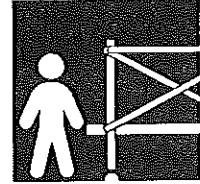




Section D. Scaffolding



Scaffolding is a vital part of the construction process. To ensure the safety of workers and the public, scaffolding must be handled properly. A competent person should be present at the worksite during the entire scaffold construction process to ensure that all scaffolding is erected, moved, used, and dismantled safely.

1. General Requirements

a. Scaffolding shall not be erected, moved, dismantled, or altered except under the supervision of a competent person.

29 Code of Federal Regulations
(CFR) 1926.451(a)(3)



b. To prevent the scaffold from swaying or being displaced, the upright members shall be plumb.

29 CFR 1926.451(a)(15)

c. Shore scaffolds or lean-to scaffolds are prohibited.

29 CFR 1926.451(a)(20)

Do not use the face of the wall being worked to support worker weight.

d. If workers pass under or work under scaffolding, US Standard #18 gauge, 1/2-inch wire mesh shall be installed between the toeboard and the midrail.

29 CFR 1926.451(a)(6)

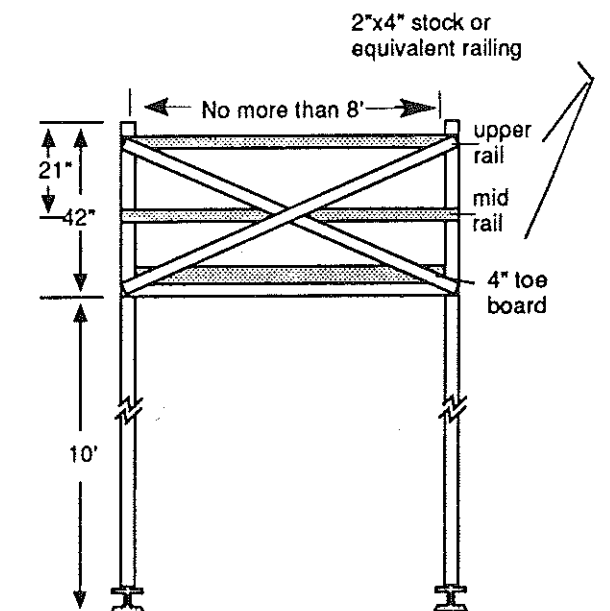
e. Any part of the scaffolding (including accessories) that is damaged or weakened shall be immediately repaired or replaced.

29 CFR 1926.451(a)(8)

f. Standard guardrails and toeboards shall be installed on all open sides and ends of scaffolds over 10 feet high, and on scaffolds 4 feet to 10 feet high with a minimum horizontal dimension in either direction of less than 45 inches. Guardrails shall be 2 x 4 inches or the equivalent,

shall be 42 inches high from planking to the top, and have a midrail and a 4-inch-high toeboard. Intervals between vertical supports shall not exceed 8'.

29 CFR 1926.451(a)(4,5)



g. Unstable objects (for example, barrels, boxes, loose bricks, or loosely stacked wood) shall not be used as a foundation for scaffolding or planking.

29 CFR 1926.451(a)(2)

h. To prevent the scaffold from settling or being displaced, the footings shall be sound, rigid, and able to support the intended load. To distribute the scaffold load evenly, the footings shall be placed on mud boards.

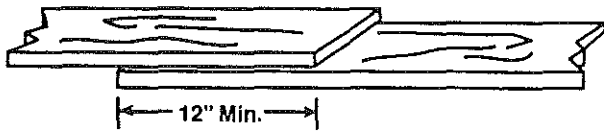
29 CFR 1926.451(a)(2)

i. Scaffold workers who are exposed to falling objects shall be provided with overhead protection by planking or 1/2" plywood (or the equivalent) that fully covers the overhead scaffold base.

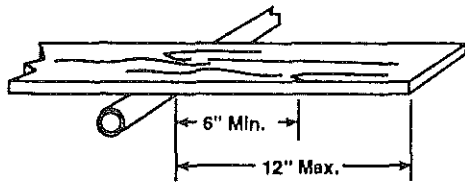
29 CFR 1926.451(a)(16)



- j. Scaffold planking shall be overlapped a minimum of 12 inches or be securely attached to the scaffolding.
29 CFR 1926.451(a)(12)



- k. Scaffold planks shall extend beyond their end supports not less than 6 inches nor more than 12 inches.
29 CFR 1926.451(a)(14)



- l. A scaffold may not be used until any tripping or slippery conditions (for example, snow, ice, mud, or loose materials) have been removed.
29 CFR 1926.451(a)(17)

- m. Workers shall use an access ladder or built-on scaffold ladder to reach their work areas; they shall not climb on scaffold cross members.
29 CFR 1926.451(a)(13)

- n. Only materials for immediate use shall be stored on scaffolds, and they shall not overload its capacity. A scaffold must be able to support 4 times the intended load.
29 CFR 1926.250(b)(5); 451(A)(7)

- o. Planking shall be of scaffold grade, or the equivalent, as recognized by approved grading rules for species of wood used. See Table D-1.
29 CFR 1926.451(a)(10)

Table D-1 Planking Material

(Maximum permissible spans for 2- x 10-inch or wider planks).					
Working Load (psf)	Full thickness undressed lumber			Nominal thickness lumber	
	25	50	75	25	50
Permissible Span (ft)	10	8	6	8	6

*Not recommended for heavy duty use.

- p. The following scaffolds must be designed by a registered professional engineer competent in this field:

- wood pole scaffolds over 60 feet in height,
- tube and coupler scaffolds that exceed the parameters in tables D-1 and D-2 of this guide,
- frame scaffolds over 125 feet in height, and
- outrigger scaffolds plus scaffold erections.
29 CFR 1926.451(b)(16), (c)(4), (d)(9), (g)(3)



2. Tubular Welded-Frame Scaffolds

- a. Scaffolding shall be cross-braced or braced diagonally so that the vertical members are secure and aligned; the scaffolding must also be plumb, square, and rigid.
29 CFR 1926.451(d)(3)

- b. Individual sections of the scaffolding shall be locked together with cotter pins or another equivalent means. If any defect in the locking mechanism is found, workers shall stop work immediately and wait until the scaffolding is repaired.
29 CFR 1926.451(d)(6)

- c. Scaffolds shall be securely tied to the building at intervals of 30 feet horizontal and 26 feet vertical. Never tie to an unstable support or wall. Ties are for lateral stability only and should never support weight.
29 CFR 1926.451(d)(7)

3. Tube and Coupler Scaffolds

Tube and coupler scaffolds shall be able to support four times the maximum intended load. See Table D-2.
29 CFR 1926.451(c)(5)



Table D-2 Tube and Coupler Scaffolds Maximum Intended Loads

Light Duty		
Uniform distributed load.....	Not to exceed 25 psf	
Post spacing (longitudinal).....	10 ft 0 in.	
Post spacing (transverse).....	6 ft 0 in.	
Working levels	Additional planked levels	Maximum height
1	8	125 ft
2	4	125 ft
3	0	91 ft
Medium Duty		
Uniform distributed load.....	Not to exceed 50 psf	
Post spacing (longitudinal).....	8 ft 0 in.	
Post spacing (transverse).....	6 ft 0 in.	
Working levels	Additional planked levels	Maximum height
1	6	125 ft
2	0	78 ft
Heavy Duty		
Uniform distributed load.....	Not to exceed 75 psf	
Post spacing (longitudinal).....	6 ft 6 in.	
Post spacing (transverse).....	6 ft 0 in.	
Working levels	Additional planked levels	Maximum height
1	6	125 ft

4. Manually Propelled Mobile Scaffolds

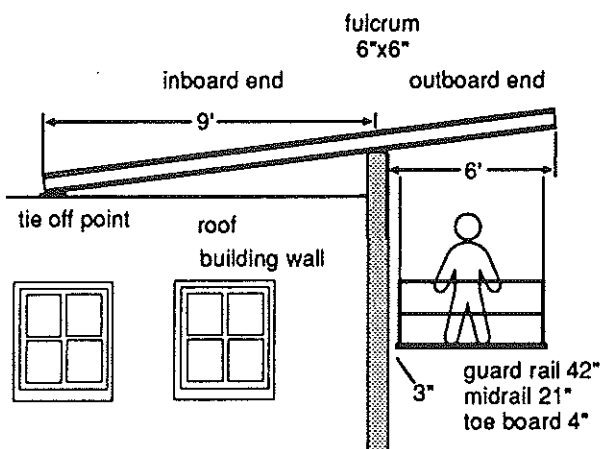
- a. When a free-standing mobile scaffold tower is used, the height of the tower shall not exceed 4 times the minimum base dimensions. For example, if the base is 10 feet x 20 feet, the maximum height is 40 feet.
29 CFR 1926.451(e)(1)
- b. To prevent planks from moving off the scaffold, they shall be laid close together, extend along the full width of the scaffold and be secured in place.
29 CFR 1926.451(e)(4)
- c. Scaffold casters rated to support 4 times the maximum scaffold load (including the workers and equipment) shall be used. All mobile scaffolds shall be equipped with wheel locks that shall be locked at all times when the scaffold is in use.
29 CFR 1926.451(e)(2)

d. Workers should not ride on a scaffold when it is moved. All tools, construction material, and other items that might fall from the scaffold shall be secured or removed before it is relocated.
29 CFR 1926.451(e)(7)

e. At each new location, a mobile scaffold shall be placed on firm ground and kept plumb, and casters shall be locked to prevent movement.
29 CFR 1926.451(e)(8)

5. Outrigger Scaffolds

a. Outrigger beams shall not extend more than 6 feet from the face of the building.
29 CFR 1926.451(g)(1)



b. The length of the inboard end of outrigger beams, measured from the fulcrum to anchor point, shall be not less than 1 1/2 times the length of the outboard end. The beams shall rest on edge, the sides shall be plumb, and the edges shall be horizontal.
29 CFR 1926.451(g)(1)

c. The fulcrum of the beam shall rest on a secure bearing that is at least 6 inches in each horizontal direction.
29 CFR 1926.451(g)(1)

d. To ensure that the beam does not move or tip, it shall be secured to the fulcrum.
29 CFR 1926.451(g)(1)

e. To prevent tipping or any horizontal movement, the inboard ends of the beams shall be securely anchored to an adjoining secure structure.
29 CFR 1926.451(g)(2)



Table D-3 Outrigger Scaffolding Requirements

Scaffold Accessory	Minimum Dimensions for Light Duty (25 psf)	Minimum Dimensions for Medium Duty (50 psf)
Outrigger beams	2" x 10"	3" x 10"
Maximum outrigger spacing	10'	6'
Planking	2" x 10"	2" x 10"
Guardrail	2" x 4"	2" x 4"
Guardrail uprights	2" x 4"	2" x 4"
Toeboard	4"	4"

f. Scaffold-grade boards shall be used for planking; the boards shall be arranged with no space between them and placed to within 3 inches of the building wall. Planking shall be securely attached to the scaffold beams.

29 CFR 1926.451(g)(4)

g. Outrigger scaffolding shall be designed in accordance with the requirements of Table D-3 or by a registered professional engineer competent in the field.

29 CFR 1926.451(g)(3)



6. Two-Point Suspension Scaffolds (Swinging Scaffolds)

a. The platform on a two-point suspension scaffold shall be not less than 20 inches nor more than 36 inches wide. The platform shall be fastened securely to the hangers with U-bolts or other equivalent means.

29 CFR 1926.451(i)(1)

b. Employees shall be protected by a safety harness that is attached to a life line; the life line shall be attached to a secure structure (not to the scaffold). For more details on fall protection, see paragraph III.A.2.g of this guide.

29 CFR 1926.451(i)(8)

c. The roof irons or hooks shall be constructed of mild steel, or other equivalent material, and securely installed and anchored to a solid part of the adjoining structure. Three-quarter-inch manila rope tie-backs, or the equivalent, which must be attached to a structurally sound portion of the building, shall be used as a back-up anchor.

29 CFR 1926.451(i)(4)

d. The scaffold shall be suspended with wire rope, fiber rope, or synthetic rope that can support 6 times the weight

of the scaffold plus workers and equipment. All scaffold components shall be capable of supporting 4 times the scaffold's rated load.

29 CFR 1926.451(i)(5)

e. To prevent damage to the rope, the sheaves of all blocks shall fit the size and type of rope used.

29 CFR 1926.451(i)(6)

f. To prevent the scaffold from swaying, it shall be lashed to the building with nylon rope or other appropriate means.

29 CFR 1926.451(i)(9)

g. All wire, fiber, and synthetic ropes; slings; hangers; platforms; or other supporting parts of the scaffolding shall be inspected before each installation. When the scaffold is being used, these parts shall be inspected daily.

29 CFR 1926.451(i)(7)

h. The number of workers on a suspension scaffold shall be limited to no more than the rated capacity divided by 250 pounds; i.e., a scaffold rated at 500 pounds allows two workers, a 750-pound rating allows three workers.

29 CFR 1926.451(i)(8)

7. Boatswain's Chair

a. If a boatswain's chair is used during gas or arc welding, the chair support slings shall be made of 3/8-inch wire rope.

29 CFR 1926.451(l)(3)

b. A worker in a boatswain's chair shall wear a safety harness and a life line that is attached to a secure structure. For more details on fall protection, see III.A.2.g of this guide.

29 CFR 1926.451(l)(4)



c. The roof irons, hooks, and anchor points that support the boatswain's chair shall be securely attached to the structure.

29 CFR 1926.451(l)(6)

d. The seat in a boatswain's chair shall be at least 12 x 24 x 1 inch thick. To prevent the chair from splitting, the underside shall be reinforced with cleats that are securely fastened to the board under the seat. The two fiber

rope seat slings shall be at least 5/8" in diameter, pass through the four seat holes, and cross on the underside.

29 CFR 1926.451(l)(1,2)

8. Other Scaffolds

Other types of scaffolds and scaffold materials or equipment that are allowed but not covered in this section shall meet the specific requirements of 29 CFR 1926.451 and/or ANSI A10.8.

**DEFINITIONS**

Boatswains' Chair — A type of scaffold that includes a seat supported by slings that are attached to a suspended rope.

Guardrail — A horizontal rail that is secured to the upright parts of a scaffold and is installed along the exposed sides and ends of the platforms. The upper rail is installed 42 inches above the planking and the midrail is 21 inches high. Guardrails must be rated to support 200 pounds laterally. A standard guardrail includes a 4 inch toeboard.

Manually Propelled Mobile Scaffold — A portable, rolling scaffold supported on casters.

Maximum Rated Load — The weight a scaffold is designed to safely support.

Mud Board — Plywood, planking, or a metal plate that is placed between the ground and the scaffold footing and is used to level the scaffold. The minimum size must be 10- x 10- x 1-inch plywood, 10- x 10- x 2-inch planking, or a 1/2-inch metal plate.

Outrigger Scaffold — A scaffold supported by outriggers or throw-outs projecting from the wall or face of the building. The inboard ends of the scaffold are secured to the building.

Plumb — Exactly vertical (90°) or true.

psf — Pound per square foot.

Scaffold — Any temporary elevated platform, and its supporting structures, that is used for supporting workers and material.

Scaffold Grade Planking — Long-grain knot-free 2" x 10" planks that are graded and marked for scaffold use.

Toeboard — A barrier along the bottom, sides, and ends of a scaffold that prevents material from falling below. Toeboards shall be at least 4 inches high.

Tube and Coupler Scaffold — A scaffold constructed from straight metal pipes (tubes) held together by metal clamps (couplers).

Tubular Welded-Frame Scaffold — A sectional panel or frame scaffold that is built of prefabricated, welded horizontal and vertical sections.

Two-Point Suspension Scaffold (Swinging Scaffold) — A scaffold that is suspended from overhead supports allowing the work platform to be lowered or raised to any desired height using tackle (line and pulley) or hoisting machines.

**KEY ITEMS CHECK LIST
SECTION D. SCAFFOLDING**

Item	Paragraph	Notes
1. GENERAL REQUIREMENTS	D.1	
Is scaffolding designed, erected, moved, and dismantled only under the direction of a competent person?	D.1.a	
Are only permissible types of scaffolds used?	D.1.c	
Is scaffolding correctly supported on a solid base?	D.1.g D.1.b	
Are upright members plumbed?	D.1.b	
Are workers protected from falling objects by toe boards, wire mesh, solid planking, and overhead protection?	D.1.d	
Are workers protected from falls of 10 feet or more by standard guardrails, safe access ladders, and solid planking and by correcting slippery conditions?	D.1.f D.1.j D.1.k D.1.m	
Are the design requirements met and are scaffolds loaded only to the maximum so as to protect workers from scaffold collapse?	D.1.o D.1.b D.1.h D.1.n	
2. TUBULAR WELDED-FRAME SCAFFOLDS	D.2	
Are sections correctly supported, plumbed, cross braced, aligned, squared, and made rigid?	D.2.a D.2.b D.2.c	
Are sections over 10 feet in height fitted with standard guardrails and toeboards?	D.1.f	
Are sections tied for lateral stability?	D.2.c	
3. TUBE AND COUPLER SCAFFOLDS	D.3	
Is care taken not to exceed load limits?	D.3	
4. MANUALLY PROPELLED MOBILE SCAFFOLDS	D.4	
Is the minimum base dimension at least 1/4 the height?	D.4.a	
Are working platforms fully planked?	D.4.b	
Are wheel locks used?	D.4.c D.4.e	
Are employees prevented from riding scaffolds when the scaffolds are moved?	D.4.d	

KEY ITEMS CHECK LIST (continued)

Item	Paragraph	Notes
5. OUTRIGGER SCAFFOLDS	D.5	
Does the outrigger extend less than 6 feet beyond the face of the building?	D.5.a	
Is the length of the inboard end of the beam at least 1-1/2 times the outboard end?	D.5.b	
Is the beam securely anchored at the inboard end and also attached to a fulcrum that has at least a 6 x 6 inch base?	D.5.c D.5.e	
6. TWO-POINT SUSPENSION SCAFFOLDS (SWINGING SCAFFOLDS)	D.6	
Are lifelines used to protect workers from falls?	D.6.b	
Are all required ropes and hardware inspected daily for damage and load-bearing adequacy?	D.6.g	
7. BOATSWAIN'S CHAIR	D.7	
Are belts and lifelines used to protect workers from falls ?	D.7.b	
Is wire rope used where welding is done from the chair?	D.7.a	
Are roof irons, hooks, and anchors firmly attached?	D.7.c	
Is the seat correctly rigged so that a broken seat will not result in a fall?	D.7.d	