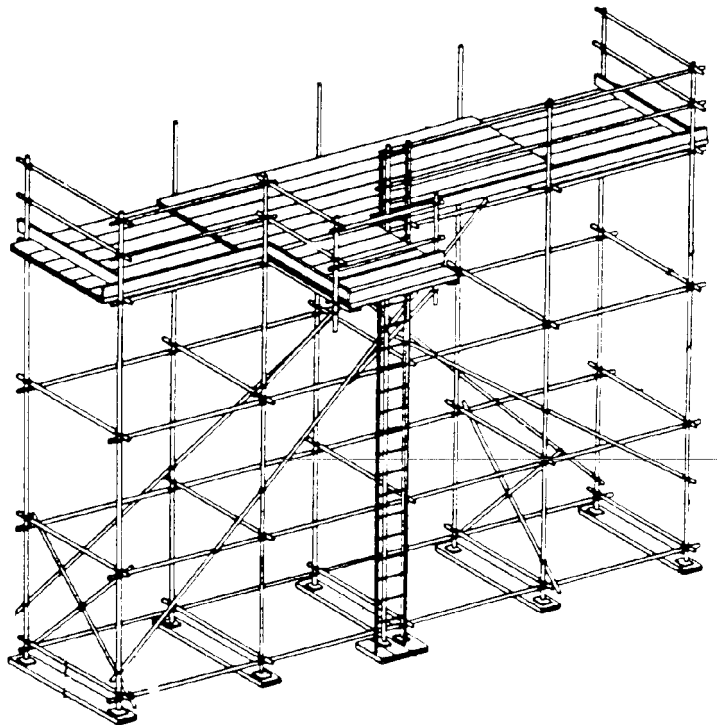


Safety Standards for Scaffolds Used in the Construction Industry

§1926.450
SUBPART L
SCAFFOLDS



Safety Standards for Scaffolds Used in the Construction Industry

SUMMARY

The Occupational Safety and Health Administration(OSHA) hereby revises the construction industry safety standards which regulate the design, construction, and use of scaffolds. The final rule updates the existing scaffold standards and sets performance-oriented criteria, where possible, to protect employees from scaffold-related hazards such as falls, falling objects, structural instability, electrocution and overloading.

In particular, the final rule has been updated to address types of scaffolds -- such as catenary scaffolds, step and trestle ladder scaffolds, and multi-level suspended scaffolds -- not covered by OSHA's existing scaffold standards. In addition, the final rule allows employers greater flexibility in the use of fall protection systems to protect employees working on scaffolds and extends fall protection to erectors and dismantlers of scaffolds to the extent feasible.

Another area that the final rule strengthens is training for workers using scaffolds; the conditions under which such employees must be retrained are also specified in the final rule. Finally, the language of the rule has been simplified, duplicative and outdated provisions have been eliminated, overlapping requirements have been consolidated, and the performance orientation of the rule has been enhanced to allow employers as much flexibility in compliance as is consistent with employee protection.

EFFECTIVE DATES

This standard will become effective on **November 29, 1996**, except for §1926.453(a)(2), which will not become effective until an Office of Management and Budget (OMB) Control number is received and displayed for this "collection of information" in accordance with the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.).

The incorporations by reference of certain publications listed in this final rule are approved by the Director of the Federal Register as of **November 29, 1996**. In addition, employers are required to comply with the provisions of paragraphs (e)(9) and (g)(2) of §1926.451, which address safe access and fall protection, respectively, for employees erecting and dismantling supported scaffolds starting on **September 2, 1997**.

I. Background

Congress amended the Contract Work Hours Standards Act in 1969 by adding a new section 107 to provide employees in the construction industry with a safer work environment and to reduce the frequency and severity of construction accidents and injuries. The amendment, commonly known as the Construction Safety Act (CSA), significantly strengthened employee protection by authorizing the promulgation of construction safety and health standards for employees of the building trades and construction industry working on federal and federally-financed or federally-assisted construction projects.

The Occupational Safety and Health Act of 1970 (the OSH Act) authorized the Secretary of Labor to adopt established federal standards issued under other statutes, including the CSA, as occupational safety and health standards. Accordingly, the Secretary of Labor adopted the Construction Standards, which had been issued under the CSA, as OSHA standards. The Safety and Health Regulations for Construction were subsequently redesignated as 29 CFR part 1926. Standards addressing scaffolds, §§1926.451 and 1926.452, were adopted in subpart L of part 1926 as OSHA standards as part of this process.

Various amendments were made to subpart L during the first two years of the OSH Act. The amendments revised scaffold provisions that addressed planking grades, wood pole scaffold construction, overhead protection, bracket scaffold loading, and plank spans. Also, substantive provisions concerning pump jack scaffolds, height of catch platforms, and guardrails were added.

Based on concerns regarding the effectiveness of the existing scaffold standards, OSHA began a complete review of subpart L in 1977. The Agency consulted the Advisory Committee on Construction Safety and Health (ACCSH) several times regarding draft revisions to subpart L.

Based on its review of existing subpart L, OSHA believes that certain provisions in the existing standards are outdated, redundant, or ambiguous. In addition, some types of scaffolds used in construction (e.g., catenary scaffolds) are not clearly addressed by the existing standards, and some provisions cover only certain types of scaffolds when they should apply to all. The final rule eliminates those unnecessary, outdated and redundant provisions (e.g., revised subpart L states the requirement for guardrails once, rather than 19 separate times as in the existing standard).

II. Hazards Involved

Scaffold-related incidents resulting in injuries and fatalities continue to occur despite the fact that OSHA has had a scaffold standard in place since 1971. However, the Agency believes that compliance with the new standard will be better than it has been in the past because this standard has been simplified, brought up to date, and strengthened to provide additional protection.

Although specific accident ratios cannot be projected for the estimated 3.6 million construction workers currently covered by subpart L, the Economic Analysis that accompanies this final rule estimates that, of the 510,500 injuries and illnesses that occur in the construction industry annually, 9,750 are related to scaffolds. In addition, of the estimated 924 occupational fatalities occurring annually, at least 79 are associated with work on scaffolds.

OSHA prepared the following statistical estimates (based on 4.5 million construction workers then covered by subpart L) to support the 1986 proposal for subpart L, based on a review of accident data prepared by the Bureau of Labor Statistics (BLS) (Ex. 3-1). The revised scaffold standards contain a number of provisions designed specifically to address the findings of this analysis.

a. Seventy-two percent of the workers injured in scaffold accidents covered by the BLS study attributed the accident either to the planking or support giving way, or to the employee slipping, or being struck by a falling object. Plank slippage was the most commonly cited cause.

b. About 70 percent of the workers learned of the safety requirements for installing work platforms, assembling scaffolds, and inspecting scaffolds through on-the-job training. Approximately 25 percent had no training in these areas.

c. Only 33 percent of scaffolds were equipped with a guardrail.

Based on its analysis of the available data and its field experience in enforcing construction standards, the Agency has determined that employees using scaffolds are exposed to a significant risk of harm. Specifically, scaffold related fatalities still account for approximately 9% of all fatalities in the construction workplace.

In addition, the above data indicate that the revised final standard would have prevented many of these accidents more effectively than compliance with the existing scaffold standards. Consequently, OSHA finds that the revision of its scaffold standards for construction is necessary to improve employee protection. OSHA has determined that, as revised, the standard clearly states employers' duties and the appropriate compliance measures.

III. Summary and Explanation of the Final Rule

The following explains how the final rule corresponds to or differs from the existing standard.

§1926.450 Scope, application and definitions applicable to this subpart.

Paragraph (a) The final rule applies to all scaffolds used in construction, alteration, repair (including painting and decorating), and demolition operations covered under 29 CFR part 1926, except that crane or derrick suspended personnel platforms will continue to be regulated under §1926.550(g). In addition, aerial lifts are covered exclusively in §1926.453, as noted in paragraph (a) of §1926.450.

OSHA will continue to regulate temporary elevated work platforms, such as false cars and go-devils used in elevator shaft construction, as scaffolds.

Paragraph (b) of §1926.450 lists and defines all major terms used in subpart L.

OSHA is revising its definitions for particular types of scaffolds by specifying whether a particular type of scaffold is a "supported" or a "suspension scaffold." OSHA believes that adding this information will make it easier for employers to identify the appropriate general requirements in final rule §1926.451.

The Agency has also revised subpart L definitions by deleting language that limits the use of a particular type of scaffold. Such substantive limitations are more appropriately placed in regulatory text. Accordingly, for example, OSHA has revised the definition for "bricklayers' square scaffolds" (a scaffold composed of framed wood squares which support a platform, limited to light and medium duty) by deleting the words "limited to light and medium duty". Similarly, OSHA has revised the definition for "coupler" to be "a device for locking together the component tubes of a tube and coupler scaffold", deleting language addressing the material used for the coupler because such requirements are more properly located in §§1926.451 or 1926.452.

Paragraph 1926.451(a) Capacity

Paragraph (a) sets the minimum strength criteria for all scaffold components and connections. The final rule sets scaffold capacity requirements that are substantively the same as those in existing subpart L, while eliminating ambiguities and apparent inconsistencies.

Paragraph (a)(1) requires that each scaffold and scaffold component be capable of supporting, without failure, its own weight and at least 4 times the maximum intended load applied or transmitted to it. Paragraphs (a)(2), (a)(3), (a)(4), (a)(5) and (g) of §1926.451 provide exceptions to this general rule, and are discussed below.

The final rule clearly provides that the 4 to 1 factor for a component applies only to the load which is actually applied or transmitted to that component, and not to the total load placed on the scaffold. The Agency requires that each component be adequate to meet the 4 to 1 factor, but only for the portion of the MIL applied or transmitted to that component. The MIL for each component depends on the type and configuration of the scaffold system.

Paragraph (a)(2) requires that direct connections to roofs and floors and counterweights used to balance adjustable suspension scaffolds be capable of resisting at least 4 times the tipping moment imposed by the scaffold operating at the rated load of the UL rated hoist or at 1.5 (minimum) times the tipping moment imposed by the scaffold operating at the stall load for hoist not UL rated, whichever is greater.

OSHA agrees that the safety factors for the counterweights, riggings, direct connections to roofs and floors, and suspension ropes of adjustable suspension scaffolds should be related to the rated load of the hoist and the stall load of the hoist, and not be based on the maximum intended load.

Paragraph (a)(3) provides that "each suspension rope, including its connecting hardware, used on non-adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope."

Paragraph (a)(4) of the final rule provides that "each suspension rope, including connecting hardware, used on adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope with the scaffold operating at either (a) the rated load of the hoist, or (b) 2 (minimum) times the stall load of the hoist, whichever is greater".

Paragraph (a)(5) requires that the stall load of any scaffold hoist not exceed 3 times its rated load. OSHA finds that this requirement is reasonably necessary to prevent accidental overloading of suspension scaffold support systems. U.L. standard 1323 limits the output force of a scaffold hoist to three times the rated load of the hoist. As far as OSHA has been able to determine, the other laboratories which test and list scaffold hoists adhere to the requirements of U.L. 1323.

Paragraph (a)(6) requires that scaffolds be designed by a qualified person and constructed and loaded in accordance with that design.

Paragraph 1926.451(b) Scaffold Platform Construction

Paragraph 1926.451(b) provides criteria for the construction of scaffolds.

Paragraph (b)(1) requires all platforms, except walkways and those platforms used by employees performing scaffold erection and dismantling operations, to be fully decked or planked.

Paragraph (b)(1)(I) requires that platform units be placed so that spaces between units do not exceed 1-inch, except where employers establish that more space is needed. For example, this would be necessary to fit around uprights when using side brackets to extend platform width.

Paragraph (b)(1)(ii) provides that, where the exception created by paragraph (b)(1)(I) applies, employers shall place platform units as close together as possible, with the space between the platform and uprights not to exceed 9½ inches. OSHA set 9½ inches as the maximum space allowed, because the minimum width for scaffold units that could be expected to sustain a working load is just over 9½ inches.

In a situation where no work, other than erecting or dismantling the scaffold, is being done at intermediate levels, the final rule requires only that the planking established by the employer as necessary to provide safe working conditions for employees erecting or dismantling the scaffold be used. On the other hand, if scaffold erection or dismantling is being performed from an intermediate level platform that is being or will be used as a work area, that platform must be fully planked in accordance with paragraph (b)(1).

The Agency believes that platforms used solely as walkways or solely by employees erecting or dismantling scaffolds should be at least 2 planks wide. This is consistent with the current practice, and the requirements of §1926.451(b)(2).

Paragraph (b)(2) requires that all scaffold platforms and walkways be at least 18 inches (46 cm) wide, with lesser widths allowed for ladder jack scaffolds, top plate bracket scaffolds, pump jack scaffolds, roof bracket scaffolds, and boatswains' chairs, and for scaffolds in areas shown to be too narrow to accommodate an 18-inch wide surface.

The rationale for setting a 12-inch minimum width for ladder jack scaffolds was the difficulty of handling one 18-inch wide plank or two 9-inch planks on a ladder, which the Agency considered more hazardous than working on a 12-inch wide plank. Pump jack scaffolds are the exception to paragraph (b)(2), for which a minimum platform width of 12 inches is permitted. In addition, top plate bracket scaffolds are permitted to have platforms not less than 12" in width.

Paragraph (b)(3) sets the requirements for the space between the front edge of a platform and the face of the structure where the scaffold is being used. It requires that, except as provided in paragraphs (b)(3)(i) and (b)(3)(ii), the front edge of all platforms must be no more than 14 inches from the face of the structure, unless the employer implements guardrail systems or personal fall arrest systems that comply with paragraph (g) of the final rule to protect employees from falling between the platform and the structure.

Paragraph (b)(3)(i) requires that the front edges of outrigger scaffolds be no more than three inches from the face of the structure, as is required by §1926.451(g)(4) of OSHA's existing standard.

Paragraph (b)(3)(ii) requires that the front edges of scaffolds used for plastering and lathing operations be no more than 18 inches from the face of the structure.

Paragraph (b)(4) requires each end of a platform unit, unless cleated or otherwise restrained by hooks or equivalent means, to extend over the center line of its support at least six inches (15 cm). The use of cleats, hooks, and similar securing devices is allowed as an alternative to the six inch extension, because of their ability to restrain movement of platform units.

Paragraph (b)(5)(i) provides that each end of a platform unit 10 feet (3 m) or less in length shall not extend over its support more than 12 inches (30 cm) unless the unit is designed, and installed so that the cantilevered portion of the unit is able to support employees or material without tipping or has guardrails which prevent employee access to the cantilevered end.

Paragraph (b)(5)(ii) provides that each platform unit greater than 10 feet in length shall not extend over its support more than 18 inches (46 cm), unless the unit is designed and installed so that the cantilevered portion of the unit is able to support employees without tipping, or that the unit has guardrails which block employee access to the cantilevered end.

Paragraph (b)(6), where platform units are abutted to create a long platform, each abutted end shall rest on a separate support surface. Abutted platform units do not rest one on another, but instead are end-to-end. Consequently, one unit does not support the other, and proper support can only be provided by separate support surfaces.

Paragraph (b)(7) provides that where platforms are overlapped to create a long platform, the overlap shall occur only over supports, and shall not be less than 12 inches (30 cm) unless the platforms are nailed together or otherwise restrained to prevent movement.

Paragraph (b)(8) requires that at all points of a scaffold where the platform changes direction, such as turning a corner, any platform that rests on a bearer at an angle other than a right angle shall be laid first and platforms which rest at right angles over the same bearer shall be laid second, on top of the first platform.

Paragraph (b)(9) provides that wood platforms shall not be covered with opaque finishes, except that platform edges may be covered or marked for purposes of identification. Platforms may be coated periodically with wood preservatives, fire-retardant finishes, and slip-resistant finishes, but the coating may not obscure the top or bottom wood surfaces. This paragraph is intended to ensure that structural defects in platforms are not covered from view by the use of an opaque coating or finish. Hairline cracks can significantly reduce the strength of a wood member, so early detection of structural defects is important. Opaque finishes can cover such cracks and make them difficult to discover. The edges of platform units are excepted from this rule to allow identification marks, grading marks, or other similar type of marks to be placed on the unit edges.

Paragraph (b)(10) requires that scaffold components manufactured by different manufacturers not be intermixed unless the component parts fit together without force and the resulting scaffold's structural integrity is maintained by the user. Scaffold components manufactured by different manufacturers shall not be modified in order to intermix them unless the resulting scaffold is determined by a competent person to be structurally sound. OSHA expects that the competent person who evaluates the scaffold will have the appropriate knowledge, skill and experience regarding scaffold systems and components.

Paragraph (b)(11) provides that scaffold components made of dissimilar metals shall not be used together unless a competent person has determined that galvanic action will not reduce the strength of any component to a level below that required by §1926.451(a).

Paragraph 1926.451(c) Criteria for Supported Scaffolds

Final rule §1926.451(c) sets criteria for the use of supported scaffolds.

Paragraph (c)(1) requires that supported scaffolds with a height to base width ratio of more than 4 to 1 (including outrigger supports, if used) be restrained from tipping by guying, tying, bracing, or equivalent means.

Paragraph (c)(1)(i) requires that guys, ties, and braces be installed at locations where horizontal members support both inner and outer legs. Paragraph (c)(1)(ii) requires:

- 1) Guys, ties, and braces shall be installed according to the scaffold manufacturer's recommendations or at the closest horizontal member to the 4:1

height and be repeated vertically at locations of horizontal members every 20 feet (6.1 m) or less thereafter for scaffolds 3 feet (0.91 m) wide or less and every 26 feet (7.9 m) or less thereafter for scaffolds greater than 3 feet (0.91 m) wide;

2) The top tie, guy or brace of a completed scaffold shall be placed no further than the 4:1 height from the top; and,

3) Such guys, ties and braces be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (9.1 m) (measured from one end [not both] towards the other).

Paragraph (c)(1)(iii) requires that scaffolds with eccentric loads (such as cantilevered work platforms) be restrained from tipping through the use of ties, guys, braces or outriggers.

Paragraph (c)(2) requires that supported scaffold poles, legs, posts, frames, and uprights bear on base plates and mud sills or other adequate firm foundation.

Paragraph (c)(2)(I) requires that such footings be level, sound, rigid, and capable of supporting the scaffold in a loaded condition without settling or displacement.

Paragraphs (c)(2)(ii) and (iii) provide that unstable objects shall neither be used to support scaffolds or platform units, nor be used as working platforms, respectively.

Paragraph (c)(2)(iv) provides that front-end loaders and similar pieces of equipment shall not be used as scaffold supports unless they have been specifically designed by the manufacturer for such use.

Paragraph (c)(2)(v) requires that fork-lifts not be used to support scaffold platforms unless the entire platform is attached to the fork and the fork-lift is not moved horizontally while the platform is occupied. Both these requirements relate to the need for solid support for scaffold platforms and reflect the fact that front-end loaders, fork-lifts and other such equipment are not generally designed for this purpose. The other requirements of §1926.451 would have to be met.

Paragraph (c)(3) of the final rule requires that supported scaffold poles, legs, posts, frames, and uprights be plumb and braced to prevent swaying and displacement.

Paragraph 1926.451(d) Criteria for Suspension Scaffolds

Paragraph (d) sets criteria for the use of suspension scaffolds.

Paragraph (d)(1) requires that all suspension scaffold support devices, such as outrigger beams, cornice hooks, parapet clamps, and similar devices, rest on surfaces

capable of supporting at least 4 times the loads imposed on them by the scaffold operating at the rated load of the hoist (or at least 1.5 times the loads imposed on them by the scaffold operating at the stall load of the hoist, whichever is greater).

Paragraph (d)(2) requires that suspension scaffold outrigger beams, when used, be made of structural metal, or equivalent strength material, and be restrained to prevent movement.

Paragraph (d)(3) sets requirements for the stabilization of outrigger beams. The paragraph requires that outrigger beams be secured directly to the supporting surface or be stabilized using counterweights, except that masons' multi-point adjustable suspension scaffolds shall not be stabilized by counterweights. The rule does not allow counterweights for stabilizing such masons' suspension scaffolds because, with the large loads often placed on masons' multi-point adjustable suspension scaffolds and the large counterweights that would be necessary to anchor such systems, OSHA is concerned that the supporting roof or floor would become dangerously overloaded.

Paragraph (d)(3)(I) provides that direct connections shall be evaluated by a competent person who affirms, based on that evaluation, that supporting surfaces can support the anticipated loads. In addition, the paragraph requires masons' multi-point adjustable suspension scaffold connections to be designed by an engineer experienced in such scaffold design. OSHA anticipates that compliance with these provisions will ensure that roof or floor decks are capable of supporting the loads to be imposed.

Paragraphs (d)(3)(ii) through (d)(3)(v) require that counterweights be made of non-flowable material; be specifically designed for use as scaffold counterweights; be secured to outrigger beams to prevent accidental displacement; and not be removed from an outrigger beam until the scaffold is disassembled, respectively. These requirements are necessary to ensure that counterweights are used only for their intended purpose and are not displaced or removed prematurely.

Paragraphs (d)(3)(vi) through (d)(3)(x) set requirements for securing outrigger beams. In particular, outrigger beams not stabilized by direct connections to the supporting surface shall be secured by tiebacks (paragraph (d)(3)(vi)). Tiebacks must be as strong as the suspension ropes (paragraph (d)(3)(vii)), be secured to a structurally sound anchorage (paragraph (d)(3)(ix)), and be installed perpendicular to the structure unless opposing angle tiebacks are installed (paragraph (d)(3)(x)). In addition, paragraph (d)(3)(viii) requires that outrigger beams be placed perpendicular to their bearing support, with the exception described more fully below.

OSHA has determined that it is reasonably necessary to require that counterweights be designed for no other purpose than to counterweight the system, and to prohibit the use of construction materials as counterweights. In addition, OSHA has determined that it is appropriate to require the marking of counterweights with their weights because that

information is needed for the proper design, selection and installation of counterweights.

Paragraph (d)(4) specifies the construction requirements for outrigger beams used with suspension scaffolds. This provision requires that suspension scaffold outrigger beams be: provided with stop bolts or shackles at both ends; securely fastened together with the flanges turned out when channel iron beams are used in place of I-beams; installed with all bearing supports perpendicular to the beam center line; and set and maintained with the web in a vertical position. In addition, when an outrigger beam is used, the shackle or clevis with which the suspension rope is attached to the outrigger beam shall be placed directly over the hoisting machine, i.e., over the center line of the stirrup.

Paragraph (d)(5) sets requirements for suspension scaffold support devices other than outrigger beams. These devices include cornice hooks, roof irons, parapet clamps, or similar devices. Under this provision, those devices must be: made of steel, wrought iron, or materials of equivalent strength; supported by bearing blocks; secured against movement by tiebacks installed at right angles to the face of the building or structure unless opposing angle tiebacks are installed and secured to a structurally sound point of anchorage on the building or structure (sound points of anchorage include structural members, but do not include standpipes, vents, other piping systems, or electrical conduit); and tiebacks shall be equivalent in strength to the strength of the hoisting rope.

Paragraph (d)(6) specifies the minimum length of suspension rope to be used with different kinds of hoists. In particular, winding drum hoists are required to have at least four wraps of suspension rope at the lowest point of scaffold travel. All other types of hoists are required to have suspension rope long enough to lower scaffolds to the level below, without having the rope end pass through the hoist, or to have the rope end configured or provided with means so that the end does not pass through the hoist.

Final rule paragraph (d)(7) states "The use of repaired wire rope as suspension rope is prohibited."

Paragraph (d)(8) provides that wire suspension ropes shall not be joined together except through the use of eye splice thimbles connected with shackles or cover plates and bolts.

Paragraph (d)(9) provides that the load end of wire suspension ropes shall be equipped with proper size thimbles and secured by eye splicing or equivalent means.

Paragraph (d)(10) requires that ropes be inspected for defects by a competent person prior to each work shift and after every occurrence which could affect a rope's integrity. The wire rope shall be replaced if the rope has any physical damage which impairs its

function and strength; any kinks that might impair the tracking or wrapping of rope around the drum(s) or sheave(s); six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay; abrasion, corrosion, scrubbing, flattening or peening causing loss of more than one-third of the original diameter of the outside wires; evidence of any heat damage resulting from a torch or any damage caused by contact with electrical wires; or evidence that a secondary brake has been activated during an overspeed condition and engages the suspension rope (paragraphs (d)(10)(I) through (vi)).

Paragraph (d)(11) requires that swaged attachments or spliced eyes on wire suspension ropes not be used unless they are made by the wire rope manufacturer or a qualified person. This provision is essential to ensure the strength and integrity of such attachments as eyes.

Paragraph (d)(12) requires that, when wire rope clips are used on suspension scaffolds, there shall be a minimum of 3 wire rope clips installed, with the clips a minimum of 6 rope diameters apart; employers shall follow the manufacturer's recommendations when installing clips, retightening clips after initial loading, and inspecting and retightening clips at the start of each work shift; U-bolt clips (a variety of wire rope clip) shall not be used at the point of suspension for any scaffold hoist; and when U-bolt clips are used, the U-bolt shall be placed over the dead end of the rope, and the saddle shall be placed over the live end of the rope.

Paragraph (d)(13) requires that suspension scaffold power-operated hoists and manually operated hoists be of a type tested and listed by a qualified testing laboratory.

Paragraph (d)(14) requires that gasoline-powered equipment and hoists not be used on suspension scaffolds.

Paragraph (d)(15) requires that gears and brakes of power operated hoists used on suspension scaffolds be enclosed.

Paragraph (d)(16) provides that, in addition to the normal operating brake, suspension scaffold power operated hoists and manually operated hoists shall have a braking device or locking pawl which engages automatically when a hoist makes either of the following uncontrolled movements: an instantaneous change in momentum or an accelerated overspeed.

Paragraph (d)(17) provides that "Manually operated hoists shall require a positive crank force to descend."

Paragraph (d)(18) provides that two-point and multi-point suspension scaffolds shall be tied or otherwise secured to prevent them from swaying, as determined necessary based on an evaluation by a competent person. This paragraph requires, in addition,

that window cleaners' anchors not be used for the purpose of preventing swaying. This prohibition is based on the fact that window cleaners' anchors are not designed for the load that could be imposed.

Paragraph (d)(19) requires that single function emergency escape and rescue devices not be used as working platforms. This paragraph also provides that the prohibition does not apply to systems which are designed to function both as working platforms and as emergency systems.

Paragraph 1926.451(e) Access

Paragraph (e) sets the requirements for safe access to scaffolds. The introductory text states that employers must provide scaffold access which complies with paragraph (e) for each affected employee. It also specifies that the access requirements for employees erecting or dismantling supported scaffolds are prescribed in paragraph (e)(9).

Paragraph (e)(1) provides that access to and between scaffold platforms more than two feet (0.6 m) above or below the point of access shall be by portable ladders, hook-on ladders, attachable ladders, scaffold stairways, stairway-type ladders (such as ladder stand), ramps, walkways, integral prefabricated scaffold access, or equivalent means, or by direct access from another scaffold, structure, personnel hoist, or similar surface. In addition, the final rule requires that cross braces not be used as a means of access.

Paragraph (e)(2) sets requirements for portable, hook-on and attachable ladders. A note to this paragraph indicates that additional requirements for the proper construction and use of portable ladders are contained in subpart X of this part--Stairways and Ladders-- of the construction standards.

Paragraph (e)(2)(i) provides that portable, hook-on, and attachable ladders shall be positioned so as not to tip the scaffold.

Paragraphs (e)(2)(ii)-(vi) provide that hook-on and attachable ladders shall have bottom rungs positioned not more than 24 inches (61 cm) above the scaffold supporting level; have rest platforms at 35 foot (10.7 m) maximum vertical intervals on all supported scaffolds more than 35 feet (10.7 m) high; be specifically designed for use with the manufactured type of scaffold to be used; have a minimum rung length of 11-1/2 inches (29 cm); and have uniformly spaced rungs with a maximum spacing between rungs of 16-3/4 inches, respectively.

Paragraph (e)(3) sets requirements for stairway-type ladders.

Paragraphs (e)(3)(i) through (v) require that stairway-type ladders be positioned so

that the bottom step is not more than 24 inches (61 cm) above the scaffold supporting level; be provided with rest platforms at 12 foot (3.7 m) maximum vertical intervals; have a minimum step width of 16 inches (41 cm) (except for mobile scaffold stairway-type ladders, which are permitted to have a minimum step width of 11 ½ inches); and have slip-resistant treads on all steps and landings..

Paragraph (e)(4) lists requirements for scaffold stairway towers used for access to scaffolds and other elevated work surfaces.

Paragraph (e)(4)(i) requires that a stairrail consisting of a toprail and a midrail be provided on each side of each scaffold stairway.

Paragraph (e)(4)(ii) requires that the toprail of each stairrail system shall be capable of serving as a handrail, unless a separate handrail is provided.

Paragraph (e)(4)(iii) requires that handrails, and toprails that serve as handrails, provide a handhold for employees grasping them to avoid falling.

Paragraph (e)(4)(iv) requires that stairrail systems and handrails be surfaced in a manner that prevents injury to employees from punctures or lacerations, and to prevent snagging of clothing.

Paragraph (e)(4)(v) requires that the ends of stairrail systems and handrails be constructed in a manner that does not constitute a projection hazard.

Paragraph (e)(4)(vi) requires that scaffold stairway handrails, and toprails that are used as handrails, have a minimum clearance of 3 inches (7.6 cm) between the handrail or toprail and other objects. Inadequate hand clearances can render handrails essentially useless.

Paragraph (e)(4)(vii) requires that stairrails be no less than 28 inches (71 cm) or more than 37 inches (94 cm) from the upper surface of the stairrail to the surface of the tread, in line with the face of the riser at the forward edge of the tread. This provision differs from the stairrail height requirements of subpart X, which was never intended to apply to scaffold stairways.

Paragraph (e)(4)(viii) requires that scaffold stairways be provided with landing platforms that are at least 18 inches wide and at least 18 inches (45.7 cm) long at each level. This provision provides adequate protection for employees without impeding the use of most scaffold stairways now in use.

Paragraph (e)(4)(ix) requires that each scaffold stairway be at least 18 inches (45.8 cm) wide between stairrails.

Paragraph (e)(4)(x) requires that treads and landings have slip-resistant surfaces.

Paragraph (e)(4)(xi) requires that scaffold stairways be installed between 40 degrees and 60 degrees from the horizontal. OSHA has determined that scaffold stairways installed in the range of 40 degrees to 60 degrees from the horizontal will provide safe employee access and will still be capable of fitting into the confines of the scaffold frames.

Paragraph (e)(4)(xii) requires that guardrails meeting the requirements of 1926.451(g)(4) be provided on the open sides and ends of each landing.

Paragraph (e)(4)(xiii) requires riser heights within each flight of scaffold stairs to be uniform within 1/4 inch. OSHA believes that a uniform riser height within 1/4 inch (0.6 cm) for all steps in each flight of stairs is necessary in order to minimize the possibility that employees will slip, trip, and fall while they are on the stairs. OSHA recognizes that there are situations where the level of the ground or of the structure to which the stair tower is connected will cause the spacing of the top or bottom step of the stairway system to deviate from uniformity with the other steps by more than 1/4 inch. The Agency has determined that such deviation will not compromise employee safety, so long as the stair tower otherwise complies with the requirements of paragraph (e)(4). This is consistent with §1926.1052(a)(3).

Paragraph (e)(4)(xiv) requires that tread depth be uniform, within 1/4 inch, for each flight of stairs.

Paragraph (e)(5) sets requirements for ramps and walkways used to access scaffolds.

Paragraph (e)(5)(i) provides that ramps and walkways six (6) feet (1.8 m) or more above lower levels shall be provided with guardrail systems in accordance with the provisions of Part 1926, Subpart M--Fall Protection.

Paragraph (e)(5)(ii) provides that ramps and walkways shall not exceed a slope of one (1) vertical to three (3) horizontal (20 degrees above the horizontal).

Paragraph (e)(5)(iii) also requires that if the slope of a ramp or walkway is steeper than one (1) vertical in eight (8) horizontal, the ramp or walkway must have cleats not more than fourteen (14) inches (35 cm) apart which are securely fastened to the planking to provide secure footing.

Paragraph (e)(6) sets requirements for integral prefabricated scaffold access frames.

Paragraph (e)(6)(i) provides that such frames shall be specifically designed and constructed for use as ladder rungs.

Paragraph (e)(6)(ii) requires that the frames have a rung length of at least 8 inches.

Paragraph (e)(6)(iii) prescribes that rungs less than 11-1/2 inches in length shall be used for access only and not as work platforms unless fall protection, or a positioning device, is used.

Paragraphs (e)(6)(iv) through (vi) require that integral prefabricated scaffold access frames be uniformly spaced within each frame section; provided with rest platforms at 35 foot (10.7 m) maximum vertical intervals on all supported scaffolds more than 35 feet (10.7 m) high; and have a maximum spacing between rungs of 16-3/4 inches (43 cm), respectively.

Paragraph (e)(6)(vi) provides that non-uniform rung spacing caused by joining end frames together is allowed, provided the resulting spacing does not exceed 16-3/4 inches (43 cm).

Paragraph (e)(7) provides that all steps and rungs of all ladder and stairway type access shall line up vertically with each other between rest platforms.

Paragraph (e)(8) provides that direct access to or from another surface shall be allowed only when the pertinent surfaces are not more than 14 inches (36 cm) apart horizontally and not more than 24 inches (61 cm) apart vertically.

Paragraph (e)(9) of the final rule sets access requirements for employees erecting or dismantling supported scaffolds. The introductory language of paragraph (e)(9) requires employers to comply with final paragraphs (e)(9)(i)-(iv) starting on September 2, 1997. OSHA has delayed implementation of this paragraph (as well as paragraph (g)(2)) so that affected employers have sufficient time to develop and implement the necessary measures. In addition, the delayed implementation allows time for OSHA to complete work on non-mandatory Appendix B, discussed below, which will provide examples of considerations that employers complying with paragraphs (e)(9) and (g)(2) would take into account.

Paragraph (e)(9)(i) provides that the means of access for erectors or dismantlers shall be determined by a competent person, based on specific site conditions and the type of scaffold being erected. As discussed in relation to the introductory text of final rule paragraph (e), while the Agency originally proposed to exempt erectors and dismantlers working on supported scaffolds from requirements for safe access, careful review of the record has led OSHA to the conclusion that a competent person is the appropriate individual to decide what the appropriate means of access for scaffold erectors and dismantlers is on any particular job, based on specific site conditions. Employers are required to have the erection, dismantling or alteration of a scaffold conducted under the supervision and direction of a competent person who is qualified in the pertinent subject matter.

Paragraph (e)(9)(ii) of the final rule requires that hook-on or attachable ladders be installed as soon as practical after the scaffold erection has progressed to the point permitting their installation and use. Sectional ladders can be used for access once adequate support is available. *Note: This entire section applies to only erectors and dismantlers.*

Paragraph (e)(9)(iii) of the final rule recognizes that the end frames of tubular welded frame scaffolds that meet certain requirements can be safely used as a means of access for scaffold erectors and dismantlers. These requirements are based on section 1637(n)(2)(C) of the California code.

Paragraph (e)(9)(iv) of the final rule provides that cross bracing is not an acceptable means of access on tubular welded frame scaffolds, because cross braces are designed to provide diagonal stability to the scaffold and are not designed to withstand the forces that could be applied by employees climbing up and down on them. This provision is consistent with ANSI A10.8, section 4.18, and with the general prohibition in final rule paragraph (e)(1), discussed above.

Paragraph §1926.451(f) Use

Paragraph (f) of the final rule addresses safe work practices for the use of scaffolds and the activities which take place on scaffolds.

Paragraph (f)(1) provides that scaffolds and scaffold components shall not be loaded in excess of their maximum intended loads or rated capacities, whichever is less. Compliance with this rule ensures that the scaffold's capacity is not exceeded. OSHA believes it is appropriate to take into account the "expected" burden as well as the burden a scaffold "can" support without failure.

Paragraph (f)(2) prohibits the use of shore or lean-to scaffolds. Such scaffolds are not properly designed nor properly constructed, and pose a serious threat to anyone working on them.

Paragraph (f)(3) requires that scaffolds and scaffold components be inspected for visible defects by a competent person prior to each work shift and after any occurrence which could affect a scaffold's structural integrity. OSHA has determined that inspections conducted by a competent person before each shift and after any occurrence that would affect the scaffold's integrity will adequately protect employees working on scaffolds and ensure that defects are detected in a timely fashion.

Paragraph (f)(4) requires that any part of a scaffold whose strength has been reduced to less than that required by §§1926.451(a) shall be immediately repaired or replaced, braced to meet those provisions, where appropriate, or be removed from service until repaired. This paragraph applies whenever a scaffold component, for any reason,

lacks the required strength. In particular, under this provision employers must follow through to address problems identified pursuant to paragraph (f)(3) of this section.

Paragraph (f)(5) provides that scaffolds shall not be moved horizontally while employees are on them, unless they have been designed by a registered professional engineer specifically for such movement or, for mobile scaffolds, where provisions of §1926.452(w) are followed.

Paragraph (f)(6) of the final rule addresses the use of scaffolds near exposed and energized power lines. In particular, this paragraph requires employers to maintain clearance between power lines and scaffolds, including any conductive materials on the scaffold. The minimum clearance for all uninsulated lines and for insulated lines of more than 300 volts is 10 feet. The minimum clearance for insulated lines of less than 300 volts is 3 feet.

Paragraph (f)(6)(I) provides that scaffolds and materials may be closer to power lines than specified above only where necessary to do the work, and only after the utility company or electrical system operator has been notified of the need to work closer and the utility company or electrical system operator has deenergized the lines, relocated the lines, or installed protective coverings to prevent accidental contact with the lines.

Paragraph (f)(7) of the final rule provides that scaffolds shall only be erected, moved, dismantled, or altered under the supervision and direction of a competent person. It further provides that the listed activities shall be performed only by experienced and trained employees selected for such work by the competent person.

Paragraph (f)(8) provides that employees are prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials.

Paragraph (f)(9) requires that, where swinging loads are being hoisted on, to, or near scaffolds such that the loads could contact the scaffold, tag lines or equivalent measures shall be utilized to stabilize the loads. This provision covers all hoisting operations in proximity to scaffolds, because a swinging load can pose a hazard regardless of its destination.

Paragraph (f)(10) requires that support ropes used with adjustable suspension scaffolds have sufficient diameter for functioning of the brakes and the hoist mechanism.

Paragraph (f)(11) requires that suspension ropes be shielded when a heat-producing process is performed. When acids or other corrosive substances are used on a scaffold, the ropes shall be shielded, treated to protect against the corrosive substances, or shall be of a material which is not adversely affected by the substance

being used.

Paragraph (f)(12) prohibits work on or from scaffolds during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and these employees are protected by a personal fall arrest system or wind screens. Wind screens shall not be used unless the scaffold is secured against the forces imposed.

Paragraph (f)(13) provides that debris shall not be allowed to accumulate on platforms, where it could pose a slip, trip, or fall hazard to employees on or below the platform. This provision is consistent with ANSI A10.8-1988, Section 4.24.

Paragraph (f)(14) provides that makeshift devices, such as but not limited to boxes and barrels, shall not be used on top of scaffold platforms to increase the working level height of employees. The Agency has concluded that these makeshift devices will not meet the pertinent criteria of this final rule, in terms of strength and stability.

Paragraph (f)(15) prohibits the use of ladders on scaffolds to increase the employee's working level except when the employees are on large area scaffolds and the ladder is used in accordance with the applicable provisions of final rule paragraph (f)(15)(i)-(iv), discussed below.

Paragraph (f)(15)(i) provides that when a ladder is placed against a structure which is not a part of the scaffold, the scaffold must be secured against the sideways thrust exerted by the ladder.

Paragraphs (f)(15)(ii) through (iv) require that the platform units be secured to the scaffold to prevent them from moving; that the ladder legs are all on the same platform unit unless other means have been provided to stabilize the ladder against platform unit deflection; and that the ladder legs be secured to prevent them from slipping and being pushed off the platform unit. The Agency believes that compliance with these provisions will prevent the tipping and instability hazards that led OSHA to propose a prohibition against the use of ladders on all scaffolds.

Paragraph (f)(16) provides that platform units shall not deflect more than 1/60 of the span when loaded. This provision intended to limit the amount platform units can deflect under load without becoming over stressed and without their ends being pulled from their supports.

Paragraph (f)(17) requires employers to reduce the possibility of welding current arcing through suspension wire rope while employees are performing welding from suspended scaffolds by insulating the suspended platform and its rigging. OSHA is adding this new provision to protect employees from the electrocution and platform collapse hazards posed by arcing welding current. In particular, the Agency requires that

employers rig affected scaffolds with insulated thimbles (paragraph (f)(17)(I)), insulated wire rope (paragraph (f)(17)(ii)), and insulated hoist mechanisms (paragraph (f)(17)(iii)). This paragraph also specifies precautions for grounding the scaffold to the structure on which welding is being performed (paragraphs (f)(17)(iv - vi)). These provisions are consistent with ANSI A10.8-1988, Section 6.2.9.

OSHA has determined that compliance with the provisions of paragraph (f)(17), taken together, will minimize the hazards of electric arcing during welding operations on suspended scaffolds. The Agency has concluded that it is appropriate to address the hazard of arcing welding current during welding operations on suspended scaffolds in the final rule for scaffolds, rather than in the welding standards, because the precautions in question relate to the scaffold rigging, not to welding procedures, and because placing the pertinent regulatory text in the rule will facilitate compliance.

Paragraph 1926.451(g) Fall protection

Paragraph (g) sets fall protection requirements for employees working on scaffolds, including criteria for guardrail systems. Fall hazards account for a high percentage of the injuries and fatalities experienced by scaffold workers. OSHA has determined that compliance with this paragraph will effectively protect employees from those hazards.

Paragraph (g)(1) sets 10 feet as the threshold height above which fall protection is required and indicates (paragraphs (g)(1)(I) - (vii)) what fall protection measures are required for particular types of scaffolds. In addition, the introductory text references paragraph (g)(2), which addresses the fall protection requirements for employees erecting and dismantling supported scaffolds. Finally, a note has been added at the end of paragraph (g)(1), to indicate clearly that the fall protection requirements for employees installing suspension scaffold support systems on floors, roofs, and other elevated surfaces are set forth in subpart M of the construction standards.

OSHA has carefully analyzed all of the comments and data available in the record and has determined that it is appropriate to maintain the 10-foot fall protection threshold. This is also the height requirement recommended by the current national consensus standard, ANSI A10.8-1988. This level differs from the 6-foot threshold for fall protection set in subpart M (Fall Protection) for other walking/working surfaces in construction because scaffolds, unlike these other surfaces, are temporary structures erected to provide a work platform for employees who are constructing or demolishing other structures. The same features that make scaffolds appropriate for short-term use in construction, such as ease of erection and dismantling) also make them less amenable to the use of fall protection at the time the first level is being erected. For example, the site preparation (such as leveling of the ground) that is done before a scaffold is erected is less thorough than the leveling performed prior to constructing a building. In addition, there is often no structure adjacent to a scaffold that can be used to anchor a personal fall arrest system, because the adjacent structure is in the process

of being built or demolished.

Paragraphs (g)(1)(I) through (vii) of the final rule specify the types of fall protection to be used on particular types of scaffolds.

Paragraph (g)(1)(I) recognizes that personal fall arrest systems, not guardrails, are appropriate for use on boatswains' chairs, catenary scaffolds, float scaffolds, needle beam scaffolds, and ladder jack scaffolds. This requirement is being applied to catenary scaffolds and ladder jack scaffolds for the first time.

Paragraph (g)(1)(ii) requires personal fall arrest systems and guardrail systems for all single-point adjustable suspension scaffolds (except boatswains' chairs), and for all two-point adjustable suspension scaffolds. The requirement to have guardrails and personal fall arrest systems on two-point scaffolds is based on the fact that a guardrail system alone does not provide adequate fall protection when a suspension rope fails and causes the scaffold to tip or hang from only one end. Personal fall arrest system protection is also necessary for single-point systems, because the fall hazard related to suspension rope failure is as serious as it is with the two-point scaffold. However, because personal fall arrest systems would be the primary means of fall protection on single-point and two-point systems, the provision allows a lower minimum strength guardrail system to be used.

Paragraph (g)(1)(iii) provides that "Each employee on a crawling board (chicken ladder) shall be protected by a personal fall arrest system, a guardrail system (with minimum 200 pound toprail capacity), or by a three-fourth inch (1.9 cm) diameter grabline or equivalent handhold securely fastened beside each crawling board."

Paragraph (g)(1)(iv) provides that employees on self-contained scaffolds be protected by both personal fall arrest systems and guardrail systems when the platform is supported by ropes (as when the scaffold is being raised or lowered on some systems) and by guardrail systems when the platform is supported directly by the scaffold frame.

Paragraph (g)(1)(v) requires guardrails to be used along scaffold walkways and to be located within 9 ½ inches horizontally of at least one side of the walkway. The provision that guardrails need only to be provided along one side applies only when the platform is used solely as a means of access to get from one point on the scaffold to another. If work activities other than access are performed on or from the walkway, then the platform is not considered to be a walkway (see definition of "walkway"), and other provisions of paragraphs (g)(1), as appropriate, would apply.

Paragraph (g)(1)(vi) provides that fall protection (i.e., a personal fall arrest system or guardrail) be provided on all open sides and ends of scaffolds from which employees are performing overhand bricklaying operations and/or related work, except those sides and ends next to the wall being laid.

Paragraph (g)(1)(vi) of the final rule is consistent with §1926.501(b)(9), which addresses fall protection for employees performing overhand bricklaying while on elevated surfaces other than scaffolds.

Paragraph (g)(1)(vii) requires that employees on scaffolds not addressed elsewhere in paragraph (g)(1) be protected either by guardrails or personal fall arrest systems.

Note

Paragraph (g)(1) does not apply where there are no "open sides or ends" on the scaffold (see definition in §1926.451(b)). For the scaffold to be considered completely enclosed, no perimeter face of the scaffold may be more than 14 inches from a wall. The requirements for fall protection will apply at openings such as hoist ways, elevator shafts, stairwells, or similar openings in the scaffold platform, or openings in the walls of the structure surrounding the platform.

Paragraph (g)(2) of the final rule addresses fall protection for employees erecting or dismantling supported scaffolds. OSHA has determined that it is appropriate to delay the implementation of paragraph (g)(2) until September 2, 1997. The delay will allow affected employers sufficient time to implement the appropriate procedures for addressing the fall protection needs of employees erecting or dismantling scaffolds. In addition, deferring compliance will allow time for the Agency to complete non-mandatory Appendix B, which will provide examples of considerations that a competent person would take into account when evaluating fall protection options for scaffold erectors and dismantlers. As discussed above in relation to final rule paragraph (e)(9), the Agency has also deferred requirements for safe access for scaffold erectors and dismantlers until September 2, 1997.

Paragraph (g)(2) requires that employers whose employees erect or dismantle supported scaffolds after September 2, 1997, ensure that a competent person determines the feasibility and safety of providing fall protection for such employees. This paragraph further requires that affected employers provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.

The Agency recognizes the importance of training and hazard awareness programs to employee safety, but finds that these precautions alone are not adequately protective because site conditions change and mistakes are made. The Agency finds that providing appropriate fall protection, whenever it is feasible or will not create a greater hazard, is the best way to ensure that erectors and dismantlers are appropriately protected from fall hazards.

The Agency agrees that, if fall protection can be provided, it is the employer's responsibility to take the actions necessary to protect employees. However, OSHA has determined, based on the information in the record, that in some situations, it is not possible to provide fall protection for erectors and dismantlers of supported scaffolds.

Employers must have valid reasons for not providing fall protection to scaffold erectors and dismantlers, but OSHA does not agree that the employer must put these reasons in writing. Compliance officers can substantiate employer claims of infeasibility or greater hazard through on-site observations and discussion with the competent person and other workers.

Paragraph (g)(3) provides that personal fall arrest systems must comply with the pertinent provisions of §1926.502(d) and, in addition, must be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member. However, when overhead obstructions such as overhead protection or additional platform levels are part of a single-point or two-point adjustable suspension scaffold, then vertical lifelines must not be used, because, in the event of a scaffold collapse, the overhead components would injure an employee who was tied off to a vertical lifeline.

Paragraph (g)(3)(I) requires that vertical lifelines, when used, be fastened to a fixed safe point of anchorage, be independent of the scaffold, and be protected from sharp edges and abrasion. Based on concern that inadequate anchor points may be used, this paragraph also incorporates the language of the note to proposed §1926.451(e)(3), which stated that safe points of anchorage include structural members of buildings, but do not include standpipes, vents, other piping systems, electrical conduit, outrigger beams, or counterweights.

Paragraph (g)(3)(ii) states that horizontal lifelines, when used, shall be secured to two or more structural members of the scaffold, and shall not be attached only to the suspension ropes.

Paragraph (g)(3)(iii) provides that, when lanyards are connected to horizontal lifelines or structural members on a single-point or two-point adjustable suspension scaffold, the scaffold must be equipped with additional independent support lines and automatic locking devices capable of stopping the fall of the scaffold in the event one or more of the suspension ropes fail. The independent support lines must be equal in number and strength to the suspension ropes. OSHA believes that in the event of a suspension rope failure, the additional support lines will keep the scaffold from falling.

Paragraph (g)(3)(iv) provides that vertical lifelines, independent support lines, and suspension ropes must not be attached to each other, or be attached to or use the same point of anchorage, or be attached to the same point on the scaffold or body belt/harness system.

Paragraph (g)(4) sets criteria for guardrail systems used to provide fall protection for employees working on scaffolds.

Paragraph (g)(4)(I) provides that guardrail systems be installed along all open sides and ends of platforms. In the case of suspended scaffolds, guardrails must be installed before any employee is allowed on a hoisted scaffold. In the case of supported scaffolds, installation must occur before employees are permitted to work from the scaffold. When an employee is on a supported scaffold during the scaffold erection process, fall protection is covered by final rule paragraph (g)(2).

Paragraph (g)(4)(ii) provides that the top edge height of toprails or equivalent members on supported scaffolds manufactured or placed into service after January 1, 2000 must be between 38 inches (0.97 m) and 45 inches (1.2 m) above the platform surface. The top edge height of guardrails on supported scaffolds manufactured and placed into service before January 1, 2000 and on all suspended scaffolds where both a guardrail and a personal fall arrest system are required must be between 36 inches (0.9 m) and 45 inches (1.2 m). The final rule also provides that toprail height may exceed 45 inches if the other criteria of paragraph (g)(4) have been satisfied.

Paragraph (g)(4)(iii) states that, when midrails, screens, mesh, intermediate vertical members (such as balusters), solid panels, or equivalent structural members are used, they are to be installed between the top edge of the guardrail system and the scaffold platform.

Paragraphs (g)(4)(iv) through (vi) specify the criteria necessary to ensure that the midrails, screens, mesh, and baluster type protection required by paragraph (g)(4)(iii) will be properly placed and effective.

Paragraph (g)(4)(iv) requires that midrails, when used, be installed at a height midway between the top edge of the guardrail system and the platform surface.

Paragraph (g)(4)(v) requires that screens and mesh, when used, extend from the top edge of the guardrail system to the scaffold platform, and along the entire opening between the supports.

Paragraph (g)(4)(vi) requires that intermediate vertical members (such as balusters or additional rails), when used, be not more than 19 inches (48 cm) apart.

Paragraph (g)(4)(vii) of the final rule provides that toprails or equivalent members be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along their top edge of at least 100 pounds (445 n) for guardrail systems installed on single-point adjustable suspension scaffolds and on two-point adjustable suspension scaffolds, and at least 200 pounds (890 n) for guardrail systems installed on all other scaffolds.

Paragraph (g)(4)(viii) provides that when the loads specified in paragraph (g)(4)(vii) are applied in a downward direction, the top edge may not drop below the height above the platform surface prescribed in paragraph (g)(4)(ii).

Paragraph (g)(4)(ix) states that midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members must be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along the midrail or other member of at least 75 pounds (333 n) for guardrail systems with a minimum 100 pound toprail capacity, and at least 150 pounds (666 n) for guardrail systems with a minimum 200 pound toprail capacity.

Paragraph (g)(4)(x) provides that a separate guardrail section is not required on the ends of suspension scaffolds when the scaffold's support system (stirrup) or hoist prevents passage of employees.

Paragraph (g)(4)(xi) requires that guardrail systems be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent the snagging of clothing.

Paragraph (g)(4)(xii) requires that toprails and midrails not be so long as to constitute a hazard.

Paragraph (g)(4)(xiii) prohibits the use of steel banding and plastic banding as toprails or midrails. Although such banding can often withstand a 200 pound load, it can tear easily if twisted. In addition, such banding often has sharp edges which can cut a hand if seized.

Paragraph (g)(4)(xiv) requires that guardrail systems using manila, plastic or synthetic rope as rails be inspected by a competent person as frequently as necessary to ensure that the guardrails comply with the performance criteria in final rule §1926.451(g).

Paragraph (g)(4)(xv) permits the use of cross bracing in lieu of either a midrail or a toprail when certain criteria are met. Cross bracing would be accepted in lieu of a toprail when the crossing point is between 38 and 48 inches above the work surface. Also, cross bracing would be accepted in lieu of a midrail when the crossing point is between 20 and 30 inches above the work surface. In addition, the end points of each upright must be no more than 48 inches apart, which will reduce the slope of the cross bracing and result in a surface that is similar to that of a standard guardrail.

Paragraph 1926.451(h). Falling object protection

Paragraph (h)(1) provides that employees working on scaffolds wear hardhats and be protected from falling hand tools, debris, and other small objects through the installation of toeboards, screens, or guardrail systems or through the erection of debris nets, catch platforms, or canopy structures that deflect falling objects. In addition, when the falling objects to which employees on scaffolds may be exposed are too large, heavy or

massive to be contained or deflected by any of the above-listed measures, the employer must protect affected employees by placing any such potential falling objects away from the edge of a surface from which they might fall and must secure those materials as necessary to prevent their falling.

Paragraph (h)(2) requires employers to protect employees working below from objects falling from scaffold.

Paragraph (h)(2)(I) provides for the use of barricades on lower levels to exclude employees from areas where falling objects might land. Compliance with this new provision will enable employers to eliminate employee exposure to the hazard.

Paragraph (h)(2)(ii) would require employers to provide toeboards along the edge of platforms more than ten feet above lower levels for a distance sufficient to protect workers below, except that on float (ship) scaffolds, an edging of 3/4 inch x 1-1/2 inch wood, or a material with equivalent strength, may be used in lieu of a toeboard.

Paragraph (h)(2)(iii) provides, as an alternative, for erection of paneling or screening in cases where tools or other materials are piled to a height higher than the top edge of a toeboard. The panel or screen must extend from the toeboard (or platform) to the top of the guardrail and be erected for a distance sufficient to protect employees below. In addition, the panel or screen would need to be capable of withstanding, without failure, a force of at least 150 pounds, applied in any downward or outward direction at any point along the screen (to comply with paragraph (g)(4)(ix)).

Paragraph (h)(2)(iv) allows employers to protect employees from falling objects through the installation of a guardrail system which complies with §1926.451(g)(4) and which has openings small enough to reject passage of potential falling objects.

Paragraph (h)(2)(v) provides that employers can protect employees working below scaffolds from falling objects through the installation of debris nets, catch platforms, or canopies that have sufficient strength to withstand the impact forces of potential falling objects.

Paragraph (h)(3) sets criteria for the use of canopies.

Paragraph (h)(3)(I) requires that canopies be installed between the falling object hazard and the employees.

Paragraph (h)(3)(ii) requires the use of additional independent support lines to support the scaffold in the event of suspension support rope failure, in cases where canopies are used for falling object protection on suspended scaffolds.

Paragraph (h)(3)(iii) requires that independent support lines and suspension ropes not

be attached to the same point of anchorage. This new provision will prevent the loss of the backup safety systems in the event of suspension rope anchorage failure.

Paragraph (h)(4) sets strength criteria for toeboards.

Paragraph (h)(4)(I) requires that toeboards be capable of withstanding, without failure, a force of at least 50 pounds applied in any downward or horizontal direction at any point along the toeboard.

Paragraph (h)(4)(ii) sets forth the construction requirements for toeboards. This provision requires that toeboards be at least three and one-half inches high, fastened securely in place, and have not more than 1/4-inch clearance above the walking/working surface. In addition, toeboards must be solid or have openings no greater than one inch in the greatest dimension.

§1926.452 Additional Requirements Applicable to Specific Types of Scaffolds

Section 1926.452 of the final rule contains requirements that supplement the requirements of §1926.451 with regard to particular types of scaffolds. The identified scaffolds have unique features which require specific attention.

OSHA has determined that compliance with the performance-oriented provisions of final rule §§1926.451 and 1926.452, taken together, will provide adequate protection for employees working on scaffolds. Further, the Agency believes that the specification language suggested by the commenters would limit innovation and impose unreasonable burdens on employers.

Paragraph (a) Pole Scaffolds

Paragraph (a) sets requirements for the proper use of bearers, braces and runners on pole scaffolds. The final rule has deleted the word "wood" from the title of the paragraph, since pole scaffolds can be constructed of other materials. In addition, the final rule provides that pole scaffolds over 60 feet in height be designed by a registered professional engineer, and must be constructed and loaded in accordance with that design. The provision also notes that non-mandatory Appendix A contains examples of criteria that will enable an employer to comply with design and loading requirements for pole scaffolds under 60 feet in height.

Paragraph (b) Tube and Coupler Scaffolds

Paragraph (b) sets requirements for the use of bearers, bracing, runners and couplers on tube and coupler scaffolds. In addition, the final rule provides that tube and coupler scaffolds over 125 feet in height be designed by a registered professional engineer,

and be constructed and loaded in accordance with such design.

Paragraph (b)(1) requires that platforms not be moved until the next location has been properly prepared to support the platform being moved.

Paragraph (b)(2) requires the installation of transverse bracing at the scaffold ends and, at least, at every third set of posts horizontally and every fourth post vertically. This paragraph provides for diagonal bracing from the outer or inner posts or runners upward to the next outer or inner posts or runners. In addition, building ties must be installed at the bearer levels between the diagonal braces in conformance with §1926.451(c)(1).

Paragraph (b)(3) sets requirements for the installation of longitudinal bracing across the inner and outer rows of posts for straight run scaffolds. In particular, such bracing must be installed diagonally in both directions and shall extend from the base of the end posts upward to the top of the scaffold at a 45 degree angle. Where scaffold length is greater than height, bracing shall be repeated at least at every fifth post (*ref. Page 316 of current SIA Handbook and drawing of tube & coupler scaffold in the standard*). Where scaffold length is less than height, such bracing shall be installed from the base of the end posts upward to the opposite end posts and then in alternating directions until reaching the top of the scaffold. In addition, bracing shall be installed as close as possible to the intersection of the bearer and post or of the runner and post.

Paragraph (b)(4) requires that bracing be attached to the runners as close to the post as possible, where conditions preclude attachment of bracing to posts. Agency recognizes that attachment to the post, while the most desirable option, is not always possible. In circumstances where such attachment is not possible, OSHA has determined that attachment to the runner, as close as possible to the post, will still maximize directional stability and provide the strength necessary to properly brace the scaffold.

Paragraph (c) Fabricated frame scaffolds

Paragraph (c) provides additional requirements for fabricated frame scaffolds (tubular welded frame scaffolds).

Paragraph (c)(1) requires that platforms not be moved until the next location is properly prepared and ready to support the platform being moved.

Paragraphs (c)(2), (c)(3) and (c)(6) are effectively identical to existing §1926.451(d)(3), (5) and (9), respectively.

Paragraph (c)(4) requires the locking together of end frames. This requirement only applies where uplift forces are strong enough to displace the end frames or panels, such as when a hoist is being used that could snag the scaffold during a hoist

operation.

Paragraph (c)(5) specifies the proper placement of platform support brackets. Improper placement of such cantilever supports can significantly reduce their support capacity and thus endanger employees working on top of the platform.

Paragraph (d) Plasterers', decorators' and large area scaffolds

Paragraph (d) requires that plasterers', decorators' and large area scaffolds be constructed in accordance with §1926.452(a), (b), or (c) of this section. Paragraph (d) references the provisions of paragraphs (a), (b), and (c) because plasters', decorators' and large area scaffolds are almost always constructed using pole scaffolds, tube and coupler scaffolds, or fabricated frame scaffolds.

Paragraph (e) Bricklayers' square scaffolds (Squares)

Paragraph (e) This paragraph requires that scaffolds made of wood be reinforced with gussets on both sides of each corner (paragraph (e)(1)); that diagonal braces be installed on all sides of each square (paragraph (e)(2)); that diagonal braces be installed between squares on the rear and front sides of the scaffold, and extend from the bottom of each square to the top of the next square (paragraph (e)(3)); and that scaffolds of this type not exceed three tiers in height, that they be constructed and arranged so that one square rests directly above the other, and that the upper tiers stand on a continuous row of planks laid across the next lower tier and be nailed down or otherwise secured to prevent displacement (paragraph (e)(4)).

Paragraph (f) Horse scaffolds

Paragraph (f) This paragraph requires that horse scaffolds not be constructed or arranged more than two tiers or 10 feet (3.0 m) in height, whichever is less (paragraph (f)(1)); when arranged in tiers, that each horse be placed directly over the horse in the tier below (paragraph (f)(2)); when arranged in tiers, the legs of each horse shall be nailed down or otherwise secured to prevent displacement (paragraph (f)(3)); and that, when arranged in tiers, each tier shall be cross braced (paragraph (f)(4)).

Paragraph (g) Form scaffolds and carpenters' bracket scaffolds

Paragraph (g) provides additional rules for form scaffolds and carpenters' bracket scaffolds.

Paragraph (g)(1) carries forward the requirements for attachment of a scaffold to a supporting framework or structure set by existing §1926.451(m)(2), (x)(4)(ii), and (x)(5).

Paragraph (g)(2) maintains the existing §1926.451(x)(6)(I) requirement that wooden bracket form scaffolds be an integral part of the form panel.

Paragraph (g)(3) requires that folding type metal brackets, when extended for use, shall be either bolted or secured with a locking-type pin.

Paragraph (h) Roof bracket scaffolds

Paragraph (h) This paragraph requires that scaffold brackets be constructed to fit the pitch of the roof and provide a level support for the platform (paragraph (h)(1)); and that brackets be anchored in place by nails unless it is impractical to use nails (paragraph (h)(2)). Paragraph (h)(2) further provides that brackets shall be held in place with first-grade manila rope of at least three-fourth inch diameter, or a rope with equivalent strength, when nails are not used. Reference 451(g)(1)(viii) for fall protection.

Paragraph (I) Outrigger scaffolds

Paragraph §1926.452(I) Paragraphs (I)(1) through (I)(4), set requirements for the proper positioning and securing of outrigger beams. Paragraphs (I)(5) and (I)(6) require that the inboard ends of outrigger beams be securely anchored and that the entire supporting structure be securely braced.

Paragraph (I)(7) requires that platform units be nailed, bolted or otherwise secured to outriggers, to prevent displacement.

Paragraph (I)(8) requires that scaffolds and scaffold components be designed by a registered professional engineer and constructed and loaded in accordance with such design. This provision reflects OSHA's determination that the design of this type of scaffold involves calculations that required the skills of a registered professional engineer, and that the criteria in the proposed rule had such limited applicability as to be of virtually no help to employers in almost all situations.

Paragraph (j) Pump jack scaffolds

Paragraph (j)(1) requires that pump jack brackets, braces, and accessories be fabricated from metal plates and angles. In addition, each pump jack bracket shall have two positive gripping mechanisms to prevent any failure or slippage.

Paragraph (j)(2) requires that poles be secured to the structure by rigid triangular bracing or equivalent, at the bottom, top, and other points as necessary. In addition, that provision further requires that when the pump jack has to pass bracing that is already installed, an additional brace must be installed approximately four feet (1.2 m) above the brace to be passed. That additional brace must be left in place until the pump jack has been moved and the original brace reinstalled.

Paragraph (j)(3) provides, when guardrails are used for fall protection, that a workbench may be used as the toprail only if the workbench complies with the requirements of §§1926.451(g)(4)(ii), (vii), (viii) and (xiii).

Paragraph (j)(4) provides that work benches shall not be used as scaffold platforms.

Paragraph (j)(5) provides, when poles are made of wood, that the pole lumber shall be straight-grained, free of shakes, large loose or dead knots, and other defects which might impair strength.

Paragraph (j)(6) provides, when wood poles are constructed of two continuous lengths, that the lengths shall be joined together with the seam parallel to the bracket.

Paragraph (j)(7) requires, when two by fours are spliced to make a pole, that mending plates be installed at all splices to develop the full strength of the member.

Paragraph (k) Ladder jack scaffolds

Paragraph 1926.452(k) of the final rule provides additional requirements for ladder jack scaffolds.

Paragraph (k)(1) provides that platforms shall not exceed a height of 20 feet (6.1 m).

Paragraph (k)(2) requires that all ladders used to support ladder jack scaffolds meet the requirements of subpart X of 29 CFR part 1926--Stairways and Ladders, except that job-made ladders, which are permitted by subpart X, are not permitted to be used to support ladder jack scaffolds.

Paragraph (k)(3) provides that the ladder jack be so designed and constructed that it will bear either on the side rails and ladder rungs or on the ladder rungs alone. This

paragraph further requires that the bearing area for a ladder jack that bears only on the rungs shall be at least 10 inches (25.4 cm) on each rung to ensure adequate support.

Paragraph (k)(4) requires that ladders used to support ladder jacks be placed, fastened, or equipped with devices to prevent slipping.

Paragraph (k)(5) provides that scaffold platforms shall not be bridged one to another. The provision would prohibit situations where, for example, four ladders are used to support three platforms. OSHA is prohibiting bridging because this practice often leads to overloading of the two ladders in the middle. This provision does not prohibit passage from one scaffold to another if the scaffolds are close enough for employees to walk (but not to jump or swing) from one scaffold to the other.

Paragraph (l) Window jack scaffolds

Paragraph (l) This paragraph provides that window jack scaffolds shall be securely attached to the window opening (paragraph (l)(1)), shall be used only for the purpose of working at the window opening through which the jack is placed (paragraph (l)(2)) and shall not be used to support planks placed between one window jack and another, or to support other elements of scaffolding. These requirements are necessary to ensure the safety of employees working from these platforms.

Paragraph (m) Crawling boards

Paragraph (m) of the final rule provides additional requirements for crawling boards (chicken ladders). The final rule requires that crawling boards extend from the roof peak to the eaves when used in connection with roof construction, repair, or maintenance (paragraph (m)(1)), and that crawling boards be secured to the roof by ridge hooks or by means which satisfy equivalent criteria (e.g., strength and durability) (paragraph (m)(2)). These requirements are designed to ensure that crawling boards used by employees performing roof work are as secure as possible. Reference 451(g)(1)(iii) for fall protection.

Paragraph (n) Step, platform, and trestle ladder scaffolds

Paragraph (n) provides additional requirements for step, platform, and trestle ladder scaffolds.

Paragraph (n)(1) provides that scaffold platforms not be placed any higher than the second highest rung or step of the ladder supporting the platform. This provision is consistent with paragraphs 17.4 and 17.5 of ANSI A10.8-1988, and is intended to ensure the stability of this type of scaffold.

Paragraph (n)(2) requires that all ladders used in conjunction with step, platform and trestle ladder scaffolds meet the requirements of subpart X of 29 CFR part 1926-- Stairways and Ladders, except that job-made ladders must not be used to support such scaffolds.

Paragraph (n)(3) provides that ladders used to support step, platform, and trestle ladder scaffolds shall be placed, fastened, or equipped with devices to prevent slipping.

Paragraph (n)(4) requires that scaffolds not be bridged one to another. Bridging, as discussed above under paragraph (k)(5), occurs when four ladders are used to support three platforms. OSHA is prohibiting bridging because this practice often leads to overloading of the two ladders in the middle. Although step, platform and trestle ladder scaffolds were not specifically addressed in OSHA's existing scaffold rule, they are covered by the general requirements in existing rule §1926.451(a).

Final rule **paragraphs (n)(2), (3), and (4)** correspond to the ladder jack scaffold provisions in final rule §1926.451(k)(2), (4) and (5), respectively. The "ladder-type" scaffolds covered by paragraph (n) differ from ladder jack scaffolds in that the platform rests directly on the ladder step or rung, whereas ladder jack scaffold platforms rest on brackets.

Paragraph (o) Single-point adjustable scaffolds

Paragraph (o) This paragraph combines existing §1926.451(k), single-point adjustable suspension scaffolds, and §1926.451(l), boatswains' chairs, because boatswains' chairs are a form of single-point adjustable suspension scaffold.

Paragraph (o)(1) provides, when two single-point adjustable suspension scaffolds are combined to form a two-point adjustable suspension scaffold, that the resulting scaffold meet the requirements for two-point adjustable suspension scaffolds in final rule paragraph (p).

Paragraph (o)(2) addresses the circumstances under which the supporting rope between a scaffold and a suspension device is permitted to deviate from a vertical position (i.e., at a 90 degree angle from level grade). This paragraph requires that the supporting rope between the scaffold and the suspension device be kept vertical unless the following four conditions are met: the rigging must have been designed by a qualified person; the scaffold must be accessible to rescuers; the supporting rope must be protected to ensure that it will not chafe at any point where a change in direction occurs; and the scaffold must not be able to sway into another surface. Whenever swaying of the scaffold could bring the scaffold into contact with another surface, the supporting rope must be vertical, with no exceptions.

Paragraph (o)(3) requires that the tackle used with boatswains' chairs be ball bearing

or bushed blocks containing safety hooks and properly "eye" spliced minimum five-eighth (5/8) inch (1.6 cm) diameter first grade manila rope, or other rope that meets the performance criteria of the above-specified manila rope. OSHA recognizes that the use of an open hook could allow a chair to be dislodged if the rigging hung up on an obstruction. The corresponding ANSI standard, A10.8-1988, paragraph 6.14.5, provides for the use of a hook with a safety latch over the opening (safety hook) to prevent dislodging of the chair. The Agency agrees that it is appropriate to explicitly require that employers who have their employees use boatswains' chair rig their scaffolds with safety hooks. In addition, OSHA believes that locking safety hooks, such as are required for use with crane and derrick suspended personnel platforms (§1926.550(g)(4)(iv)(B)), would provide the most effective protection for affected employees.

Paragraph (o)(4) provides that boatswains' chair seat slings be reeved through four corner holes in the seat; shall cross each other on the underside of the seat; and shall be rigged so as to prevent slippage which could cause an out-of-level condition. This paragraph is intended to prevent tipping of the chair.

Paragraph (o)(5) requires, except as provided in paragraph (o)(6), that boatswains' chair seat slings be a minimum of five-eighth (5/8) inch (1.6 cm) diameter fiber or synthetic rope or other rope which satisfies equivalent performance criteria.

Paragraph (o)(6) requires that boatswains' chair seat slings be a minimum of three-eighth (3/8) inch (1.0 cm) wire rope, when a heat-producing process such as gas or arc welding is being conducted. This provision is necessary to ensure that the chair's sling is made of fire-resistant materials.

Paragraph (o)(7) requires that non-cross-laminated wood boatswains's chairs be reinforced on their underside by cleats securely fastened to prevent the board from splitting.

Paragraph (p) Two-point adjustable suspension scaffolds

Paragraph (p) provides additional requirements for two-point adjustable suspension scaffolds (swing stages).

Paragraph (p)(1) provides that platforms not be more than 36 inches (0.9 m) wide unless designed by a qualified person to prevent unstable conditions.

Paragraph (p)(2) requires that the platform be securely fastened to hangers (stirrups) by U-bolts or other means which satisfy §1926.451(a).

Paragraph (p)(3) provides that the blocks for fiber or synthetic ropes consist of at least one double and one single block, and that the sheaves of all blocks fit the size of the

rope used.

Paragraph (p)(4) requires that platforms be of the ladder-type, plank-type, beam-type, or light-metal type. Light metal-type platforms having a rated capacity of 750 pounds or less and platforms 40 feet (12.2 m) or less in length shall be tested and listed by a nationally-recognized testing laboratory.

Paragraph (p)(5) requires that two-point scaffolds not be bridged or otherwise connected one to another during raising and lowering operations unless the bridge connections are articulated and the hoists properly sized. It is not intended to prohibit passage from one scaffold to another, but to prevent significant overloading of the hoist nearest the bridging device during operation of the hoist, or displacement of the bridge if the hoist is used to raise or lower one of the scaffolds. Many hoists are only sized to support one end of a two-point system. If one of two bridged scaffolds were to be raised by a hoist, a bridge laid between the scaffolds could be displaced unless the bridge is articulated (connected). This could also significantly increase the load on the hoist if it is not properly sized. The final rule addresses these two hazards by requiring bridge connections to be articulated and requiring that hoists be properly sized.

Paragraph (p)(6) allows passage from one platform to another only when the platforms are at the same height, when the platforms abut each other, and when walk-through stirrups specifically designed for this purpose are used.

Paragraph (q) Multi-point suspension scaffolds, stone setters' multi-point adjustable suspension scaffolds, and masons' multi-point adjustable suspension scaffolds

Paragraph 1926.452(q) provides additional requirements for multi-point suspension scaffolds, stone setters' multi-point adjustable suspension scaffolds, and masons' multi-point adjustable suspension scaffolds.

Paragraph (q)(1) provides that, when two or more scaffolds are used, they shall not be bridged one to another unless they are designed to be bridged, the bridge connections are articulated (connected), and the hoists are properly sized.

Paragraph (q)(2) provides that, if bridges are not used, passage may be made from one platform to another only when the platforms are at the same height and are abutting.

Paragraph (q)(3) requires that scaffolds be suspended from metal outriggers, brackets, wire rope slings, hooks, or equivalent means.

Paragraph (r) Catenary scaffolds

Paragraph 1926.452(r) of the final rule provides additional requirements for catenary scaffolds.

Paragraph (r)(1) allows no more than one platform to be placed between consecutive vertical pickups, and no more than two platforms to be used on a catenary scaffold. These requirements are intended to prevent overloading of this type of scaffold.

Paragraph (r)(2) requires that platforms supported by wire ropes have hook-shaped stops on each end of the platforms to prevent the platforms from slipping off the wire ropes. These hooks shall be so placed that they will prevent the platforms from falling if one of the horizontal wire ropes breaks. This language is consistent with the corresponding provision of ANSI A10.8-1988, paragraph 20.1.

Paragraph (r)(3) of the final rule provides that wire ropes shall not be tightened to the extent that the application of a scaffold load will over stress them. This provision is consistent with the corresponding language of ANSI A10.8-1988, paragraph 20.2.

Paragraph (r)(4) requires that wire ropes be continuous and without splices between anchors. This language is consistent with the corresponding language in ANSI A10.8-1988, paragraph 20.2, and is necessary to ensure that the rope has sufficient integrity to handle the load.

Paragraph (s) Float (ship) scaffolds

Paragraph (s) provides additional requirements for float (ship) scaffolds.

Paragraph (s)(1) requires that the platform be supported by a minimum of two bearers, each of which shall project a minimum of six inches (15.2 cm) beyond the platform on both sides. This will ensure that the platform will be fully supported. In addition, each bearer shall be securely fastened to the platform to prevent slippage.

Paragraph (s)(2) provides that rope connections shall be such that the platform cannot shift or slip. Platform slippage is a significant factor in scaffold accidents.

Paragraph (s)(3) provides that, when only two ropes are used with each float, those ropes shall be arranged so as to provide four ends which are securely fastened to overhead supports, and each supporting rope shall be hitched around one end of the bearer and pass under the platform to the other end of the bearer where it is hitched again, leaving sufficient rope at each end for the supporting ties.

Paragraph (t) Interior hung scaffolds

Paragraph (t) provides additional requirements for interior hung scaffolds.

Paragraph (t)(1) requires that scaffolds be suspended only from the roof structure or other structural members such as ceiling beams. This requirement is necessary to ensure that these suspended scaffolds are supported by structural members with adequate capacity for safe use.

Paragraph (t)(2) requires that the supporting members be inspected and checked for strength before the scaffold is erected. This requirement is necessary because such points of support cannot be assumed to be strong enough to support a scaffold since they may already be loaded to their capacity or they may have deteriorated over time. This provision is consistent with ANSI A10.8-1988, paragraph 16.7.

Paragraph (t)(3) provides that suspension ropes and cables be connected to the overhead supporting members by shackles, clips, thimbles, or by other means which provide equivalent strength, security and durability.

Paragraph (u) Needle beam scaffolds

Paragraph (u) of the final rule provides additional requirements for needle beam scaffolds.

Paragraph (u)(1) requires that scaffold support beams be installed on edge.

Paragraph (u)(2) provides that ropes or hangers be used for supports, except that one end of a needle beam scaffold may be supported by a permanent structural member. This provision is based on existing §§1926.451(p)(2) and (8), and is necessary to ensure that these scaffolds are properly supported by rope or hangers that meet the strength criteria of §1926.451(a).

Paragraph (u)(3) requires that the ropes be securely attached to the needle beams. This is a change from existing §1926.451(p)(3), which specified that all rope attachments must be either a scaffold hitch or properly made eye splices. OSHA determined that the existing rule is too restrictive, because other knots and means of attachment, such as wire rope clips, can adequately support the scaffold without decreasing employee safety.

Paragraph (u)(4) provides that the support connection be arranged so as to prevent the needle beam from rolling or becoming displaced, which could result in tipping of the platform.

Paragraph (u)(5) provides that platform units shall be securely attached to the needle beams by bolts or equivalent means. In addition, cleats and overhang are not considered to be adequate means of attachment.

Paragraph (v) Multi-level suspended scaffolds

Paragraph 1926.452(v) of the final rule provides additional requirements for multi-level suspended scaffolds. These scaffolds are suspended scaffolds with more than one working level.

Paragraph (v)(1) requires that multi-level suspended platform scaffolds be equipped with additional independent support lines, equal in number to the number of points supported and of equivalent strength to the suspension ropes, and be rigged to support the scaffold in the event the suspension rope(s) fail. These additional lines would support the scaffold, and prevent collapse in the event of primary support line failure.

Paragraph (v)(2) provides that the independent support lines and suspension ropes shall not be attached to the same points of anchorage. This provision reflects OSHA concern that the independent support lines would not protect workers from scaffold collapse if the independent lines and the suspension ropes were attached to the same anchorage point when the anchorage failed.

Paragraph (v)(3) requires that supports for platforms be attached directly to the support stirrup and not to any other platform. This provision is intended to protect against platform overloading.

Paragraph (w) Mobile scaffolds (Does not include scissor lifts)

Paragraph (w) provides additional rules for mobile scaffolds. This paragraph applies to all mobile scaffolds, not just to those which are manually propelled.

Paragraph (w)(1) provides that scaffolds shall be braced by cross, horizontal, or diagonal braces, or combination thereof, to prevent racking or collapse of the scaffold and to secure vertical members together laterally so as to automatically square and align the vertical members. In addition, scaffolds shall be plumb, level, and squared. All brace connections shall be secured. This paragraph also provides that scaffolds constructed of tube and coupler components shall conform to the requirements of §1926.452(b) (paragraph (w)(1)(i)), and that scaffolds constructed of fabricated frame components shall conform to the requirements of §1926.452(c) (paragraph (w)(1)(ii)).

Paragraph (w)(2) requires that scaffold casters and wheels be locked with positive wheel and/or wheel and swivel locks, or equivalent means, to prevent movement of the scaffold while the scaffold is used in a stationary manner.

Paragraph (w)(3) provides that manual force used to move the scaffold shall be applied as close to the base as practicable, but not more than five feet (1.5 m) above the supporting surface. The final rule limits the height at which the force can be

applied to 5 feet above the supporting surface, to minimize overturning forces.

Paragraph (w)(4) requires that power systems used to propel mobile scaffolds be designed for such use. In addition, forklifts, trucks, similar motor vehicles, or add-on motors shall not be used to propel scaffolds unless the scaffold is designed for such propulsion systems.

Paragraph (w)(5) requires that scaffolds be stabilized to prevent tipping during movement.

Paragraph (w)(6) provides that employees shall not be allowed to ride on scaffolds unless the following conditions exist:

1. The surface on which the scaffold is being moved shall be within three degrees of level, and free of pits, holes, and obstructions (w)(6)(i));
2. The height to base width ratio of the scaffold during movement shall be two to one or less, unless the scaffold is designed and constructed to meet or exceed nationally-recognized stability test requirements (w)(6)(ii));
3. Outrigger frames, when used, shall be installed on both sides of the scaffold (w)(6)(iii));
4. When power systems are used, the propelling force shall be applied directly to the wheels, and shall not produce a speed in excess of one foot per second (0.3 mps) (w)(6)(iv)); and
5. No employee is on any part of the scaffold which extends outward beyond the wheels, casters, or other supports (w)(6)(v)).

Paragraph (w)(7) requires that platforms not extend outward beyond the base supports of the scaffold unless outrigger frames or equivalent devices are used to ensure stability. Compliance with this provision will prevent eccentric loading of the scaffold frame that could cause the scaffold to tip over.

Paragraph (w)(8) provides that, where leveling of the scaffold is necessary, screw jacks or equivalent means be used. This provision is consistent with the corresponding provision in ANSI A10.8-1988, paragraph 11.1.4.

Paragraph (w)(9) requires that caster stems and wheel stems be pinned or otherwise secured to scaffold legs or adjustment screws.

Paragraph (w)(10) provides that, before a scaffold is moved, employees on the scaffold shall be made aware of the move.

(x) Repair bracket scaffolds.

The Agency described such scaffolds as consisting of platforms supported by brackets which are secured in place by one or more wire ropes placed in an approximately horizontal plane around the circumference of the structure and tensioned by a turnbuckle.

Paragraph (x)(1) requires employers to secure brackets in place with ½ inch diameter wire rope that extends around the circumference of the chimney.

Paragraph (x)(2) requires that each bracket be attached to the securing wire rope (or ropes) by a positive locking device capable of preventing the unintentional detachment of the bracket from the rope, or by some other means which prevents unintentional detachment.

Paragraph (x)(3) requires that each bracket, at the contact point between the supporting structure and the bottom of the bracket, be provided with a "shoe" (heel block or foot) capable of preventing the lateral movement of the bracket.

Paragraph (x)(4) requires that platform units be secured to brackets in a manner that prevents the separation of platform units from brackets and prevents movement of platform units or brackets on a completed scaffold.

Paragraph (x)(5) provides that, when a wire rope is placed around a structure to provide safe anchorage for personal fall arrest systems that are used by employees erecting or dismantling repair bracket scaffolds, the wire rope shall be at least 5/16 inches in diameter and shall, in all other respects, satisfy the requirements of subpart M, OSHA's Fall Protection Standard.

Paragraph (x)(6) requires that each wire rope used for securing brackets in place or as an anchorage for personal fall arrest systems be protected from damage due to contact with edges, corners, protrusions, or other discontinuities of the supporting structure or scaffold components.

Paragraph (x)(7) provides that tensioning of each wire rope used for securing brackets in place or as an anchorage for personal fall arrest systems shall be by means of a turnbuckle at least 1 inch in diameter, or by some other equivalent means. OSHA has allowed employers the flexibility to use means other than a single turnbuckle for tensioning wire ropes, where the alternative means provide equivalent tension, because the Agency wants to encourage innovation and provide flexibility. In addition, OSHA anticipates that there may be circumstances where more than one turnbuckle will be needed to tension the wire rope, depending on the diameter of the chimney.

Paragraph (x)(8) requires that each turnbuckle be connected to the other end of its rope by use of a proper-size eye splice thimble.

Paragraph (x)(9) provides that U-bolt wire rope clips shall not be used on any wire rope used to secure brackets or to serve as an anchor for personal fall arrest systems. OSHA is concerned that the use of U-bolt wire rope clips as wire rope fasteners on the horizontal support ropes could result in damage to the dead end of the rope. Further, if a segment of damaged dead end later were to become part of the live end due to an increase in the circumference of the structure, the Agency was concerned that the wire rope would be unable to support the loads imposed on it.

Paragraph (x)(10) requires employers to ensure that materials are not dropped to the outside of the supporting structure.

Paragraph (x)(11) requires that erection of a repair bracket scaffold be performed in only one direction around the structure.

Paragraph (y) Stilts

Paragraph (y) provides requirements for the use of stilts.

Paragraph (y)(1) requires that employees not wear stilts on scaffolds except when the employees are on large area scaffolds.

Paragraph (y)(2) provides, when employees wearing stilts are on large area scaffolds where guardrail systems are being used, that the dimensions of the guardrail system shall be increased to offset the height of the stilts.

Paragraph (y)(3) of the final rule provides that all surfaces on which stilts are used shall be flat and free of pits, holes and obstructions, such as debris, as well as all other tripping and falling hazards.

Paragraph (y)(4) of the final rule provides that stilts shall be properly maintained and that any alterations of the original equipment must be approved by the manufacturer.

§1926.453 Aerial lifts

The introductory text to this section indicates that §1926.453 applies only to ANSI A92.2 type equipment (vehicle mounted elevating and rotating work platforms), and further notes that the requirements of §1926.451 and §1926.452 do not apply to this type of equipment.

Paragraph (a) addresses general requirements for aerial lifts, while **paragraph (b)** contains specific requirements for this equipment. **Paragraph (b)(1)** through **(b)(5)** specify requirements for ladder trucks and tower trucks, extensible and articulating boom platforms, electrical tests, bursting safety factors, and welding standards for

aerial lifts, respectively

§1926.454 Training requirements

Sets certain criteria allowing employers to tailor training to fit their workplace circumstances.

Paragraph (a) sets training requirements for employers who have employees working on scaffolds. It requires employers to ensure that each employee whose employment involves being on a scaffold is trained to recognize the hazards associated with the type of scaffold being used and to understand the procedures which must be followed to control or minimize those hazards.

Paragraphs (a)(1) through (a)(5) address five areas in which training must be provided, as applicable.

Paragraph (a)(1) requires that affected employees be trained in the nature of any electrical hazards, fall hazards and falling object hazards in the work area. Many employees have been killed or seriously injured because they were unaware of workplace hazards or did not understand the consequences of exposure to those hazards. This provision clearly indicates the hazards (i.e., electrocution, falls and falling objects) regarding which training must be provided.

Paragraph (a)(2) requires that affected employees be trained in the correct procedures for protection from electrical hazards and for erecting, maintaining, and disassembling the required fall protection systems and falling object protection systems. Employees who are on scaffolds while working need to know how protective systems function, so that they know how to install, maintain or remove these systems, as necessary. For example, where a scaffold has been erected without the protective measures necessary for work to be performed on or from the scaffold, the employees subsequently coming onto the scaffold would need to install them. Even where the scaffold erectors have installed the required protection for affected employees, the employees working on the scaffold need to know when and how to maintain that protection, so that a hazardous situation does not develop during scaffold use.

Paragraph (a)(3) requires that employees be trained in the proper use of the scaffold and in the proper handling of materials on the scaffold.

Paragraph (a)(4) requires that employees be trained in the maximum intended load and the load-carrying capacities of the scaffolds used.

Paragraph (a)(5) requires that employees be trained in the pertinent requirements of subpart L.

Paragraph (b) addresses training for employees assembling, maintaining or dismantling scaffolds. Paragraph (b) requires that the employer have each employee who erects, disassembles, moves, operates, repairs, maintains, or inspects a scaffold trained by a competent person so that the employee can recognize any hazards related to such work duties. It is designed to differentiate clearly between the training needed by employees erecting and dismantling scaffolds and the training needed by employees who are on scaffolds in the course of their work. It requires the employer to ensure that each affected employee has been trained by a competent person in four areas, as applicable.

Paragraph (b)(1) requires that affected employees be trained in the nature of scaffold hazards.

Paragraph (b)(2) requires that affected employees be trained in the correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question. Training provided to an employee to construct, repair or dismantle one type of scaffold will not necessarily enable that employee to repair another type.

Paragraph (b)(3) requires that affected employees be trained in the design criteria, maximum load-carrying capacity, and intended use of the scaffold.

Paragraph (b)(4) requires that affected employees be trained in the pertinent requirements of subpart L.

Paragraph (c) requires the employer to retrain any employee when the employer has reason to believe that the employee does not have the understanding and skill required by paragraph (a) or (b) of this section. Employees must be retrained, as necessary, to restore the requisite scaffold-related proficiency. Circumstances where the provision requires retraining include, but are not limited to, the following situations: first, whenever there is a change at the worksite that presents a hazard about which the employee has not been trained (**paragraph (c)(1)(i)**); second, where changes in the types of scaffolds, fall protection, falling object protection, or other equipment present a hazard about which the employee has not been trained (**paragraph (c)(1)(ii)**); and, third, where inadequacies in an affected employee's work practices involving scaffolds indicate that the employee has not retained the requisite proficiency (**paragraph (c)(1)(iii)**).

Non-mandatory Appendix A to Subpart L--
Scaffold Specifications.

This appendix is provided as a guide to assist employers in complying with the requirements of §1926.451. This appendix is non-mandatory. As stated above in the discussion of paragraph 1926.451(a), scaffolds built in accordance with this Appendix A will be considered to meet the intent of this revised subpart L.

Non-mandatory Appendix B to subpart L--
Criteria for Determining the Feasibility and Safety of Providing
Safe Access and Fall Protection for Scaffold Erectors and Dismantlers.

This space is being reserved for publication of informational guidance at a later date.

Non-mandatory Appendix C to Subpart L--
List of National Consensus Standards

This Appendix is provided to serve as a guide to employers required to provide appropriate employee protection under §1926.453, Aerial Lifts. This Appendix reflects the proliferation of equipment-specific ANSI A92 standards since the adoption of ANSI A92.2-1969.

Non-mandatory Appendix D to Subpart L--
List of Training Topics for Scaffold Erectors and Dismantlers

OSHA has developed this Appendix to assist employers in identifying appropriate topics for training scaffold erectors and dismantlers.

Non-mandatory Appendix E to Subpart L--
Drawings and Illustrations

This Appendix provides drawings of particular types of scaffolds and scaffold components, and graphic illustrations of bracing patterns and tie spacing patterns. It is intended to provide visual guidance to assist the user in complying with the requirements of this standard.

SUBPART L--SCAFFOLDS

1926.450 Scope, Application and Definitions
Applicable to this Subpart

1926.451 General Requirements

1926.452 Additional Requirements
Applicable to
Specific Types of Scaffolds

1926.453 Elevating and Rotating Work
Platforms

1926.454 Training

Appendix A to Subpart L--Scaffolds

Appendix B to Subpart L--Scaffolds

Appendix C to Subpart L--Scaffolds

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SUBPART L--SCAFFOLDS

§1926.450 Scope, application and definitions applicable to this Subpart.

(a) Scope and application. This subpart applies to all scaffolds used in workplaces covered by this Part. It does not apply to crane or derrick suspended personnel platforms, which are covered by §1926.550(g). The criteria for aerial lifts are set out exclusively in §1926.453 of this subpart.

(b) Definitions. "Adjustable suspension scaffold" means a suspension scaffold equipped with a hoist(s) that can be operated by an employee(s) on the scaffold.

"Bearer (putlog)" means a horizontal transverse scaffold member (which may be supported by ledgers or runners) upon which the scaffold platform rests and which joins scaffold uprights, posts, poles, and similar members.

"Boatswains' chair" means a single-point adjustable suspension scaffold consisting of a seat or sling designed to support one employee in a sitting position.

"Body belt (safety belt)" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

"Body harness" means a design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders, with means for attaching it to other components of a personal fall arrest system.

"Brace" means a rigid connection that holds one scaffold member in a fixed position with respect to another member, or to a building or structure.

"Bricklayers' square scaffold" means a supported scaffold composed of framed squares which support a platform.

"Carpenters' bracket scaffold" means a supported scaffold consisting of a platform supported by brackets attached to building or structural walls.

"Catenary scaffold" means a suspension scaffold consisting of a platform supported by two essentially horizontal and parallel ropes attached to structural members of a building or other structure. Additional support may be provided by vertical pickups.

"Chimney hoist" means a multi-point adjustable suspension scaffold used to provide access to work inside chimneys. (See "Multi-point adjustable suspension scaffold".)

"Cleat" means a structural block used at the end of a platform to prevent the platform from slipping off its supports. Cleats are also used to provide footing on sloped surfaces such as crawling boards.

"Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

"Continuous run scaffold" (Run scaffold) means a two-point or multi-point adjustable suspension scaffold constructed using a series of interconnected braced scaffold members or supporting structures erected to form a continuous scaffold.

"Coupler" means a device for locking together the tubes of a tube and coupler scaffold.

"Crawling board (chicken ladder)" means a supported scaffold consisting of a plank with cleats spaced and secured to provide footing, for use on sloped surfaces such as roofs.

"Deceleration device" means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyard, or automatic self-retracting lifeline lanyard, which dissipates a substantial amount of energy during a fall arrest or limits the energy imposed on an employee during fall arrest.

"Double pole (independent pole) scaffold" means a supported scaffold consisting of a platform(s) resting on cross beams (bearers) supported by ledgers and a double row of uprights independent of support (except ties, guys, braces) from any structure.

"Equivalent" means alternative designs, materials or methods to protect

against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

"Eye" or "Eye Splice" means a loop with or without a thimble at the end of a wire rope.

"Exposed power lines" means electrical power lines which are accessible to employees and which are not shielded from contact. Such lines do not include extension cords or power tool cords.

"Fabricated decking and planking" means manufactured platforms made of wood (including laminated wood, and solid sawn wood planks), metal or other materials.

"Fabricated frame scaffold (tubular welded frame scaffold)" means a scaffold consisting of a platform(s) supported on fabricated end frames with integral posts, horizontal bearers, and intermediate members.

"Failure" means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.

"Float (ship) scaffold" means a suspension scaffold consisting of a braced platform resting on two parallel bearers and hung from overhead supports by ropes of fixed length.

"Form scaffold" means a supported scaffold consisting of a platform supported by brackets attached to form work.

"Guardrail system" means a vertical barrier, consisting of, but not limited to, toprails, midrails, and posts, erected to prevent employees from falling off a scaffold platform or walkway to lower levels.

"Hoist" means a manual or power-operated mechanical device to raise or lower a suspended scaffold.

"Horse scaffold" means a supported scaffold consisting of a platform supported by construction horses (saw horses). Horse scaffolds constructed of metal are sometimes known as trestle scaffolds.

"Independent pole scaffold" (see "Double pole scaffold").

"Interior hung scaffold" means a suspension scaffold consisting of a platform suspended from the ceiling or roof structure by fixed length supports.

"Ladder jack scaffold" means a supported scaffold consisting of a platform resting on brackets attached to ladders.

"Ladder stand" means a mobile, fixed-size, self-supporting ladder consisting of a wide flat tread ladder in the form of stairs.

"Landing" means a platform at the end of a flight of stairs.

"Large area scaffold" means a pole scaffold, tube and coupler scaffold, systems scaffold, or fabricated frame scaffold erected over substantially the entire work area. For example: a scaffold erected over the entire floor area of a room.

"Lean-to scaffold" means a supported scaffold which is kept erect by tilting it toward and resting it against a building or structure.

"Lifeline" means a component consisting of a flexible line that connects to an anchorage at one end to hang vertically (vertical lifeline), or that connects to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

"Lower levels" means areas below the level where the employee is located and to which an employee can fall. Such areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, materials, water, and equipment.

"Masons' adjustable supported scaffold" (see "Self-contained adjustable scaffold").

"Masons' multi-point adjustable suspension scaffold" means a continuous run suspension scaffold designed and used for masonry operations.

"Maximum intended load" means the total load of all persons, equipment, tools, materials, transmitted loads, and other loads reasonably anticipated to be applied to a scaffold or scaffold component at any one time.

"Mobile scaffold" means a powered or unpowered, portable, caster or wheel-mounted supported scaffold.

"Multi-level suspended scaffold" means a two-point or multi-point adjustable suspension scaffold with a series of platforms at various levels resting on common stirrups.

"Multi-point adjustable suspension scaffold" means a suspension scaffold consisting of a platform(s) which is suspended by more than two ropes from overhead supports and equipped with means to raise and lower the platform to desired work levels. Such scaffolds include chimney hoists.

"Needle beam scaffold" means a platform suspended from needle beams.

"Open sides and ends" means the edges of a platform that are more than 14 inches (36 cm) away horizontally from a sturdy, continuous, vertical surface (such as a building wall) or a sturdy, continuous horizontal surface (such as a floor), or a point of access. Exception: For plastering and lathing operations the horizontal threshold distance is 18 inches (46 cm).

"Outrigger" means the structural member of a supported scaffold used to increase the base width of a scaffold in order to provide support for and increased stability of the scaffold.

"Outrigger beam (Thrust out)" means the structural member of a suspension scaffold or outrigger scaffold which provides support for the scaffold by extending the scaffold point of attachment to a point out and away from the structure or building.

"Outrigger scaffold" means a supported scaffold consisting of a platform resting on outrigger beams (thrustouts) projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside the building or structure.

"Overhand bricklaying" means the process of laying bricks and masonry units such that the surface of the wall to be jointed is on the opposite side of the wall from the mason, requiring the mason to lean over the wall to complete the work. It includes mason tending and electrical installation incorporated into the brick wall during the overhand bricklaying process.

"Personal fall arrest system" means a system used to arrest an employee's fall. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or combinations of these.

"Platform" means a work surface elevated above lower levels. Platforms can be constructed using individual wood planks, fabricated planks, fabricated decks, and fabricated platforms.

"Pole scaffold" (see definitions for "Single-pole scaffold" and "Double (independent) pole scaffold").

"Power operated hoist" means a hoist which is powered by other than human energy.

"Pump jack scaffold" means a supported scaffold consisting of a platform supported by vertical poles and movable support brackets.

"Qualified" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

"Rated load" means the manufacturer's specified maximum load to be lifted by a hoist or to be applied to a scaffold or scaffold component.

"Repair bracket scaffold" means a supported scaffold consisting of a platform supported by brackets which are secured in place around the circumference or perimeter of a chimney, stack, tank or

other supporting structure by one or more wire ropes placed around the supporting structure. "Roof bracket scaffold" means a rooftop supported scaffold consisting of a platform resting on angular-shaped supports.

"Runner" (ledger or ribbon)" means the lengthwise horizontal spacing or bracing member which may support the bearers.

"Scaffold" means any temporary elevated platform (supported or suspended) and its supporting structure (including points of anchorage), used for supporting employees or materials or both.

"Self-contained adjustable scaffold" means a combination supported and suspension scaffold consisting of an adjustable platform(s) mounted on an independent supporting frame(s) not a part of the object being worked on, and which is equipped with a means to permit the raising and lowering of the platform(s). Such systems include rolling roof rigs, rolling outrigger systems, and some masons' adjustable supported scaffolds.

"Shore scaffold" means a supported scaffold which is placed against a building or structure and held in place with props.

"Single-point adjustable suspension scaffold" means a suspension scaffold consisting of a platform suspended by one rope from an overhead support and equipped with means to permit the movement of the platform to desired work levels.

"Single-pole scaffold" means a supported scaffold consisting of a platform(s) resting on bearers, the outside ends of which are supported on runners secured to a single row of posts or uprights, and the inner ends of which are supported on or in a structure or building wall.

"Stair tower (Scaffold stairway/tower)" means a tower comprised of scaffold components and which contains internal stairway units and rest platforms. These towers are used to provide access to scaffold platforms and other elevated points such as floors and roofs.

"Stall load" means the load at which the prime-mover of a power-operated hoist stalls or the power to the prime-mover is automatically disconnected.

"Step, platform, and trestle ladder scaffold" means a platform resting directly on the rungs of step ladders or trestle ladders.

"Stilts" means a pair of poles or similar supports with raised footrests, used to permit walking above the ground or working surface.

"Stone setters' multi-point adjustable suspension scaffold" means a continuous run suspension scaffold

designed and used for stone setters' operations.

"Supported scaffold" means one or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid support.

"Suspension scaffold" means one or more platforms suspended by ropes or other non-rigid means from an overhead structure(s).

"System scaffold" means a scaffold consisting of posts with fixed connection points that accept runners, bearers, and diagonals that can be interconnected at predetermined levels.

"Tank builders' scaffold" means a supported scaffold consisting of a platform resting on brackets that are either directly attached to a cylindrical tank or attached to devices that are attached to such a tank.

"Top plate bracket scaffold" means a scaffold supported by brackets that hook over or are attached to the top of a wall. This type of scaffold is similar to carpenters' bracket scaffolds and form scaffolds and is used in residential construction for setting trusses.

"Tube and coupler scaffold" means a supported or suspended scaffold consisting of a platform(s) supported by tubing, erected with coupling devices connecting uprights, braces, bearers, and runners.

"Tubular welded frame scaffold" (see "Fabricated frame scaffold").

"Two-point suspension scaffold (swing stage)" means a suspension scaffold consisting of a platform supported by hangers (stirrups) suspended by two ropes from overhead supports and equipped with means to permit the raising and lowering of the platform to desired work levels.

"Unstable objects" means items whose strength, configuration, or lack of stability may allow them to become dislocated and shift and therefore may not properly support the loads imposed on them. Unstable objects do not constitute a safe base support for scaffolds, platforms, or employees. Examples include, but are not limited to, barrels, boxes, loose brick, and concrete blocks.

"Vertical pickup" means a rope used to support the horizontal rope in catenary scaffolds.

"Walkway" means a portion of a scaffold platform used only for access and not as a work level.

"Window jack scaffold" means a platform resting on a bracket or jack which projects through a window opening.

§1926.451 General requirements. NOTE: As indicated in the Scope and Application

(§1926.450(a)), this section does not apply to aerial lifts.

(a) Capacity (1) Except as provided in paragraphs (a)(2), (a)(3), (a)(4), (a)(5) and (g) of this section, each scaffold and scaffold component shall be capable of supporting, without failure, its own weight and at least 4 times the maximum intended load applied or transmitted to it.

(2) Direct connections to roofs and floors, and counterweights used to balance adjustable suspension scaffolds, shall be capable of resisting at least 4 times the tipping moment imposed by the scaffold operating at either (a) the rated load of the hoist, or (b) 1.5 (minimum) times the tipping moment imposed by the scaffold operating at the stall load of the hoist, whichever is greater.

(3) Each suspension rope, including connecting hardware, used on non-adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope.

(4) Each suspension rope, including connecting hardware, used on adjustable suspension scaffolds shall be capable of supporting, without failure, at least 6 times the maximum intended load applied or transmitted to that rope with the scaffold operating at either (a) the rated load of the hoist, or (b) 2 (minimum) times the stall load of the hoist, whichever is greater.

(5) The stall load of any scaffold hoist shall not exceed 3 times its rated load.

(6) Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design. Non-mandatory Appendix A contains examples of criteria that will enable an employer to comply with paragraph (a) of this section.

(b) Scaffold platform construction.

(1) Each platform on all working levels of scaffolds shall be fully planked or decked between the front uprights and the guardrail supports as follows:

(i) Each platform unit (e.g., scaffold plank, fabricated plank, fabricated deck, or fabricated platform) shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than 1 inch (2.5 cm) wide, except where the employer can demonstrate that a wider space is necessary (for example, to fit around uprights when side brackets are used to extend the width of the platform).

(ii) Where the employer makes the demonstration provided for in paragraph (b)(1)(i) above, the platform shall be planked or decked as fully as possible and the

remaining open space between the platform and the uprights shall not exceed 9½ inches (24.1 cm).

Exception: The requirement in paragraph (b)(1) to provide full planking or decking does not apply to platforms used solely as walkways or solely by employees performing scaffold erection or dismantling. In these situations, only the planking that the employer establishes is necessary to provide safe working conditions is required.

(2) Except as provided in paragraphs (b)(2)(i) and (b)(2)(ii) of this section, each scaffold platform and walkway shall be at least 18 inches (46 cm) wide.

(i) Each ladder jack scaffold, top plate bracket scaffold, roof bracket scaffold, and pump jack scaffold shall be at least 12 inches (30 cm) wide. There is no minimum width requirement for boatswains' chairs.

(ii) Where scaffolds must be used in areas that the employer can demonstrate are so narrow that platforms and walkways cannot be at least 18 inches (46 cm) wide, such platforms and walkways shall be as wide as feasible, and employees on those platforms and walkways shall be protected from fall hazards by the use of guardrails and/or personal fall arrest systems.

(3) Except as provided in paragraphs (b)(3)(i) and (ii) of this section, the front edge of all platforms shall not be more than 14 inches (36 cm) from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used in accordance with §1926.451(g) to protect employees from falling.

(i) The maximum distance from the face for outrigger scaffolds shall be 3 inches (8 cm);

(ii) The maximum distance from the face for plastering and lathing operations shall be 18 inches (46 cm).

(4) Each end of a platform, unless cleated or otherwise restrained by hooks or equivalent means, shall extend over the centerline of its support at least 6 inches (15 cm).

(5) (i) Each end of a platform 10 feet or less in length shall not extend over its support more than 12 inches (30 cm) unless the platform is designed and installed so that the cantilevered portion of the platform is able to support employees and/or materials without tipping, or has guardrails which block employee access to the cantilevered end.

(ii) Each platform greater than 10 feet in length shall not extend over its support more than 18 inches (46 cm), unless it is designed and installed so that the cantilevered portion of the platform is able to support employees without tipping,

or has guardrails which block employee access to the cantilevered end.

(6) On scaffolds where scaffold planks are abutted to create a long platform, each abutted end shall rest on a separate support surface. NOTE: This provision does not preclude the use of common support members, such as "T" sections, to support abutting planks, or hook on platforms designed to rest on common supports.

(7) On scaffolds where platforms are overlapped to create a long platform, the overlap shall occur only over supports, and shall not be less than 12 inches (30 cm) unless the platforms are nailed together or otherwise restrained to prevent movement.

(8) At all points of a scaffold where the platform changes direction, such as turning a corner, any platform that rests on a bearer at an angle other than a right angle shall be laid first, and platforms which rest at right angles over the same bearer shall be laid second, on top of the first platform.

(9) Wood platforms shall not be covered with opaque finishes, except that platform edges may be covered or marked for identification. Platforms may be coated periodically with wood preservatives, fire-retardant finishes, and slip-resistant finishes; however, the coating may not obscure the top or bottom wood surfaces.

(10) Scaffold components manufactured by different manufacturers shall not be intermixed unless the components fit together without force and the scaffold's structural integrity is maintained by the user. Scaffold components manufactured by different manufacturers shall not be modified in order to intermix them unless a competent person determines the resulting scaffold is structurally sound.

(11) Scaffold components made of dissimilar metals shall not be used together unless a competent person has determined that galvanic action will not reduce the strength of any component to a level below that required by §1926.451(a)(1).

(c) Criteria for supported scaffolds.

(1) Supported scaffolds with a height to base width (including outrigger supports, if used) ratio of more than four to one (4:1) shall be restrained from tipping by guying, tying, bracing, or equivalent means, as follows:

(i) Guys, ties, and braces shall be installed at locations where horizontal members support both inner and outer legs.

(ii) Guys, ties, and braces shall be installed according to the scaffold

manufacturer's recommendations or at the closest horizontal member to the 4:1 height and be repeated vertically at locations of horizontal members every 20 feet (6.1 m) or less thereafter for scaffolds 3 feet (0.91 m) wide or less, and every 26 feet (7.9 m) or less thereafter for scaffolds greater than 3 feet (0.91 m) wide. The top guy, tie or brace of completed scaffolds shall be placed no further than the 4:1 height from the top. Such guys, ties and braces shall be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (9.1 m) (measured from one end [not both] towards the other).

(iii) Ties, guys, braces, or outriggers shall be used to prevent the tipping of supported scaffolds in all circumstances where an eccentric load, such as a cantilevered work platform, is applied or is transmitted to the scaffold.

(2) Supported scaffold poles, legs, posts, frames, and uprights shall bear on base plates, mud sills or other adequate firm foundation.

(i) Footings shall be level, sound, rigid, and capable of supporting the loaded scaffold without settling or displacement.

(ii) Unstable objects shall not be used to support scaffolds or platform units.

(iii) Unstable objects shall not be used as working platforms.

(iv) Front-end loaders and similar pieces of equipment shall not be used to support scaffold platforms unless they have been specifically designed by the manufacturer for such use.

(v) Fork-lifts shall not be used to support scaffold platforms unless the entire platform is attached to the fork and the fork-lift is not moved horizontally while the platform is occupied.

(3) Supported scaffold poles, legs, posts, frames, and uprights shall be plumb and braced to prevent swaying and displacement.

(d) Criteria for suspension scaffolds.

(1) All suspension scaffold support devices, such as outrigger beams, cornice hooks, parapet clamps, and similar devices, shall rest on surfaces capable of supporting at least 4 times the load imposed on them by the scaffold operating at the rated load of the hoist (or at least 1.5 times the load imposed on them by the scaffold at the stall capacity of the hoist, whichever is greater).

(2) Suspension scaffold outrigger beams, when used, shall be made of structural metal or equivalent strength material, and shall be restrained to prevent movement.

(3) The inboard ends of suspension scaffold outrigger beams shall be stabilized by bolts or other direct connections to the floor or roof deck, or they shall have their inboard ends stabilized by counterweights, except masons' multi-point adjustable suspension scaffold outrigger beams shall not be stabilized by counterweights.

(i) Before the scaffold is used, direct connections shall be evaluated by a competent person who shall confirm, based on the evaluation, that the supporting surfaces are capable of supporting the loads to be imposed. In addition, masons' multi-point adjustable suspension scaffold connections shall be designed by an engineer experienced in such scaffold design.

(ii) Counterweights shall be made of non-flowable material. Sand, gravel and similar materials that can be easily dislocated shall not be used as counterweights.

(iii) Only those items specifically designed as counterweights shall be used to counterweight scaffold systems. Construction materials such as, but not limited to, masonry units and rolls of roofing felt, shall not be used as counterweights.

(iv) Counterweights shall be secured by mechanical means to the outrigger beams to prevent accidental displacement.

(v) Counterweights shall not be removed from an outrigger beam until the scaffold is disassembled.

(vi) Outrigger beams which are not stabilized by bolts or other direct connections to the floor or roof deck shall be secured by tiebacks.

(vii) Tiebacks shall be equivalent in strength to the suspension ropes.

(viii) Outrigger beams shall be placed perpendicular to its bearing support (usually the face of the building or structure). However, where the employer can demonstrate that it is not possible to place an outrigger beam perpendicular to the face of the building or structure because of obstructions that cannot be moved, the outrigger beam may be placed at some other angle, provided opposing angle tiebacks are used.

(ix) Tiebacks shall be secured to a structurally sound anchorage on the building or structure. Sound anchorages include structural members, but do not include standpipes, vents, other piping systems, or electrical conduit.

(x) Tiebacks shall be installed perpendicular to the face of the building or structure, or opposing angle tiebacks shall be installed. Single tiebacks installed at an angle are prohibited.

(4) Suspension scaffold outrigger beams shall be:

(i) Provided with stop bolts or shackles at both ends;

(ii) Securely fastened together with the flanges turned out when channel iron beams are used in place of I-beams;

(iii) Installed with all bearing supports perpendicular to the beam center line;

(iv) Set and maintained with the web in a vertical position; and

(v) When an outrigger beam is used, the shackle or clevis with which the rope is attached to the outrigger beam shall be placed directly over the center line of the stirrup.

(5) Suspension scaffold support devices such as cornice hooks, roof hooks, roof irons, parapet clamps, or similar devices shall be:

(i) Made of steel, wrought iron, or materials of equivalent strength;

(ii) Supported by bearing blocks; and

(iii) Secured against movement by tiebacks installed at right angles to the face of the building or structure, or opposing angle tiebacks shall be installed and secured to a structurally sound point of anchorage on the building or structure. Sound points of anchorage include structural members, but do not include standpipes, vents, other piping systems, or electrical conduit.

(iv) Tiebacks shall be equivalent in strength to the hoisting rope.

(6) When winding drum hoists are used on a suspension scaffold, they shall contain not less than four wraps of the suspension rope at the lowest point of scaffold travel. When other types of hoists are used, the suspension ropes shall be long enough to allow the scaffold to be lowered to the level below without the rope end passing through the hoist, or the rope end shall be configured or provided with means to prevent the end from passing through the hoist.

(7) The use of repaired wire rope as suspension rope is prohibited.

(8) Wire suspension ropes shall not be joined together except through the use of eye splice thimbles connected with shackles or cover plates and bolts.

(9) The load end of wire suspension ropes shall be equipped with proper size thimbles and secured by eye splicing or equivalent means.

(10) Ropes shall be inspected for defects by a competent person prior to each work shift and after every occurrence which could affect a rope's integrity. Ropes shall be replaced if any of the following conditions exist:

(i) Any physical damage which impairs the function and strength of the rope.

(ii) Kinks that might impair the tracking or wrapping of rope around the drum(s) or sheave(s).

(iii) Six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay.

(iv) Abrasion, corrosion, scrubbing, flattening or peening causing loss of more than one-third of the original diameter of the outside wires.

(v) Heat damage caused by a torch or any damage caused by contact with electrical wires.

(vi) Evidence that the secondary brake has been activated during an over speed condition and has engaged the suspension rope.

(11) Swaged attachments or spliced eyes on wire suspension ropes shall not be used unless they are made by the wire rope manufacturer or a qualified person.

(12) When wire rope clips are used on suspension scaffolds:

(i) There shall be a minimum of 3 wire rope clips installed, with the clips a minimum of 6 rope diameters apart;

(ii) Clips shall be installed according to the manufacturer's recommendations;

(iii) Clips shall be retightened to the manufacturer's recommendations after the initial loading;

(iv) Clips shall be inspected and retightened to the manufacturer's recommendations at the start of each work shift thereafter;

(v) U-bolt clips shall not be used at the point of suspension for any scaffold hoist;

(vi) When U-bolt clips are used, the U-bolt shall be placed over the dead end of the rope, and the saddle shall be placed over the live end of the rope.

(13) Suspension scaffold power-operated hoists and manual hoists shall be tested and listed by a qualified testing laboratory.

(14) Gasoline-powered equipment and hoists shall not be used on suspension scaffolds.

(15) Gears and brakes of power-operated hoists used on suspension scaffolds shall be enclosed.

(16) In addition to the normal operating brake, suspension scaffold power-operated hoists and manually operated hoists shall have a braking device or locking pawl which engages automatically when a hoist makes either of the following uncontrolled movements: an instantaneous change in momentum or an accelerated over speed.

(17) Manually operated hoists shall require a positive crank force to descend.

(18) Two-point and multi-point suspension scaffolds shall be tied or otherwise secured to prevent them from swaying, as determined to be necessary based on an evaluation by a competent person. Window cleaners' anchors shall not be used for this purpose.

(19) Devices whose sole function is to provide emergency escape and rescue shall not be used as working platforms. (This provision does not preclude the use of systems which are designed to function both as suspension scaffolds and emergency systems.)

(e) Access. This paragraph applies to scaffold access for all employees. Access requirements for employees erecting or dismantling supported scaffolds are specifically addressed in paragraph (e)(9) of this section.

(1) When scaffold platforms are more than 2 feet (0.6 m) above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stair towers (scaffold stairways/towers), stairway-type ladders (such as ladder stands), ramps, walkways, integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist, or similar surface shall be used. Cross braces shall not be used as a means of access.

(2) Portable, hook-on, and attachable ladders (Additional requirements for the proper construction and use of portable ladders are contained in Subpart X of this part--Stairways and Ladders):

(i) Portable, hook-on, and attachable ladders shall be positioned so as not to tip the scaffold;

(ii) Hook-on and attachable ladders shall be positioned so that their bottom rung is not more than 24 inches (61 cm) above the scaffold supporting level;

(iii) When hook-on and attachable ladders are used on a supported scaffold more than 35 feet (10.7 m.) high, they shall have rest platforms at 35-foot (10.7 m) maximum vertical intervals.

(iv) Hook-on and attachable ladders shall be specifically designed for use with the type of scaffold used;

(v) Hook-on and attachable ladders shall have a minimum rung length of 11-1/2 inches (29 cm); and

(vi) Hook-on and attachable ladders shall have uniformly spaced rungs with a maximum spacing between rungs of 16-3/4 inches.

(3) Stairway-type ladders shall:

(i) be positioned such that their bottom step is not more than 24 inches (61 cm) above the scaffold supporting level;

(ii) be provided with rest platforms at 12 foot (3.7 m) maximum vertical intervals;

(iii) have a minimum step width of 16 inches (41 cm), except that mobile scaffold stairway-type ladders shall have a minimum step width of 11 ½ inches (30 cm); and

(iv) have slip-resistant treads on all steps and landings.

(4) Stair towers (scaffold stairway/towers) shall be positioned such that their bottom step is not more than 24 inches (61 cm.) above the scaffold supporting level.

(I) A stairrail consisting of a toprail and a midrail shall be provided on each side of each scaffold stairway.

(ii) The toprail of each stairrail system shall also be capable of serving as a handrail, unless a separate handrail is provided.

(iii) Handrails, and toprails that serve as handrails, shall provide an adequate handhold for employees grasping them to avoid falling.

(iv) Stairrail systems and handrails shall be surfaced to prevent injury to employees from punctures or lacerations, and to prevent snagging of clothing.

(v) The ends of stairrail systems and handrails shall be constructed so that they do not constitute a projection hazard.

(vi) Handrails, and toprails that are used as handrails, shall be at least 3 inches (7.6 cm) from other objects.

(vii) Stairrails shall be not less than 28 inches (71 cm) nor more than 37 inches (94 cm) from the upper surface of the stairrail to the surface of the tread, in line with the face of the riser at the forward edge of the tread.

(viii) A landing platform at least 18 inches (45.7 cm) wide by at least 18 inches (45.7 cm) long shall be provided at each level.

(ix) Each scaffold stairway shall be at least 18 inches (45.7 cm) wide between stairrails.

(x) Treads and landings shall have slip-resistant surfaces.

(xi) Stairways shall be installed between 40 degrees and 60 degrees from the horizontal.

(xii) Guardrails meeting the requirements of §1926.451(g)(4) shall be provided on the open sides and ends of each landing.

(xiii) Riser height shall be uniform, within 1/4 inch, (0.6 cm) for each flight of stairs. Greater variations in riser height are allowed for the top and bottom steps of the entire system, not for each flight of stairs.

(xiv) Tread depth shall be uniform, within 1/4 inch, for each flight of stairs.

(I) Ramps and walkways. (1) Ramps and walkways 6 feet (1.8 m) or more above lower levels shall have guardrail systems which comply with Subpart M of this part--Fall Protection;

(ii) No ramp or walkway shall be inclined more than a slope of one (1) vertical to three (3) horizontal (20 degrees above the horizontal).

(iii) If the slope of a ramp or a walkway is steeper than one (1) vertical in eight (8) horizontal, the ramp or walkway shall have cleats not more than fourteen (14) inches (35 cm) apart which are securely fastened to the planks to provide footing.

(6) Integral prefabricated scaffold access frames shall:

(I) Be specifically designed and constructed for use as ladder rungs;

(ii) Have a rung length of at least 8 inches (20 cm); (iii) Not be used as work platforms when rungs are less than 11-1/2 inches in length, unless each affected employee uses fall protection, or a positioning device, which complies with §1926.502;

(iv) Be uniformly spaced within each frame section;

(v) Be provided with rest platforms at 35-foot (10.7 m) maximum vertical intervals on all supported scaffolds more than 35 feet (10.7 m) high; and

(vi) Have a maximum spacing between rungs of 16 3/4 inches (43 cm). Non-uniform rung spacing caused by joining end frames together is allowed, provided the resulting spacing does not exceed 16-3/4 inches (43 cm).

(7) Steps and rungs of ladder and stairway type access shall line up vertically with each other between rest platforms.

(8) Direct access to or from another surface shall be used only when the scaffold is not more than 14 inches (36 cm) horizontally and not more than 24 inches (61 cm) vertically from the other surface.

(9) Effective (insert date one year after publication in the Federal Register), access for employees erecting or dismantling supported scaffolds shall be in accordance with the following:

(I) The employer shall provide safe means of access for each employee erecting or dismantling a scaffold where the provision of safe access is feasible and does not create a greater hazard. The employer shall have a competent person determine whether it is feasible or would pose a greater hazard to provide, and have employees use a safe means of access. This determination shall be based on site

conditions and the type of scaffold being erected or dismantled.

(ii) Hook-on or attachable ladders shall be installed as soon as scaffold erection has progressed to a point that permits safe installation and use.

(iii) When erecting or dismantling tubular welded frame scaffolds, (end) frames, with horizontal members that are parallel, level and are not more than 22 inches apart vertically may be used as climbing devices for

access, provided they are erected in a manner that creates a usable ladder and provides good hand hold and foot space.

(iv) Cross braces on tubular welded frame scaffolds shall not be used as a means of access or egress.

(f) Use. (1) Scaffolds and scaffold components shall not be loaded in excess of their maximum intended loads or rated capacities, whichever is less.

(2) The use of shore or lean-to scaffolds is prohibited.

(3) Scaffolds and scaffold components shall be inspected for visible defects by a competent person before each work shift, and after any occurrence which could affect a scaffold's structural integrity.

(4) Any part of a scaffold damaged or weakened such that its strength is less than that required by §§1926.451(a) shall be immediately repaired or replaced, braced to meet those provisions, or removed from service until repaired.

(5) Scaffolds shall not be moved horizontally while employees are on them, unless they have been designed by a registered professional engineer specifically for such movement or, for mobile scaffolds, where the provisions of §1926.452(w) are followed.

(6) The clearance between scaffolds and power lines shall be as follows: Scaffolds shall not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines than as follows:

Exception: Scaffolds and materials may be closer to power lines than specified above where such clearance is necessary for performance of work, and only after the utility company, or electrical system operator, has been notified of the need to work closer and the utility company, or electrical system operator, has deenergized the lines, relocated the lines, or installed protective coverings to prevent accidental contact with the lines.

(7) Scaffolds shall be erected, moved, dismantled, or altered only under the supervision and direction of a competent person qualified in scaffold erection,

moving, dismantling or alteration. Such activities shall be performed only by experienced and trained employees selected for such work by the competent person.

(8) Employees shall be prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials.

(9) Where swinging loads are being hoisted onto or near scaffolds such that the loads might contact the scaffold, tag lines or equivalent measures to control the loads shall be used.

(10) Suspension ropes supporting adjustable suspension scaffolds shall be of a diameter large enough to provide sufficient surface area for the functioning of brake and hoist mechanisms.

(11) Suspension ropes shall be shielded from heat-producing processes. When acids or other corrosive substances are used on a scaffold, the ropes shall be shielded, treated to protect against the corrosive substances, or shall be of a

material that will not be damaged by the substance being used.

height of employees, except on large area scaffolds where employees have satisfied the following criteria:

(12) Work on or from scaffolds is prohibited during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and those employees are protected by a personal fall arrest system or wind screens. Wind screens shall not be used unless the scaffold is secured against the anticipated wind forces imposed.

(13) Debris shall not be allowed to accumulate on platforms.

(14) Makeshift devices, such as but not limited to boxes and barrels, shall not be used on top of scaffold (l) When the ladder is placed against a structure which is not a part of the scaffold, the scaffold shall be secured against the sideways thrust exerted by the ladder;

(ii) The platform units shall be secured to the scaffold to prevent their movement;

(iii) The ladder legs shall be on the same platform or other means shall be provided to stabilize the ladder against unequal platform deflection, and

(iv) The ladder legs shall be secured to prevent them from slipping or being pushed off the platform. Platforms to increase the working level height of employees.

(15) Ladders shall not be used on scaffolds to increase the working level (16) Platforms shall not deflect more than 1/60 of the span when loaded.

(17) To reduce the possibility of welding current arcing through the suspension wire rope when performing welding from suspended scaffolds, the following precautions shall be taken, as applicable:

(l) An insulated thimble shall be used to attach each suspension wire rope to its hanging support (such as cornice hook or outrigger). Excess suspension wire rope and any additional independent lines from grounding shall be insulated;

INSULATED LINES VOLTAGE

MINIMUM DISTANCE ALTERNATIVES

LESS THAN 300 VOLTS	3 FEET (0.9 M)	
300 VOLTS TO 50 kv	10 FEET (3.1 M)	
MORE THAN 50kv	10 FEET (3.1 M) PLUS .4 INCHES (.1 cm) FOR EACH 1 kv OVER 50 kv	2 TIMES THE LENGTH OF THE LINE INSULATOR, BUT NEVER LESS THAN 10 FEET (3.1 m).

UNINSULATED LINES

VOLTAGE MINIMUM DISTANCE ALTERNATIVES

LESS THAN 50 kv	10 FEET (3.1 M)	
MORE THAN 50 kv	10 FEET (3.1 M) PLUS .4 INCHES (.1 cm) FOR EACH 1 kv OVER 50 kv	2 TIMES THE LENGTH OF THE LINE INSULATOR, BUT NEVER LESS THAN 10 FEET (3.1 m).

(ii) The suspension wire rope shall be covered with insulating material extending at least 4 feet (1.2 m) above the hoist. If there is a tail line below the hoist, it shall be insulated to prevent contact with the platform. The portion of the tail line that hangs free below the scaffold shall be guided or retained, or both, so that it does not become grounded;

(iii) Each hoist shall be covered with insulated protective covers;

(iv) In addition to a work lead attachment required by the welding process, a grounding conductor shall be connected from the scaffold to the structure. The size of this conductor shall be at least the size of the welding process work lead, and this conductor shall not be in series with the welding process or the work piece;

(v) If the scaffold grounding lead is disconnected at any time, the welding machine shall be shut off; and

(vi) An active welding rod or uninsulated welding lead shall not be allowed to contact the scaffold or its suspension system.

(g) Fall protection. (1) Each employee on a scaffold more than 10 feet (3.1 m) above a lower level shall be protected from falling to that lower level. Paragraphs (g)(1)(l) through (vii) of this fall arrest system and a guardrail system (with minimum 200 pound toprail capacity) when the platform is supported by ropes;

(v) Each employee on a walkway located within a scaffold shall be protected by a guardrail system (with minimum 200 pound toprail capacity) installed within 9 ½

inches (24.1 cm) of and along at least one side of the walkway.

(vi) Each employee performing overhand bricklaying operations from a supported scaffold shall be protected from falling from all open sides and ends of the scaffold (except at the side next to the wall being laid) by the use of a personal fall arrest system or guardrail system (with minimum 200 pound toprail capacity).

(vii) For all scaffolds not otherwise specified in paragraphs (g)(1)(l) through (g)(1)(vi) of this section, each employee shall be protected by the use of personal fall arrest systems or guardrail systems meeting the requirements of paragraph (g)(4), below.

(2) Effective (insert date one year after publication in the Federal Register), the employer shall have a competent person determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Employers are required to provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.

(3) In addition to meeting the requirements of §1926.502(d), personal fall arrest systems used on scaffolds shall be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member. Vertical lifelines shall not be used when overhead components, such as overhead protection or additional platform levels, are part of a single-point or two-point adjustable suspension scaffold.

(i) When vertical lifelines are used, they shall be fastened to a fixed safe point of anchorage, shall be independent of the scaffold, and shall be protected from sharp edges and abrasion. Safe points of anchorage include structural members of buildings, but do not include standpipes, vents, other piping systems, electrical conduit, outrigger beams, or counterweights.

(ii) When horizontal lifelines are used, they shall be secured to two or more structural members of the scaffold, or they may be looped around both suspension and independent suspension lines (on scaffolds so equipped) above the hoist and brake attached to the end of the scaffold. Horizontal lifelines shall not be attached only to the suspension ropes.

(iii) When lanyards are connected to horizontal lifelines or structural members on a single-point or two-point adjustable suspension scaffold, the scaffold shall be equipped with additional independent support lines and automatic locking devices capable of stopping the fall of the scaffold in the event one or both of the suspension ropes fail. The independent support lines shall be equal in number and strength to the suspension ropes.

(iv) Vertical lifelines, independent support lines, and suspension ropes shall not be attached to each other, nor shall they be attached to or use the same point of anchorage, nor shall they be attached to the same point on the scaffold or personal fall arrest system.

(4) Guardrail systems installed to meet the requirements of this section shall comply with the following provisions (guardrail systems built in accordance with Appendix A will be deemed to meet the requirements of paragraphs (g)(4)(vii), (viii), and (ix) of this section):

(i) Guardrail systems shall be installed along all open sides and ends of platforms. Guardrail systems shall be installed before the scaffold is released for use by employees other than erection/dismantling crews.

(ii) The top edge height of top rails or equivalent member on supported scaffolds manufactured or placed in service after January 1, 2000 shall be installed between 38 inches (0.97 m) and 45 inches (1.2 m) above the platform surface. The top edge height on supported scaffolds manufactured and placed in service before January 1, 2000, and on all suspended scaffolds where both a guardrail and a personal fall arrest system are required shall be between 36 inches (0.9 m) and 45 inches (1.2 m). When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of paragraph (g)(4).

(iii) When midrails, screens, mesh, intermediate vertical members, solid panels, or equivalent structural members are used, they shall be installed between the top edge of the guardrail system and the scaffold platform.

(iv) When midrails are used, they shall be installed at a height approximately midway between the top edge of the guardrail system and the platform surface.

(v) When screens and mesh are used, they shall extend from the top edge of the guardrail system to the scaffold platform, and along the entire opening between the supports.

(vi) When intermediate members (such as balusters or additional rails) are used, they shall not be more than 19 inches (48 cm) apart.

(vii) Each top rail or equivalent member of a guardrail system shall be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along its top edge of at least 100 pounds (445 n) for guardrail systems installed on single-point adjustable suspension scaffolds or two-point adjustable suspension scaffolds, and at least 200 pounds (890 n) for guardrail systems installed on all other scaffolds.

(viii) When the loads specified in paragraph (g)(4)(vii) of this section are applied in a downward direction, the top edge shall not drop below the height above the platform surface that is prescribed in paragraph (g)(4)(ii) above.

(ix) Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members of a guardrail system shall be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along the midrail or other member

of at least 75 pounds (333 n) for guardrail systems with a minimum 100 pound top rail capacity, and at least 150 pounds (666 n) for guardrail systems with a minimum 200 pound top rail capacity.

(x) Suspension scaffold hoists and non-walk-through stirrups may be used as end guardrails, if the space between the hoist or stirrup and the side guardrail or structure does not allow passage of an employee to the end of the scaffold.

(xi) Guardrails shall be surfaced to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.

(xii) The ends of all rails shall not overhang the terminal posts except when such overhang does not constitute a projection hazard to employees.

(xiii) Steel or plastic banding shall not be used as a top rail or midrail.

(xiv) Manila or plastic (or other synthetic) rope being used for top rails or midrails shall be inspected by a competent person as frequently as necessary to ensure that it continues to meet the strength requirements of §1926.451(g).

(xv) Cross bracing is acceptable in place of a midrail when the crossing point of two braces is between 20 inches (0.5 m) and 30 inches (0.8 m) above the work platform or as a top rail when the crossing point of two braces is between 38 inches (0.97 m) and 48 inches (1.3 m) above the work platform. The end points at each upright shall be no more than 48 inches (1.3 m) apart.

(h) Falling object protection. (1) In addition to wearing hardhats each employee on a scaffold shall be provided with additional protection from falling hand tools, debris, and other small objects through the installation of toeboards, screens, or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects. When the falling objects are too large, heavy or massive to be contained or deflected by any of the above-listed measures, the employer shall place such potential falling objects away from the edge of the surface from which they could fall and shall secure those materials as necessary to prevent their falling.

(2) Where there is a danger of tools, materials, or equipment falling from a scaffold and striking employees below, the following provisions apply:

(i) The area below the scaffold to which objects can fall shall be barricaded, and employees shall not be permitted to enter the hazard area; or

(ii) A toeboard shall be erected along the edge of platforms more than 10 feet (3.1 m) above lower levels for a

distance sufficient to protect employees below, except on float (ship) scaffolds where an edging of 3/4 x 1-1/2 inch (2 x 4 cm) wood or equivalent may be used in lieu of toeboards;

(iii) Where tools, materials, or equipment are piled to a height higher than the top edge of the toeboard, paneling or screening extending from the toeboard or platform to the top of the guardrail shall be erected for a distance sufficient to protect employees below, or

(iv) A guardrail system shall be installed with openings small enough to prevent passage of potential falling objects, or

(v) A canopy structure, debris net, or catch platform strong enough to withstand the impact forces of the potential falling objects shall be erected over the employees below.

(3) Canopies, when used for falling object protection, shall comply with the following criteria:

(i) Canopies shall be installed between the falling object hazard and the employees.

(ii) When canopies are used on suspension scaffolds for falling object protection, the scaffold shall be equipped with additional independent support lines equal in number to the number of points supported, and equivalent in strength to the strength of the suspension ropes.

(iii) Independent support lines and suspension ropes shall not be attached to the same points of anchorage.

(4) Where used, toeboards shall be:

(i) Capable of withstanding, without failure, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard (toeboards built in accordance with Appendix A will be deemed to meet this requirement); and

(ii) At least three and one-half inches (9 cm) high from the top edge of the toe board to the level of the walking/working surface. Toeboards shall be securely fastened in place at the outermost edge of the platform and have not more than 1/4 inch (0.7 cm) clearance above the walking/working surface. Toeboards shall be solid or with openings not over one inch (2.5 cm) in the greatest dimension.

§1926.452 Additional requirements applicable to specific types of scaffolds.

In addition to the applicable requirements of §1926.451, the following requirements apply to the specific types of scaffolds indicated. Scaffolds not specifically addressed by §1926.452, such as but not limited to systems scaffolds, must meet the requirements of §1926.451.

(a) Pole scaffolds. (1) When platforms are being moved to the next level, the existing platform shall be left undisturbed until the new bearers have been set in place and braced, prior to receiving the new platforms.

(2) Cross bracing shall be installed between the inner and outer sets of poles on double pole scaffolds.

(3) Diagonal bracing in both directions shall be installed across the entire inside face of double-pole scaffolds used to support loads equivalent to a uniformly distributed load of 50 pounds (222 kg) or more per square foot (929 square cm).

(4) Diagonal bracing in both directions shall be installed across the entire outside face of all double- and single-pole scaffolds.

(5) Runners and bearers shall be installed on edge.

(6) Bearers shall extend a minimum of 3 inches (7.6 cm) over the outside edges of runners.

(7) Runners shall extend over a minimum of two poles, and shall be supported by bearing blocks securely attached to the poles.

(8) Braces, bearers, and runners shall not be spliced between poles.

(9) Where wooden poles are spliced, the ends shall be squared and the upper section shall rest squarely on the lower section. Wood splice plates shall be provided on at least two adjacent sides, and shall extend at least 2 feet (0.6 m) on either side of the splice, overlap the abutted ends equally, and have at least the same cross-sectional areas as the pole. Splice plates of other materials of equivalent strength may be used.

(10) Pole scaffolds over 60 feet in height shall be designed by a registered professional engineer, and shall be constructed and loaded in accordance with that design. Non-mandatory Appendix A contains examples of criteria that will enable an employer to comply with design and loading requirements for pole scaffolds under 60 feet in height.

(b) Tube and coupler scaffolds.

(1) When platforms are being moved to the next level, the existing platform shall be left undisturbed until the new bearers have been set in place and braced prior to receiving the new platforms.

(2) Transverse bracing forming an "X" across the width of the scaffold shall be installed at the scaffold ends and at least at every third set of posts horizontally (measured from only one end) and every fourth runner vertically. Bracing shall extend diagonally from the inner or outer posts or runners upward to the next outer or inner posts or runners. Building ties shall

be installed at the bearer levels between the transverse bracing and shall conform to the requirements of §1926.451(c)(1).

(3) On straight run scaffolds, longitudinal bracing across the inner and outer rows of posts shall be installed diagonally in both directions, and shall extend from the base of the end posts upward to the top of the scaffold at approximately a 45 degree angle. On scaffolds whose length is greater than their height, such bracing shall be repeated beginning at least at every fifth post. On scaffolds whose length is less than their height, such bracing shall be installed from the base of the end posts upward to the opposite end posts, and then in alternating directions until reaching the top of the scaffold. Bracing shall be installed as close as possible to the intersection of the bearer and post or runner and post.

(4) Where conditions preclude the attachment of bracing to posts, bracing shall be attached to the runners as close to the post as possible.

(5) Bearers shall be installed transversely between posts, and when coupled to the posts, shall have the inboard coupler bear directly on the runner coupler. When the bearers are coupled to the runners, the couplers shall be as close to the posts as possible.

(6) Bearers shall extend beyond the posts and runners, and shall provide full contact with the coupler.

(7) Runners shall be installed along the length of the scaffold, located on both the inside and outside posts at level heights (when tube and coupler guardrails and midrails are used on outside posts, they may be used in lieu of outside runners).

(8) Runners shall be interlocked on straight runs to form continuous lengths, and shall be coupled to each post. The bottom runners and bearers shall be located as close to the base as possible.

(9) Couplers shall be of a structural metal, such as drop-forged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

(10) Tube and coupler scaffolds over 125 feet in height shall be designed by a registered professional engineer, and shall be constructed and loaded in accordance with such design. Non-mandatory Appendix A contains examples of criteria that will enable an employer to comply with design and loading requirements for tube and coupler scaffolds under 125 feet in height.

(c) Fabricated frame scaffolds (tubular welded frame scaffolds).

(1) When moving platforms to the next level, the existing platform shall be left undisturbed until the new end frames

have been set in place and braced prior to receiving the new platforms.

(2) Frames and panels shall be braced by cross, horizontal, or diagonal braces, or combination thereof, which secure vertical members together laterally. The cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, level, and square. All brace connections shall be secured.

(3) Frames and panels shall be joined together vertically by coupling or stacking pins or equivalent means.

(4) Where uplift can occur which would displace scaffold end frames or panels, the frames or panels shall be locked together vertically by pins or equivalent means.

(5) Brackets used to support cantilevered loads shall:

(i) be seated with side-brackets parallel to the frames and end-brackets at 90 degrees to the frames;

(ii) not be bent or twisted from these positions; and

(iii) be used only to support personnel, unless the scaffold has been designed for other loads by a qualified engineer and built to withstand the tipping forces caused by those other loads being placed on the bracket-supported section of the scaffold.

(6) Scaffolds over 125 feet (38.0 m) in height above their base plates shall be designed by a registered professional engineer, and shall be constructed and loaded in accordance with such design.

(d) Plasterers', decorators', and large area scaffolds. Scaffolds shall be constructed in accordance with paragraphs (a), (b), or (c) of this section, as appropriate.

(e) Bricklayers' square scaffolds (squares). (1) Scaffolds made of wood shall be reinforced with gussets on both sides of each corner.

(2) Diagonal braces shall be installed on all sides of each square.

(3) Diagonal braces shall be installed between squares on the rear and front sides of the scaffold, and shall extend from the bottom of each square to the top of the next square.

(4) Scaffolds shall not exceed three tiers in height, and shall be so constructed and arranged that one square rests directly above the other. The upper tiers shall stand on a continuous row of planks laid across the next lower tier, and shall be nailed down or otherwise secured to prevent displacement.

(f) Horse scaffolds. (1) Scaffolds shall not be constructed or

arranged more than two tiers or 10 feet (3.0 m) in height, whichever is less.

(2) When horses are arranged in tiers, each horse shall be placed directly over the horse in the tier below.

(3) When horses are arranged in tiers, the legs of each horse shall be nailed down or otherwise secured to prevent displacement.

(4) When horses are arranged in tiers, each tier shall be cross braced.

(g) Form scaffolds and carpenters' bracket scaffolds.

(1) Each bracket, except those for wooden bracket-form scaffolds, shall be attached to the supporting form work or structure by means of one or more of the following: nails; a metal stud attachment device; welding; hooking over a secured structural supporting member, with the form wales either bolted to the form or secured by snap ties or tie bolts extending through the form and securely anchored; or, for carpenters' bracket scaffolds only, by a bolt extending through to the opposite side of the structure's wall.

(2) Wooden bracket-form scaffolds shall be an integral part of the form panel.

(3) Folding type metal brackets, when extended for use, shall be either bolted or secured with a locking-type pin.

(h) Roof bracket scaffolds. (1) Scaffold brackets shall be constructed to fit the pitch of the roof and shall provide a level support for the platform.

(2) Brackets (including those provided with pointed metal projections) shall be anchored in place by nails unless it is impractical to use nails. When nails are not used, brackets shall be secured in place with first-grade manila rope of at least three-fourth inch (1.9 cm) diameter, or equivalent.

(i) Outrigger scaffolds. (1) The inboard end of outrigger beams, measured from the fulcrum point to the extreme point of anchorage, shall be not less than one and one-half times the outboard end in length.

(2) Outrigger beams fabricated in the shape of an I-beam or channel shall be placed so that the web section is vertical.

(3) The fulcrum point of outrigger beams shall rest on secure bearings at least 6 inches (15.2 cm) in each horizontal dimension.

(4) Outrigger beams shall be secured in place against movement, and shall be securely braced at the fulcrum point against tipping.

(5) The inboard ends of outrigger beams shall be securely anchored either by means of braced struts bearing against sills

in contact with the overhead beams or ceiling, or by means of tension members secured to the floor joists underfoot, or by both.

(6) The entire supporting structure shall be securely braced to prevent any horizontal movement.

(7) To prevent their displacement, platform units shall be nailed, bolted, or otherwise secured to outriggers.

(8) Scaffolds and scaffold components shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with such design.

(j) Pump jack scaffolds. (1) Pump jack brackets, braces, and accessories shall be fabricated from metal plates and angles. Each pump jack bracket shall have two positive gripping mechanisms to prevent any failure or slippage.

(2) Poles shall be secured to the structure by rigid triangular bracing or equivalent at the bottom, top, and other points as necessary. When the pump jack has to pass bracing already installed, an additional brace shall be installed approximately 4 feet (1.2 m) above the brace to be passed, and shall be left in place until the pump jack has been moved and the original brace reinstalled.

(3) When guardrails are used for fall protection, a workbench may be used as the toprail only if it meets all the requirements in paragraphs (g)(4)(ii), (vii), (viii), and (xiii) of §1926.451.

(4) Work benches shall not be used as scaffold platforms.

(5) When poles are made of wood, the pole lumber shall be straight-grained, free of shakes, large loose or dead knots, and other defects which might impair strength.

(6) When wood poles are constructed of two continuous lengths, they shall be joined together with the seam parallel to the bracket.

(7) When two by fours are spliced to make a pole, mending plates shall be installed at all splices to develop the full strength of the member.

(k) Ladder jack scaffolds. (1) Platforms shall not exceed a height of 20 feet (6.1 m).

(2) All ladders used to support ladder jack scaffolds shall meet the requirements of subpart X of this part--Stairways and Ladders, except that job-made ladders shall not be used to support ladder jack scaffolds.

(3) The ladder jack shall be so designed and constructed that it will bear on the side rails and ladder rungs or on the ladder rungs alone. If bearing on rungs

only, the bearing area shall include a length of at least 10 inches (25.4 cm) on each rung.

(4) Ladders used to support ladder jacks shall be placed, fastened, or equipped with devices to prevent slipping.

(5) Scaffold platforms shall not be bridged one to another.

(l) Window jack scaffolds. (1) Scaffolds shall be securely attached to the window opening.

(2) Scaffolds shall be used only for the purpose of working at the window opening through which the jack is placed.

(3) Window jacks shall not be used to support planks placed between one window jack and another, or for other elements of scaffolding.

(m) Crawling boards (chicken ladders). (1) Crawling boards shall extend from the roof peak to the eaves when used in connection with roof construction, repair, or maintenance.

(2) Crawling boards shall be secured to the roof by ridge hooks or by means that meet equivalent criteria (e.g., strength and durability).

(n) Step, platform, and trestle ladder scaffolds. (1) Scaffold platforms shall not be placed any higher than the second highest rung or step of the ladder supporting the platform.

(2) All ladders used in conjunction with step, platform and trestle ladder scaffolds shall meet the pertinent requirements of subpart X of this part—Stairways and Ladders, except that job-made ladders shall not be used to support such scaffolds.

(3) Ladders used to support step, platform, and trestle ladder scaffolds shall be placed, fastened, or equipped with devices to prevent slipping.

(4) Scaffolds shall not be bridged one to another.

(o) Single-point adjustable suspension scaffolds. (1) When two single-point adjustable suspension scaffolds are combined to form a two-point adjustable suspension scaffold, the resulting two-point scaffold shall comply with the requirements for two-point adjustable suspension scaffolds in paragraph (p), below.

(2) The supporting rope between the scaffold and the suspension device shall be kept vertical unless all of the following conditions are met:

(i) The rigging has been designed by a qualified person, and

(ii) The scaffold is accessible to rescuers, and

(iii) The supporting rope is protected to ensure that it will not chafe at any point where a change in direction occurs, and

(iv) The scaffold is positioned so that swinging cannot bring the scaffold into contact with another surface.

(3) Boatswains' chair tackle shall consist of correct size ball bearings or bushed blocks containing safety hooks and properly "eye-spliced" minimum five-eighth (5/8) inch (1.6 cm) diameter first-grade manila rope, or other rope which will satisfy the criteria (e.g., strength and durability) of manila rope.

(4) Boatswains' chair seat slings shall be reeved through four corner holes in the seat; shall cross each other on the underside of the seat; and shall be rigged so as to prevent slippage which could cause an out-of-level condition.

(5) Boatswains' chair seat slings shall be a minimum of five-eighth (5/8) inch (1.6 cm) diameter fiber, synthetic, or other rope which will satisfy the criteria (e.g., strength, slip resistance, durability, etc.) of first grade manila rope.

(6) When a heat-producing process such as gas or arc welding is being conducted, boatswains' chair seat slings shall be a minimum of three-eighth (3/8) inch (1.0 cm) wire rope.

(7) Non-cross-laminated wood boatswains' chairs shall be reinforced on their underside by cleats securely fastened to prevent the board from splitting.

(p) Two-point adjustable suspension scaffolds (swing stages).

NOTE: The following requirements do not apply to two-point adjustable suspension scaffolds used as masons' or stone setters' scaffolds. Such scaffolds are covered by paragraph (q) of this section.

(1) Platforms shall not be more than 36 inches (0.9 m) wide unless designed by a qualified person to prevent unstable conditions.

(2) The platform shall be securely fastened to hangers (stirrups) by U-bolts or by other means which satisfy the requirements of §1926.451(a).

(3) The blocks for fiber or synthetic ropes shall consist of at least one double and one single block. The sheaves of all blocks shall fit the size of the rope used.

(4) Platforms shall be of the ladder-type, plank-type, beam-type, or light-metal type. Light metal-type platforms having a rated capacity of 750 pounds or less and platforms 40 feet (12.2 m) or less in length shall be tested and listed by a nationally recognized testing laboratory.

(5) Two-point scaffolds shall not be bridged or otherwise connected one to another during raising and lowering operations unless the bridge connections are articulated (attached), and the hoists properly sized.

(6) Passage may be made from one platform to another only when the platforms are at the same height, are abutting, and walk-through stirrups specifically designed for this purpose are used.

(q) Multi-point adjustable suspension scaffolds, stone setters' multi-point adjustable suspension scaffolds, and masons' multi-point adjustable suspension scaffolds.

(1) When two or more scaffolds are used they shall not be bridged one to another unless they are designed to be bridged, the bridge connections are articulated, and the hoists are properly sized.

(2) If bridges are not used, passage may be made from one platform to another only when the platforms are at the same height and are abutting.

(3) Scaffolds shall be suspended from metal outriggers, brackets, wire rope slings, hooks, or means that meet equivalent criteria (e.g., strength, durability).

(r) Catenary scaffolds. (1) No more than one platform shall be placed between consecutive vertical pickups, and no more than two platforms shall be used on a catenary scaffold.

(2) Platforms supported by wire ropes shall have hook-shaped stops on each end of the platforms to prevent them from slipping off the wire ropes. These hooks shall be so placed that they will prevent the platform from falling if one of the horizontal wire ropes breaks.

(3) Wire ropes shall not be tightened to the extent that the application of a scaffold load will over stress them.

(4) Wire ropes shall be continuous and without splices between anchors.

(s) Float (ship) scaffolds. (1) The platform shall be supported by a minimum of two bearers, each of which shall project a minimum of 6 inches (15.2 cm) beyond the platform on both sides. Each bearer shall be securely fastened to the platform.

(2) Rope connections shall be such that the platform cannot shift or slip.

(3) When only two ropes are used with each float:

(i) They shall be arranged so as to provide four ends which are securely fastened to overhead supports.

(ii) Each supporting rope shall be hitched around one end of the bearer and pass under the platform to the other end of the bearer where it is hitched again, leaving sufficient rope at each end for the supporting ties.

(t) Interior hung scaffolds. (1) Scaffolds shall be suspended only from the roof structure or other structural member such as ceiling beams.

(2) Overhead supporting members (roof structure, ceiling beams, or other structural members) shall be inspected and checked for strength before the scaffold is erected.

(3) Suspension ropes and cables shall be connected to the overhead supporting members by shackles, clips, thimbles, or other means that meet equivalent criteria (e.g., strength, durability).

(u) Needle beam scaffolds. (1) Scaffold support beams shall be installed on edge.

(2) Ropes or hangers shall be used for supports, except that one end of a needle beam scaffold may be supported by a permanent structural member.

(3) The ropes shall be securely attached to the needle beams.

(4) The support connection shall be arranged so as to prevent the needle beam from rolling or becoming displaced.

(5) Platform units shall be securely attached to the needle beams by bolts or equivalent means. Cleats and overhang are not considered to be adequate means of attachment.

(v) Multi-level suspended scaffolds. (1) Scaffolds shall be equipped with additional independent support lines, equal in number to the number of points supported, and of equivalent strength to the suspension ropes, and rigged to support the scaffold in the event the suspension rope(s) fail.

(2) Independent support lines and suspension ropes shall not be attached to the same points of anchorage.

(3) Supports for platforms shall be attached directly to the support stirrup and not to any other platform.

(w) Mobile scaffolds. (1) Scaffolds shall be braced by cross, horizontal, or diagonal braces, or combination thereof, to prevent racking or collapse of the scaffold and to secure vertical members together laterally so as to automatically square and align the vertical members. Scaffolds shall be plumb, level, and squared. All brace connections shall be secured.

(l) Scaffolds constructed of tube and coupler components shall also comply with the requirements of §1926.452(b);

(ii) Scaffolds constructed of fabricated frame components shall also comply with the requirements of §1926.452(c).

(2) Scaffold casters and wheels shall be locked with positive wheel and/or wheel and swivel locks, or equivalent means, to prevent movement of the scaffold while the scaffold is used in a stationary manner.

(3) Manual force used to move the scaffold shall be applied as close to the base as practicable, but not more than 5 feet (1.5 m) above the supporting surface.

(4) Power systems used to propel mobile scaffolds shall be designed for such use. Forklifts, trucks, similar motor vehicles or add-on motors shall not be used to propel scaffolds unless the scaffold is designed for such propulsion systems.

(5) Scaffolds shall be stabilized to prevent tipping during movement.

(6) Employees shall not be allowed to ride on scaffolds unless the following conditions exist:

(i) The surface on which the scaffold is being moved is within 3 degrees of level, and free of pits, holes, and obstructions;

(ii) The height to base width ratio of the scaffold during movement is two to one or less, unless the scaffold is designed and constructed to meet or exceed nationally recognized stability test requirements such as those listed in paragraph (x) of Appendix A to this subpart (ANSI/SIA A92.5 and A92.6);

(iii) Outrigger frames, when used, are installed on both sides of the scaffold;

(iv) When power systems are used, the propelling force is applied directly to the wheels, and does not produce a speed in excess of 1 foot per second (.3 mps); and

(v) No employee is on any part of the scaffold which extends outward beyond the wheels, casters, or other supports.

(7) Platforms shall not extend outward beyond the base supports of the scaffold unless outrigger frames or equivalent devices are used to ensure stability.

(8) Where leveling of the scaffold is necessary, screw jacks or equivalent means shall be used.

(9) Caster stems and wheel stems shall be pinned or otherwise secured in scaffold legs or adjustment screws.

(10) Before a scaffold is moved, each employee on the scaffold shall be made aware of the move.

(x) Repair bracket scaffolds.

(1) Brackets shall be secured in place by at least one wire rope at least ½ inch (1.27 cm) in diameter.

(2) Each bracket shall be attached to the securing wire rope (or ropes) by a positive locking device capable of preventing the unintentional detachment of the bracket from the rope, or by equivalent means.

(3) Each bracket, at the contact point between the supporting structure and the bottom of the bracket, shall be provided with a shoe (heel block or foot) capable of preventing the lateral movement of the bracket.

(4) Platforms shall be secured to the brackets in a manner that will prevent the separation of the platforms from the brackets and the movement of the platforms or the brackets on a completed scaffold.

(5) When a wire rope is placed around the structure in order to provide a safe anchorage for personal fall arrest systems used by employees erecting or dismantling scaffolds, the wire rope shall meet the requirements of subpart M of this part, but shall be at least 5/16 inch (0.8 cm) in diameter.

(6) Each wire rope used for securing brackets in place or as an anchorage for personal fall arrest systems shall be protected from damage due to contact with edges, corners, protrusions, or other discontinuities of the supporting structure or scaffold components.

(7) Tensioning of each wire rope used for securing brackets in place or as an anchorage for personal fall arrest systems shall be by means of a turnbuckle at least 1 inch (2.54 cm) in diameter, or by equivalent means.

(8) Each turnbuckle shall be connected to the other end of its rope by use of an eye splice thimble of a size appropriate to the turnbuckle to which it is attached.

(9) U-bolt wire rope clips shall not be used on any wire rope used to secure brackets or to serve as an anchor for personal fall arrest systems.

(10) The employer shall ensure that materials shall not be dropped to the outside of the supporting structure.

(11) Scaffold erection shall progress in only one direction around any structure.

(y) Stilts

Stilts, when used, shall be used in accordance with the following requirements:

(1) An employee may wear stilts on a scaffold only if it is a large area scaffold.

(2) When an employee is using stilts on a large area scaffold where a guardrail system is used to provide fall protection, the guardrail system shall be increased in height by an amount equal to the height of the stilts being used by the employee.

(3) Surfaces on which stilts are used shall be flat and free of pits, holes and obstructions, such as debris, as well as other tripping and falling hazards.

(4) Stilts shall be properly maintained. Any alteration of the original equipment shall be approved by the manufacturer.

§1926.556 is redesignated as §1926.453 and is revised to read as follows:

1926.453 Aerial lifts.

(a) General requirements. (1) Unless otherwise provided in this section, aerial lifts acquired for use on or after the effective date of this section shall be designed and constructed in conformance with the applicable requirements of the American National Standards for "Vehicle Mounted Elevating and Rotating Work Platforms," ANSI A92.2-1969, including appendix. Aerial lifts acquired before the effective date of this section, which do not meet the requirements of ANSI A92.2-1969, may not be used after January 1, 1976, unless they shall have been modified so as to conform with the applicable design and construction requirements of ANSI A92.2-1969. Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to job-sites above ground: (i) Extensible boom platforms; (ii) aerial ladders; (iii) articulating boom platforms; (iv) vertical towers; and (v) a combination of any of the above. Aerial equipment may be made of metal, wood, fiberglass reinforced plastic (FRP), or other material; may be powered or manually operated; and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(2) Aerial lifts may be "field modified" for uses other than those intended by the manufacturer provided the modification has been certified in writing by the manufacturer or by any other equivalent entity, such as a nationally recognized testing laboratory, to be in conformity with all applicable provisions of ANSI A92.2-1969 and this section and to be at least as safe as the equipment was before modification.

(b) Specific requirements. (1) Ladder trucks and tower trucks. Aerial ladders shall be secured in the lower traveling position by the locking device on top of the truck cab, and the manually operated device at the base of the ladder before the truck is moved for highway travel.

(2) Extensible and articulating boom platforms. (i) Lift controls shall be tested each day prior to use to determine that such controls are in safe working condition.

(ii) Only authorized persons shall operate an aerial lift.

(iii) Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.

(iv) Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

(v) A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.

(vi) Boom and basket load limits specified by the manufacturer shall not be exceeded.

(vii) The brakes shall be set and when outriggers are used, they shall be positioned on pads or a solid surface. Wheel chocks shall be installed before using an aerial lift on an incline, provided they can be safely installed.

(viii) An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation in accordance with the provisions of paragraphs (a)(1) and (2) of this section.

(ix) Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

(x) Climbers shall not be worn while performing work from an aerial lift.

(xi) The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating value.

(xii) Before moving an aerial lift for travel, the boom(s) shall be inspected to see that it is properly cradled and outriggers are in stowed position except as provided in paragraph (b)(2)(viii) of this section.

(3) Electrical tests. All electrical tests shall conform to the requirements of ANSI A92.2-1969 section 5. However equivalent d.c. voltage tests may be used in lieu of the a.c. voltage specified in A92.2-1969; d.c. voltage tests which are approved by the equipment manufacturer or equivalent entity shall be considered an

equivalent test for the purpose of this paragraph (b)(3).

(4) Bursting safety factor. The provisions of the American National Standards Institute standard ANSI A92.2-1969, section 4.9 Bursting Safety Factor shall apply to all critical hydraulic and pneumatic components. Critical components are those in which a failure would result in a free fall or free rotation of the boom. All noncritical components shall have a bursting safety factor of at least 2 to 1.

(5) Welding standards. All welding shall conform to the following standards as applicable:

(i) Standard Qualification Procedure, AWS B3.0-41.

(ii) Recommended Practices for Automotive Welding Design, AWS D8.4-61.

(iii) Standard Qualification of Welding Procedures and Welders for Piping and Tubing, AWS D10.9-69.

(iv) Specifications for Welding Highway and Railway Bridges, AWS D2.0-69.

NOTE: Non-mandatory Appendix C lists examples of national consensus standards that are considered to provide employee protection equivalent to that provided through the application of ANSI A92.2-1969, where appropriate. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American National Standards Institute. Copies may be inspected at the Docket Office, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Avenue, NW., room N2634, Washington, DC or at the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC.

§1926.454 Training requirements.

NOTE: This section supplements and clarifies the requirements of §1926.21(b)(2) as these relate to the hazards of work on scaffolds.

(a) The employer shall have each employee who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards. The training shall include the following areas, as applicable:

(1) The nature of any electrical hazards, fall hazards and falling object hazards in the work area;

(2) The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling

the fall protection systems and falling object protection systems being used;

(3) The proper use of the scaffold, and the proper handling of materials on the scaffold;

(4) The maximum intended load and the load-carrying capacities of the scaffolds used; and

(5) Any other pertinent requirements of this subpart.

(b) The employer shall have each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold trained by a competent person to recognize any hazards associated with the work in question. The training shall include the following topics, as applicable:

(1) The nature of scaffold hazards;

(2) The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question;

(3) The design criteria, maximum intended load-carrying capacity and intended use of the scaffold;

(4) Any other pertinent requirements of this subpart.

(c) When the employer has reason to believe that an employee lacks the skill or understanding needed for safe work involving the erection, use or dismantling of scaffolds, the employer shall retrain each such employee so that the requisite proficiency is regained. Retraining is required in at least the following situations:

(1) Where changes at the worksite present a hazard about which an employee has not been previously trained; or

(2) Where changes in the types of scaffolds, fall protection, falling object protection, or other equipment present a hazard about which an employee has not been previously trained; or

(3) Where inadequacies in an affected employee's work involving scaffolds indicate that the employee has not retained the requisite proficiency.

Non-mandatory Appendix A to Subpart L -- Scaffold Specifications

This Appendix provides non-mandatory guidelines to assist employers in complying with the requirements of subpart L of this part. An employer may use these guidelines and tables as a starting point for designing scaffold systems. However, the guidelines do not provide all the information necessary to build a complete system, and the employer is still responsible for designing and assembling these components in such a way that the completed system will meet the requirements of final rule §1926.451(a). Scaffold components which are not selected and loaded in accordance with this Appendix, and components for which no specific guidelines or tables are given in this Appendix (e.g., joints, ties, components for wood pole scaffolds more than 60 feet in height, components for heavy-duty horse scaffolds, components made with other materials, and components with other dimensions, etc.) must be designed and constructed in accordance with the capacity requirements of final rule §1926.451(a), and loaded in accordance with final rule §1926.451(d)(1). As noted in final rule §1926.451(a), the guidelines in this Appendix have been derived from tables and other information in existing §1926.451.