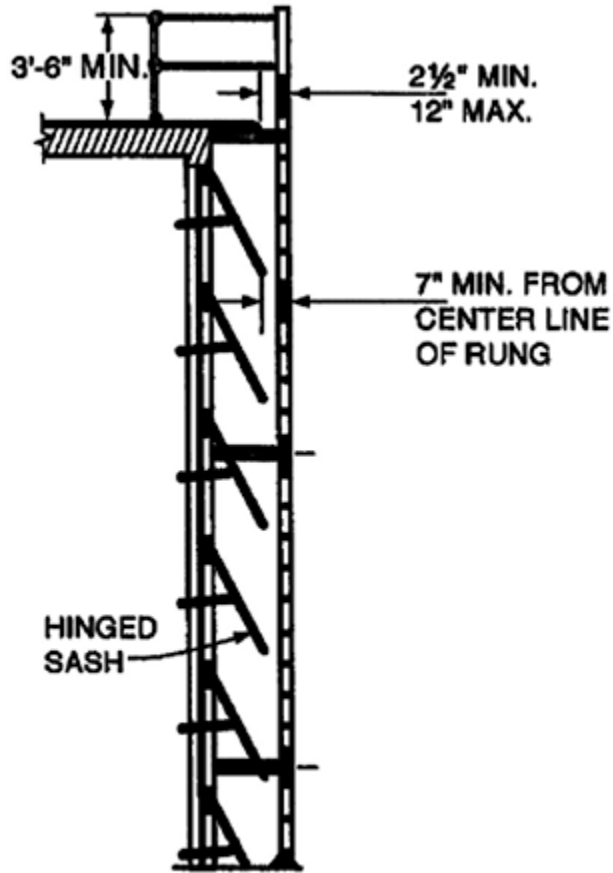


Fig. 7  
Ladder Far from Wall

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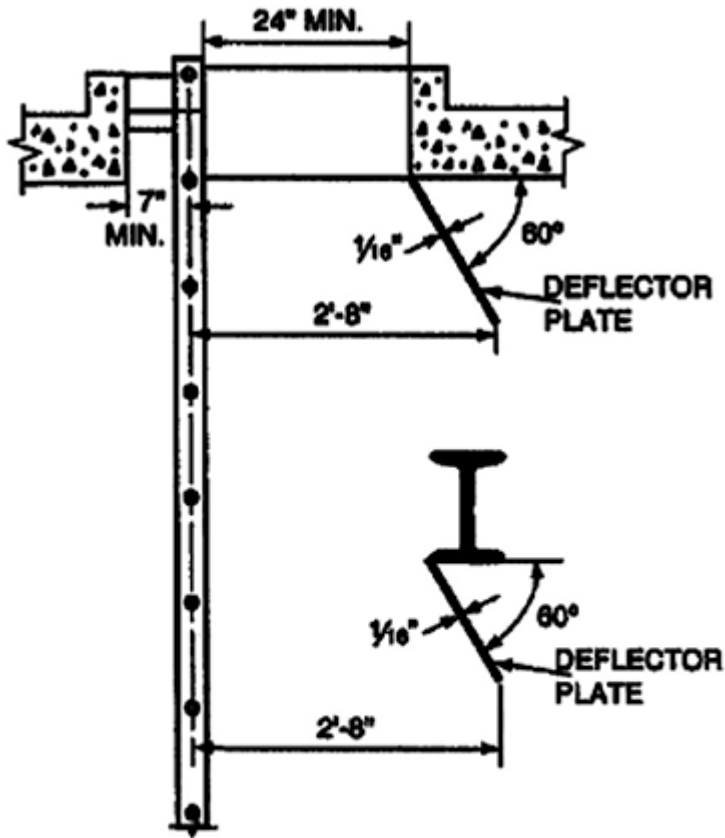


Fig. 8  
Deflector Plates for Head Hazards

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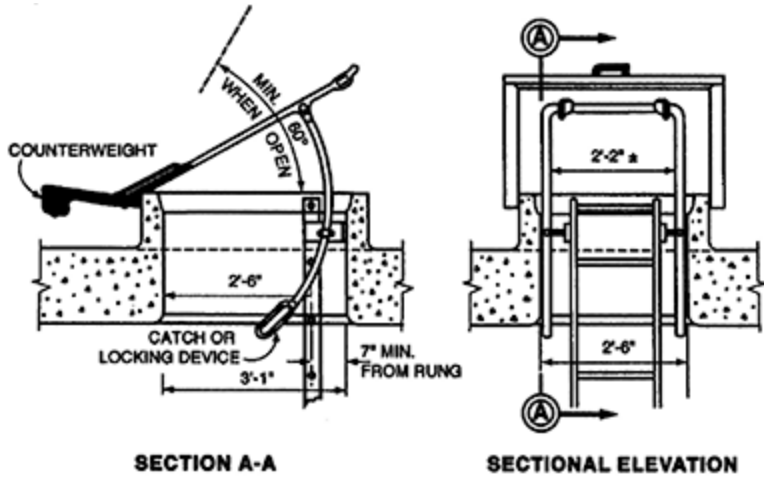


Fig. 9  
Relationship of Fixed Ladder to a Safe Access Hatch

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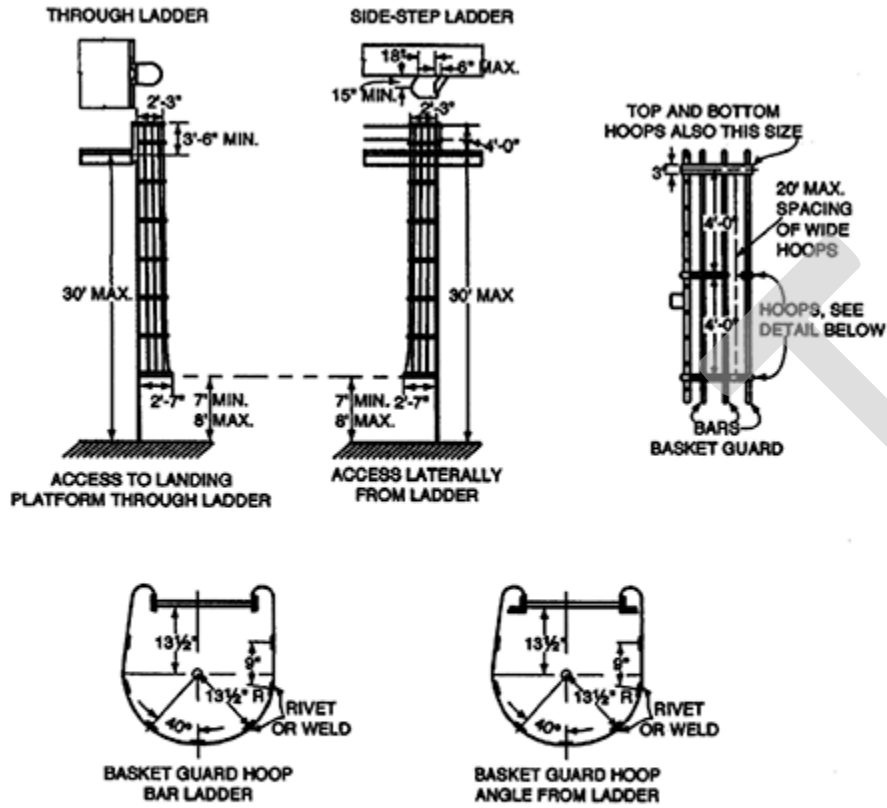


Fig. 10  
Cages for Ladders More Than 20 Feet High

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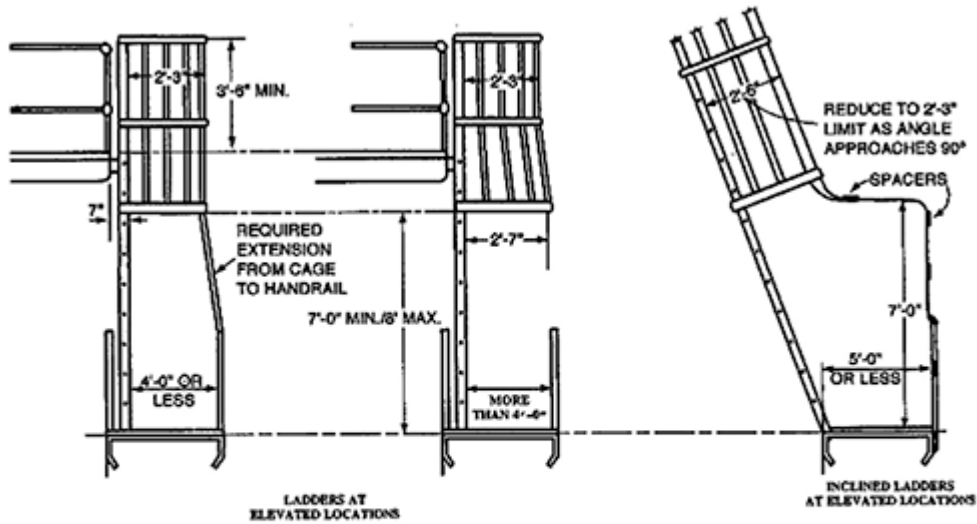


Fig. 11  
Ladder Cages at Elevated Locations

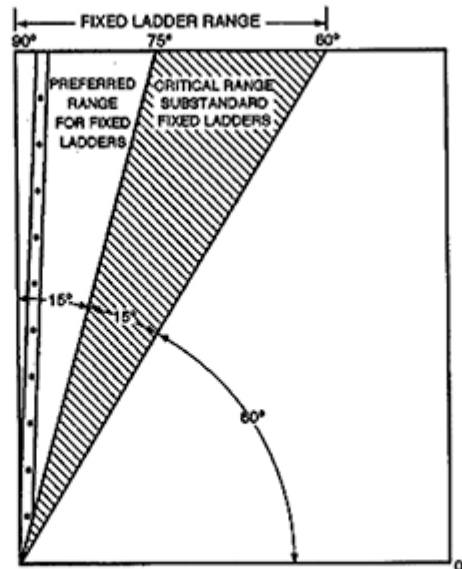


Fig. 12  
Pitch of Fixed Ladders



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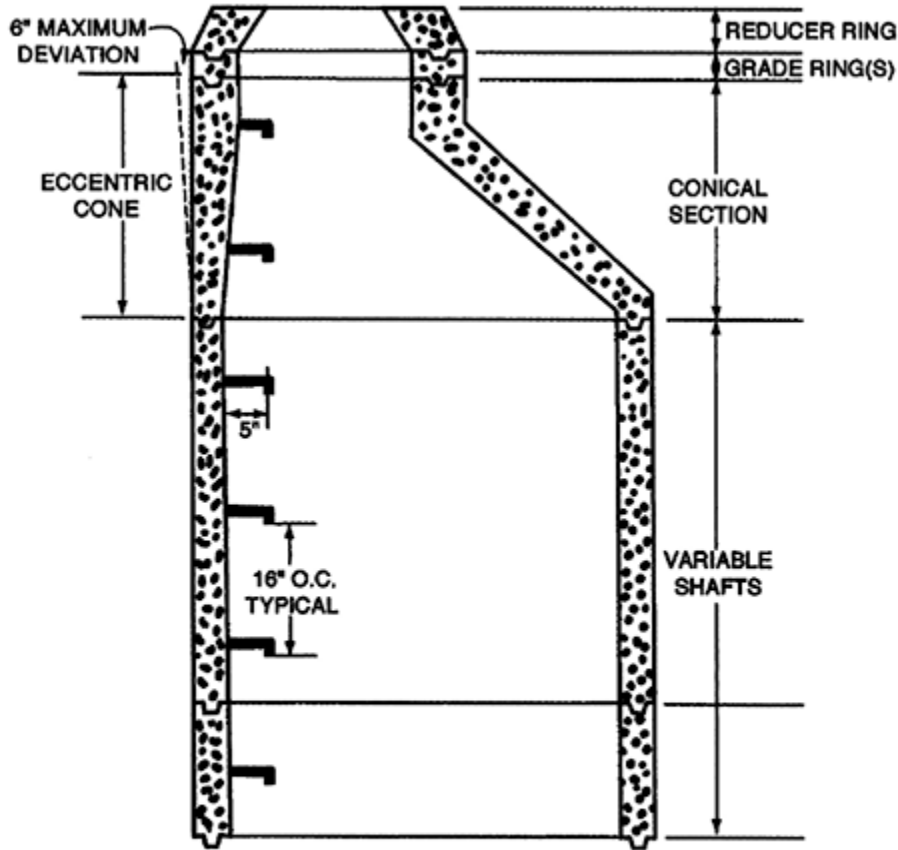


Fig. 13  
Manholes and Underground Vaults

Fig. 3 Side-Step Fixed Ladder Sections

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.