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Section 13

Walking and Working Surfaces

This section sets forth safety standards and work practices for walking and working surfaces. It specifically addresses making work locations safe for access, using scaffolds, requirements of work platforms, and designing and constructing guardrails.

13.1 Safe Access to Work

Use ladders, stairways, or ramps that comply with the requirements of this section to provide safe access to all work locations (temporary or permanent).

- Provide a stairway, ladder, ramp, or manhoist at all personnel access points where elevation changes 19 inches or more.
- Keep at least one point of access between levels of buildings or structures, so employees can pass freely at all times.

13.1.1 Ladders. Use ladders where stairs or ramps cannot be installed. Ladder construction must comply with the applicable ladder safety code.

a. General Ladder Requirements

1. Electrical Hazard. Do not use portable metal ladders or wood ladders with metal reinforcements for any electrical work or in substations, switchyards, powerplants, pumping plants, or in any area where employees may contact energized circuits.

2. Maintenance. Routinely inspect and maintain all ladders. Promptly repair or remove broken or damaged ladders. Properly store ladders to prevent damage.

3. Securing Ladders. Portable ladders, except stepladders must be secured. Fixed ladders must be fixed, and don't require securing for use, portable ladders do not require intermediate support.

4. Location. Protect ladders placed in access ways or other locations where they may be displaced with barricades or guards. Keep the area immediately adjacent to the top and bottom of a ladder free from debris, materials, equipment, or other obstructions.

5. Restrictions. Use ladders as work platforms only for short duration tasks, and use only light tools or material (changing a light bulb, for example).

6. Use. Face ladders and keep hands free when going up or down ladders.

b. Portable Ladders

1. Design, construct, use, and maintain portable ladders according to the more stringent standards published in this subsection and ANSI A14.1, "Portable Wood Ladders," ANSI A14.2, "Portable Metal Ladders," and ANSI A14.5, "Portable Reinforced Plastic Ladders." Use only type 1A, extra heavy-duty industrial ladders.

2. Place portable ladders at a slope of 4:1 (vertical:horizontal).

3. Portable stepladders must be no more than 20 feet tall.

4. Employees working from ladders must remain within 20 feet of the floor.

5. Secure portable ladders against accidental displacement at the top and bottom. Portable ladders must extend at least 42 inches above the upper landing. Do not use stepladders for access.

6. Rest portable ladders on a firm foundation that can support the load without displacement.

7. Do not use extension sections of ladders as independent ladders.

8. Use job-made ladders only for their designed and constructed purpose and not as portable ladders.

9. Allow only one person at a time on a portable ladder.

10. Equip ladders with safety shoes, spurs, spikes, tread feet, or other slip-resistant devices at the base section of each rail. Use the appropriate device for the type of surface they are used on.

c. Fixed Ladders

1. Design, construct, use, and maintain fixed ladders according to the more stringent of standards in this subsection; ANSI A14.3, "Safety Requirements for Fixed Ladders," and ANSI A14.4, "Safety Requirements for Job-Made Ladders."

2. The climb length of fixed ladders must be 24 feet or less; otherwise, equip the ladder with a cage, well, or ladder climbing device or offset landings at 20-foot intervals. Ladders equipped with cages or ladder climbing devices must have a climb length of 30 feet or less between ground, floors, or offset landings. Bottom of cages must start between 7 and 8 feet from the base of each section of ladder. Install climbing devices so an employee can connect or disconnect while standing on ground, floors, or platform. Increase ladder widths to accommodate climbing devices. Do not use the reinforcing bar of fixed ladders as a rung or grab rail.

3. Provide a landing at the top of all fixed ladders and extend the side rails, stanchions, or other supports at least 42 inches above the landing.

4. Provide at least 7 inches of toe space from the centerline of the rung or step to the wall or other obstructions.

5. Provide two separate ladders or double-cleat ladders for access to and from work areas for 25 or more employees, or where simultaneous, two-way traffic is necessary.

6. Use nonslip material on rungs in slippery areas.

13.1.2 Stairways

a. Requirement. Use stairways for access to areas 20 feet or more above the adjacent surface, except for scaffolds which are commonly accessed by ladder. If scaffold is to be used for extended time periods, or if employees routinely carry tools or materials, stairs must be provided.

b. Design

1. Temporary Stairways. Design and construct temporary stairways with a live load safety factor of five, but never less than a moving concentrated load of 1,000 pounds. Install temporary stairways at 30- to 50-degree angles from horizontal. Use any uniform combination of rise/tread dimensions between 6-1/2- to 9-1/2-inch rise and 11- to 8-inch tread run, to obtain a stairway within this permissible range. Any flight of stairs with an unbroken rise of more than 12 feet must have a standard landing that extends at least 30 inches in the direction of travel. Where doors or gates open directly onto the stairway, provide a platform. The swing of the door or gate must not reduce the width of the platform to less than 20 inches. Provide a vertical clearance of at least 7 feet above any stair tread, measured from the leading edge.

2. Existing Permanent Stairways. On permanent stairways, riser must be no more than 7-1/2 inches high and treads no less than 10 inches deep. Adjacent steps must not vary by more than 3/16 inch. No flight of stairs may vary more than 3/8 inch.

3. New Permanent Stairways. New stairways must have risers no more than 7 inches high and treads no less than 11 inches deep.

c. Construction. Construct temporary stairways and handrails of materials without hazardous projections or surface imperfections, rigidly support them, and securely fasten stair treads in place**.**

d. Stair Railings and Handrails. Stairs with 4 or more risers, or rising more than 30 inches, must have standard railings and a standard handrail, as specified below**:**

- Less than 44 inches wide and both sides enclosed: at least one handrail on right side descending.
- Less than 44 inches wide and one side open: one stair railing on the open side.
- Less than 44 inches wide and both sides open: a stair railing on each side.
- More than 44 inches, but less than 88 inches, wide: one handrail on each enclosed side and a stair railing on each open side.
- More than 88 inches wide: one handrail on each enclosed side, plus a standard stair railing located midway (width).

e. Standard Stair Railing. Construct standard stair railings to the specifications set forth in "Standard Guardrails," except that no toeboard is required, and it must be at least 36 inches high (measured from top of the forward edge of the tread to the upper surface of the top rail). When the top edge of the stair rail system also serves as a handrail, the top edge must be 37 inches maximum height**.**

f. Standard Handrail. Securely mount a standard handrail on the wall or partition, enclosing the stairs. It must be between 30 and 37 inches high. Material and strength requirements must equal the stair railing. Mount the handrail with a minimum 1-1/2-inch clearance from any obstruction. Handrails must provide an adequate handhold for employees grasping them to avoid falling.

g. Projection Hazard. The ends of stair rail systems and handrails must not be a projection hazard**.**

h. Metal Pan Stairs. Where permanent metal pan stairs are set for temporary use, install treads of wood filler pieces flush with the pan rims**.**

i. Stairwells and Platforms. Protect platforms on all open sides with standard guardrails and toeboards.

j. Maintenance. Routinely maintain stairways. Keep stairs free from debris and materials. Eliminate slippery conditions as they occur.

13.1.3 Ramps.

a. Requirement. Substitute temporary access ramps, for stairways, when the slope or incline does not exceed 15 degrees. With prior approval, you may use cleated ramps for access on slopes up to 20 degrees.

b. Design.

1. Temporary Ramps. Design temporary ramps with a safety factor of five, with a minimum 100-pound-per-square-foot live load. The ramp must be at least 18 inches wide, yet not cause congestion of persons, materials, or equipment. Equip ramps with standard guardrails on open sides and with at least one handrail. Cleated ramps (chicken walks) must have 1- by 2-inch cleats. Space the cleats no more than 12 inches apart. The cleats must be as long as the width of the ramp. Secure them with nails, driven through the decking and clinched on the underside. Provide vehicle trestles, ramps, and bridges that permit foot traffic with a suitable walkway and guardrail outside of the roadway. Protect roadway ramps with timbers or curbs at least 8 inches high, secured to each side of the roadway.

2. Permanent Ramps. Permanent ramps must be at least 44 inches wide, and the slope must not exceed 1:12. The continuous slope must not have more than a 30-inch rise, unless there is a horizontal landing as long as the width of the ramp. When possible, ramps will be designed for handicap access. When the ramp is used for public access, wheelchair accessibility is required.

3. Overhead Protection. Provide overhead protection whenever falling objects could pose a hazard to the public, employees, or property. The overhead protection must be strong enough to withstand all potential impacts. Install overhead protection between 7 and 9 feet above the ramp.

13.2 Safe Use of Scaffolds

Provide scaffolds, platforms, or temporary floors whenever employees perform work that they cannot perform safely from the ground or from solid construction.

13.2.1 General Requirements.

a. Competent Person. A competent person must supervise erecting, dismantling, or altering of scaffolding. Such action must also comply with the requirements of this section and ANSI A10.8, "Construction and Demolition Operations - Scaffolding - Safety Requirements." (The more stringent standards must prevail.) Do not use ladders or makeshift devices to increase scaffolding height. Keep scaffolding working surfaces level.

b. Safety Factors. Wire or fiber rope used for scaffold suspension must be able to support at least six times the maximum intended load. All other scaffolds and their components must be able to support at least four times the maximum intended load.

c. Access. Access scaffolding by separate or integral ladders or by stairways. Do not use structural members to access scaffolding.

d. Nets, Lifelines, Lanyard, and Belts. When employees work on suspended or movable scaffolding (or scaffolding without standard guardrails), use a fall protection system.

e. Guardrails. Work platforms and scaffolds more than 6 feet above the ground or floor level must have standard guardrails, midrails, and toeboards on the open side and ends. (Exceptions are floats, needle beam, and ladder-supported scaffolds.) In addition, install standard guardrails on open sides and ends on scaffolds 4 to 6 feet high, erected above machinery or other hazards, or with a minimum horizontal dimension less than 45 inches in either direction.

f. Footing. The footing or anchorage for scaffolds must be sound, rigid, and able to carry the maximum intended load without settling or displacement. Do not use unstable objects (such as barrels, boxes, loose brick, or concrete blocks) to support scaffolds or planks.

g. Poles, Legs, Uprights. Make sure poles, legs, and uprights are plumb. Brace them securely and rigidly to prevent swaying or displacement.

h. Scaffold Lumber. All load-carrying wood members of scaffold framing, except planks, must be No. 1 Douglas fir, or equivalent. All dimensions are nominal sizes provided in the American Lumber Standards. However, rough sizes are an exception. When rough sizes are noted, only rough or undressed lumber of the specified size will satisfy minimum requirements.

i. Loadings. Load scaffolds only up to their designed working load. Store only those supplies needed for immediate operations on scaffolds.

j. Restrictions. While employees use or occupy scaffolds, do not alter or move them horizontally, unless specifically designed for such use.

k. Design. A professional engineer (PE) must design scaffolding with structural members or working surfaces that differ from those specified here. The COR or office head must accept the design before erecting the scaffolding onsite. The design of wood scaffolding members and connections must adhere to the "National Design Specifications for Wood Construction," published by the National Forest Products Association. To account for the additional safety factors for scaffolding, multiply basic allowable stresses therein by a factor of 0.065, and use a duration load adjustment of 1.25. These section multiplication factors are cumulative.

l. Overhead Protection. Provide overhead protection for employees who work on scaffolds and are exposed to falling objects.

m. Scaffold Enclosures. When employees must work under scaffolding, or the scaffold is above an accessway, enclose the scaffold on the open side and ends. Also, enclose the space between the decking and the form or wall. The protective enclosure must be No. 18 U.S. Standard gauge wire, or equivalent, with mesh of 0.5 inch or less.

n. Welding, Cutting, Burning, and Riveting. Do not weld, cut, burn, rivet, or perform open flame work on staging suspended by natural fiber or synthetic rope. When using natural fiber or synthetic rope staging supports near corrosive materials, protect or treat them to prevent deterioration.

o. Hoisting Equipment. Only mount material hoists on scaffolds or elevated work platforms if the scaffold or work platform is designed or strengthened to withstand the additional loading. A PE must certify such design or strengthening.

p. Lean-to Scaffolds. Do not use lean-to scaffolds.

q. Unsafe Conditions. Keep scaffolds, platforms, and access ways free of ice, snow, grease, mud, and any other material or equipment that creates a slipping or falling hazard. Do not permit tools, materials, equipment, or debris to accumulate on scaffolds, work platforms, or in access ways. To improve footing, apply an abrasive material to scaffolds, work platforms, or accessways that are usually wet or slippery. The competent person must perform a daily inspection.

13.2.2 Scaffolding Platforms

a. Requirement. Select materials for scaffold decking that can safely support the intended load. The load rating for scaffold decking is the person loading requirements or the uniformly distributed load requirement, whichever is greater**.**

1. Person Loading Requirements. If scaffold design is based on person loading, use a 250-pound point loading at center span to represent one person, two 250-pound point loads 18 inches from the center on each side to represent two persons, and the sum of the above to represent three persons.

2. Uniformly Distributed Load Requirement. When applicable, you may design each scaffold decking unit to carry a uniformly distributed load, as an alternate to the person loading requirement.

Light duty: 25 pounds per square foot
Medium duty: 50 pounds per square foot
Heavy duty: 75 pounds per square foot
Special duty: More than 75 pounds per square foot

b. Scaffold Planks.

1. Sawn Wood Scaffold Planks. Design wood scaffold planks so the deflection, at the center of the span at the design load, does not exceed the span divided by 60. All solid sawn scaffold planks must be of a scaffold grade and certified by, or bear the grade stamp of, a grading agency approved by the American Lumber Standards Committee. Table 13-1 shows permissible spans that comply with the above requirements.

Table 13-1.—Permissible spans for wood scaffold planks

Rough sawn Douglas fir, 2 inches by 10 inches	
One person, or medium duty	10 feet
Two persons, or heavy duty	8 feet
Three persons	5 feet

Note: Other combinations of planks and spans are permissible, as long as all planks are grade stamped or certified as scaffold plank grade and the stresses and deflections do not exceed those specified in ANSI A10.8.

2. Manufactured Wood Scaffold Planks. Wood scaffold planks that are not solid sawn (laminated wood planks) must bear the seal of an independent, nationally recognized inspection agency to certify that they comply with the design criteria in ANSI A10.8.

3. Fabricated Metal Scaffold Planks and Decks. Use fabricated metal scaffold planks and decks only if they are marked by the manufacturer to show the rated working load.

c. Width. Scaffolds, ramps, runways, and platforms must be wide enough to prevent congestion of persons, materials, or equipment. They must be at least 18 inches wide.

d. Lapped Planking. Planking, when lapped, must overlap at least 12 inches. Scaffold from 6 to 12 inches, or be cleated at 6 to 12 inches, or else be cleated at both ends to prevent sliding off supports.

e. Flush Planking. When installed flush, the butt joint must be at the centerline of a pole, and the plank ends supported by, and secured to, separate bearers.

f. Corner Planking. When a scaffold changes direction, place and secure planks to prevent tipping. Use diagonally installed bearers to support the intended load and to prevent tipping.

g. Changing Levels. When moving platforms or planking to another adjacent level, leave the old planking in place until you install the new bearers.

h. Working Surfaces. Fully plank or deck all working surfaces on scaffolds. Place planking units as close together as possible. The decking and guardrails must be no more than 9-1/2 inches apart.

13.2.3 Suspension Scaffolds.

a. General. Apply the following requirements when constructing and using all types of suspension scaffolds**.**

1. Design. Design and construct all parts and components of suspension scaffold systems with a minimum safety factor of four, except the suspension ropes.

2. Suspension. Support suspension scaffolds by wire, synthetic, or fiber ropes with a minimum safety factor of six. Secure suspension scaffolds to outrigger beams. Equip the fixed ends of the suspension ropes with a proper size thimble, secured by splicing or other equivalent means, and attached to the supports by shackles. Securely attach running ends of the suspension ropes to the hoisting drums. Keep at least four turns of the rope on the drum at all times. Attach the suspension ropes at the vertical centerline of the outrigger. The attachment must be directly over the hoisting drum.

3. Outrigger Beams. Outrigger beams must be structural steel, equivalent in strength to at least a standard 7-inch, 15.3-pound-per-foot, steel I-beam. Outrigger beams must be at least 15 feet long. Unless a PE designs outrigger beams for a specific use, they must not extend more than 6.5 feet beyond the fulcrum or bearing point. Set outrigger beams with their webs in the vertical position and anchor them to the structure with U-bolts and anchor plates, washers, and nuts (or equivalent). Rest the beams on wood-bearing blocks and install a stop bolt on each end of every beam. When counterweights stabilize the inboard ends of the outrigger beams, securely fasten the weight to the outrigger beam and provide a safety factor of 4 to 1 against overturning. Construct counterweights of solid material. Do not use sandbags or other containers of material for counterweights.

4. Hoisting Devices. Equip all suspension scaffolds (except stationary or crane supported) with either manual or powered hoisting machines. The machines must be either worm geared or powered both up and down. Design suspension scaffolds to stop independently of manual braking; they must not move when power is not applied.

5. Hoist Safety Controls. Powered scaffolds must have constant pressure, nonlocking controls. Install a device to shut off the power ahead of the operating control. Design the speed control device to prevent manual release.

6. Scaffold Brackets. Scaffold brackets must be wrought iron or mild steel. Do not use reinforcing steel as part of the support system.

7. Stability Control. Control suspension scaffolds with wire rope guides or equivalent means, such as taglines, to prevent sway. Install 3/4-inch, manilla rope tiebacks, or equivalent, on suspension scaffolds as a secondary means of anchorage.

8. Plank-Type Platforms. Construct plank-type platforms of not less than 2- by 10-inch scaffold planks, cleated together on the underside. Install cleats within 6 inches of each end and at intervals no greater than 4 feet along planks. The platform hangers must not be more than 8 feet apart, and the planking must not extend more than 12 inches past the end hangers. Securely fasten the platform to the hangers.

9. Beam-Type Platforms. Side stringers for beam-type platforms must be at least 2 by 6 inches and made of knot-free lumber, set on edge. Support the flooring on 2- by 6-inch cross beams, laid flat and set snugly into the top edge of stringers at intervals no greater than 4 feet. Flooring must be 1- by 6-inch lumber, nailed to the supports, and spaced no more than 0.5 inch apart. Hangers must not be more than 12 feet apart.

10. Metal Platforms. Use metal platforms only if they are tested and listed by a nationally recognized testing laboratory.

11. Safety Harnesses. When using suspension scaffolds, employees must wear approved fall protection harnesses. Attach the harnesses to a lifeline rigged independently of the scaffold system. An employee does not need to use the lifeline if the system has independent wire safety ropes installed at each end of the scaffold, with approved grabbing and locking devices. However, each employee must wear a safety harness with lanyard attached to the scaffold.

12. Overhead Protection. When an overhead hazard exists, erect overhead protection of 3/4-inch exterior plywood (or equivalent strength material). Overhead protection must be no more than 9 feet above the decking.

13. Guardrails. Equip suspension scaffolds with standard guardrails and toeboards on all sides and ends.

14. Operation. Only qualified persons trained in operating, using, and inspecting the particular suspended scaffold may operate suspended scaffolds.

15. Testing and Maintenance. Test suspension scaffolds at twice the intended working load before use. Before each shift begins, inspect the scaffold, including anchorage, rigging, and hoisting machines. Maintain scaffolds and hoisting machines in safe, operable condition.

b. Two-Point Suspension Scaffolds.

1. Platforms. Platforms of two-point suspension scaffolds must be plank, beam, or metal type. Construct platforms according to the requirements in this section. The platforms must be between 20 and 36 inches wide. Securely fasten platforms to the hangers with U-bolts or other equivalent means.

2. Securing to building. At each elevated work station, secure the scaffold to the building or structure to prevent sway or movement away from the wall. Do not use window cleaner's anchors for this purpose.

13.2.4 Boatswain's Chairs

a. Restrictions. Do not suspend boatswain's chairs from cranes, derricks, or any type of motorized hoist without prior approval.

b. Seat Design. The chair seat must be at least 12 by 24 inches and 1 inch thick. Reinforce the underside with cleats to prevent the seat from splitting.

c. Seat Slings. The seat slings must be either fiber rope at least 5/8 inch in diameter, or wire rope at least 3/8 inch in diameter. Thread the two slings through the four seat holes so they cross each other on the bottom of the seat. Construct boatswain's chairs used for cutting, welding, or other heat-producing operations with wire rope slings**.**

d. Safety Belts. Protect employees using boatswain's chairs with safety harness and lifelines**.**

13.2.5 Metal Scaffolds and Towers

a. General Requirements

1. Listing. A nationally recognized testing laboratory must list all metal scaffolds and towers. Erect such scaffolds and towers according to the manufacturer's specifications. Do not exceed the design load limits.

2. Access. Provide metal scaffolds and towers with access ladders or stairways.

3. Erection. Set sections of metal scaffolds plumb and securely connect them together. Install all braces before using the scaffold. Secure the entire scaffold together and brace it to the building or structure at intervals no more than 30 feet apart horizontally and 26 feet vertically.

b. Tube and Coupler Scaffolds

1. Design. Design and construct tube and coupler scaffolds to the specifications set forth in this paragraph. PEs must review all design scaffolds.

2. Minimum Dimensions. Construct tube and coupler scaffolds of steel tubing not less than the minimum diameters and maximum spacing according to 29 CFR 1910.28.

Table 13-2.—Tube and coupler scaffold dimensions

Component	Light duty	Medium duty	Heavy duty
Posts, runners, and bracing diameter (minimum)	2 inches	2 inches	2 inches
Bearer diameter (minimum)	2 inches	2.5 inches	2.5 inches
Post spacing (maximum length)	10 feet	8 feet	6.5 feet
Post spacing (maximum width)	6 feet	6 feet	6 feet

Note: Design other spacing dimensions or other structural components, when used, to support an equivalent load. Donot use dissimilar metal on the same scaffold frame. When tubing of metals other than steel are used, they must be designed to support an equivalent load.

3. Bearers. Bearers must be at least 4 inches, but not more than 12 inches longer than the post or runner spacing. Install bearers transversely between posts; secure the bearer coupler to the posts bearing on the runner coupler.

4. Runners. Space runners no more than 6-1/2 feet apart on centers. Make the bottom runners as close to the base as possible.

5. Transverse Bracing. Install transverse bracing, in an "X," across the width of the scaffold at the top and bottom of the end posts, and at every fourth runner vertically. Repeat this "X" bracing at every third set of posts measured horizontally from one end of the scaffold.

6. Longitudinal Diagonal Bracing. Install longitudinal diagonal bracing along the inside and outside rows of posts, beginning near the bottom of the posts at one end and extending to the top of the posts at the other end. Install the diagonal bracing at a 45-degree angle. Couple longitudinal diagonal bracing to each runner it crosses.

c. Tubular Welded Frame Scaffolds

1. Design. Use tubular welded frame scaffold only if it is designed to safely support four times the maximum rated load. Place the frames directly over one another, using couplings or stacking pins to vertically align the posts.

2. Height Limitation. A licensed PE must prepare drawings and specifications for metal frame scaffolds that are more than 125 feet high.

3. Uplift. Lock frame members together vertically with pins or other equivalent means, whenever there is possibility that an uplift may occur.

4. Cross Bracing. Properly brace metal tubular frame scaffold with cross bracing or diagonal braces, or both, to secure vertical members. The length of the cross braces must automatically square and align vertical members. Make all brace connections secure.

d. Mobile Scaffolds

1. Maximum Height. Free-standing mobile scaffolds must be no higher than four times the minimum base dimension.

2. Casters. Equip wheels and casters with a positive locking device to prevent the scaffold from accidentally moving.

3. Moving. When moving mobile scaffolds, apply the force to move them as close to the base of the scaffold as possible. Stabilize the scaffold during movement. Use scaffolds only on firm, level, and broom-clean surfaces.

- 4. Riding. Employees may ride manually propelled mobile scaffolds only under the following conditions:
- The floor or surface is within 1.5 degrees of level and is free of pits, holes, or obstructions.
- The minimum dimension of the scaffold base, when ready to move, is at least one-half the height.
- If used, outriggers must be installed on both sides of staging.
- Equip wheels or coasters with rubber or similarly resilient tires.
- Remove tools and materials from the platform or secure them prior to moving the scaffold.

13.2.6 Form Scaffolds

a. Figure-Four Form Scaffolds

1. General. Use figure-four form scaffolds for light duty. Do not use them to support loads more than 25 pounds per square foot, unless specifically designed for greater loading.

2. Design and Construction. Design and construct figure-four form scaffolds, incorporating the dimensions shown in table 13-3:

Table 13-3.—Figure-four scaffold dimensions

Component	Dimensions
Upright and guardrail	2 x 4 inches minimum
Upright or guardrail and ledger spacing	8 feet 0 inch maximum Approximately 42 inches
Guardrail height	1 x 6 inches minimum[1]
Bearers (two)	1 x 6 inches minimum
Braces (two)	1 x 6 inches minimum
Intermediate guardrail	3 feet 6 inches beyond form support
Maximum ledger length	member
Planking	2 x 10 inches minimum
Toeboards	4 inches minimum height

[1] Lumber sizes for components other than planking are nominal sizes.

3. Attachment to a Form. The form scaffold must be an integral part of the form and nailed or bolted to the form studding.

b. Metal Bracket Form Scaffolds

1. Design. Metal bracket form scaffolds must be designed and constructed with a minimum safety factor of four, computed on the basis of maximum rated load. The metal brackets may be of any metal that will support the maximum rated load. Equip them with standard guardrails and toeboards.

2. Attachment to Form. Space metal brackets no more than 8 feet apart on centers. The brackets may be an integral part of the form. If so, bolt or weld them to the form, or attach them using "clip-on" or "hook-over" brackets, provided that you bolt the form walers to the form or secure them with snap ties or shea-bolts extending through the form and anchor securely.

3. Folding Brackets. Bolt or secure folding brackets in the extended position with locking pins.

13.2.7 Ladder-Jack Scaffolds

a. Requirement. Use only type 1A ladders with ladder-jack scaffolds. The combined weight of workers, the planks, equipment, and materials must not exceed the rated load of the ladders.

b. Height. The working platform of ladder-supported scaffolds must be no more than 20 feet high.

c. Securing. To prevent ladders from moving, secure them at the top and bottom with brackets.

d. Scaffold Planking. Only one person may occupy a ladder-jack scaffold erected with wood scaffold planks. When using fabricated planks, allow no more than two people on the plank.

e. Ladder Jacks. Design ladder jacks so that they bear on the side rails, in addition to the ladder rungs, or they must bear on a minimum length of 10 inches on each rung.

f. Fall Protection. Protect employees using ladder-supported scaffolds that are 6 feet or more above the ground or floor level with safety harnesses and lifelines.

13.2.8 Special Work Platforms. A PE must design special work platforms, such as draft tube scaffolds, and penstock jumbos. Recertify them every 5 years. A competent person must inspect them before each use.

13.2.9 Crane Supported Personnel Platforms (Manskips)

a. General Requirements. Use crane-supported personnel platforms to reach the worksite only when conventional means of erection, use, and dismantling (for example, personnel hoists, ladders, stairways, aerial lifts, elevating work platforms, or scaffolding) are impossible or hazardous. Use of crane-supported personnel platforms requires specific authorization, must comply with the requirements of this subsection, and requires supporting justification. The written request must be specific to the operation and must: (1) detail the proposed operation with supporting data that show why employees cannot safely reach the worksite using other standard procedures and (2) confirm, with sufficient manufacturing and design engineering data, that the proposed system and equipment fully comply with the requirements contained herein. Approvals will be for the specific operation described. Do not use the platform system for any other operation, unless an additional request has been submitted and approved. Place approved systems in operation only after you have developed a JHA. The JHA must contain provisions for initially and periodically instructing the crane operator and all affected employees. Personnel must not work from crane-supported scaffolding except when under constant supervision

of a general foreman or superintendent, or designated lift supervisor, and the crane and operation meet the requirements of this subsection and the section on cranes.

b. Specific Requirements

1. Hoist-Line Suspended Personnel Platforms

(a) Suspend platform only from the main boom nose.

(b) Do not handle personnel above ground when wind velocity exceeds 10 miles per hour, when any dangerous weather condition exists, or when other danger is impending.

(c) Keep cranes level during operation with outriggers fully extended and jack pads set on firm, level terrain or on substantial shoring.

(d) Select sites so that, when locating cranes for platform operation, no part may come within the minimum distance from energized lines. Do not use barriers, manufacturer's locks, or control level restraints to meet these requirements.

(e) Do not handle materials lifts when personnel are on the platform. Detach the platform before rigging the crane for material handling.

(f) Do not belt off or otherwise attach a platform to an adjacent pole, structure, or equipment.

(g) Lifting and lowering speeds must not exceed 100 feet per minute.

(h) Engage load and boom hoist drum brakes, swing brakes, and locking devices (such as pawls or dogs) when the occupied personnel platform is in the stationary position.

(i) When employees occupy platforms, they must wear body harnesses with lanyards appropriately attached to the load block, headache ball, or to a structural member of the platform. Harnesses, lanyards, and structural support members used as anchorages must meet requirements contained in the section that discusses personal protective equipment and fall protection.

(j) Do not move a mobile-crane when employees are aloft.

(k) Employees must keep all body parts inside the platform during raising, lowering, and positioning.

2. Cranes

(a) Install and test the crane periodically, using the section on hoisting equipment.

(b) Use only cranes equipped with planetary or worm gears, torque converters, automatic braking systems, or other equivalent systems that prevent placing the boom hoist and loadlines in a freewheeling or neutral position controlled by manual brake and/or dogs only. Use only the main hoist for personnel handling.

(c) The crane must be able to sustain a static load (as shown on the crane's capacity chart) of two times the rated platform capacity for all radii and configurations through which the platform will be hoisted.

(d) The minimum load hoist line wire rope safety factor must be 7 or 10 when using rotation-resistant rope.

(e) Install an anti-two-blocking device or two-block damage prevention feature and ensure that it is operating. The anti-two blocking device must have automatic capabilities for controlling functions that may cause two-blocking conditions.

(f) Mark telescoping booms or equip them with a device that clearly shows the boom's extended length to the operator at all times.

(g) All critical components of hydraulic or pneumatic systems must have a minimum bursting strength of at least four times the system's designed operating pressure. (Critical components are those in which a failure could result in free rotation or lowering of the boom or platform.)

(h) Equip all critical hydraulic cylinders with pilot-operated check valve, or other appropriate devices, to prevent freefall or uncontrolled movement of boom or platform in the event of a hydraulic line failure. Electrical systems used for positioning platforms must provide equal protection in the event of power failure.

(i) Make sure the crane is level within 1 percent and located on firm footing. Extend and engage the outriggers.

3. Platforms

(a) The crane manufacturer or a PE must design the personnel platform.

(b) Suspension systems must be designed to minimize tipping of the platform due to movement of employees on the platform.

(c) The entire platform must be designed with a minimum safety factor of five.

(d) Provide 6-foot minimum headroom for employees on the platform.

(e) Provide each personnel platform with perimeter protection from the floor to 42 inches, 3 inches above the floor. Perimeter protection must be either solid construction or expanded metal with openings no greater than one-half of an inch.

(f) Provide a grab rail inside the personnel platform.

(g) If you provide an access gate, make sure it swings inward and equip it with a latch (restraining device) to prevent accidental opening.

(h) Provide overhead protection on the personnel platform when employees are exposed to falling objects.

(i) Grind smooth all exposed rough edges that employees on the platform could contact.

(j) A certified welder, qualified for the weld grades, types, and material specified in the design, must perform all welding.

(k) Conspicuously post a plate or other permanent marking on the personnel platform showing the weight and the rated load capacity of the personnel platform.

(l) Personnel platforms must be easily identifiable by color or marking. Use personnel platforms only to hoist personnel and approved tools and equipment.

(m) Use a wire rope bridle sling to connect the personnel platform to the loadline.

(n) You must close and lock hooks, headache ball assemblies, lower load blocks, or other attachment assemblies, thus eliminating the hook throat opening. Alternatively, use a shackle with a screw pin, nut, and retaining pin.

(o) Wire rope, shackles, rings, and other rigging hardware must have a minimum safety factor of seven.

4. Additional Inspections and Tests

(a) At the beginning of each shift, the competent person must inspect cranes used to hoist personnel platforms. In addition, inspect the crane again after using it for any material handling operations, before using it to hoist employees.

(b) Before hoisting employees for the first time at each new setup location, make a full-cycle operational test lift at 150 percent of the intended load of the personnel platform.

(c) Note: Setup location means the location where the crane or derrick is brought and set up, including assembly and leveling.

(d) Immediately after lift testing, visually inspect the crane, personnel platform, and base support to determine if the testing has adversely affected any component or structure.

(e) Before further use, correct any defects found during such inspections that may create a safety hazard.

(f) At the beginning of each shift, and after using the crane to hoist materials, make a trial lift with the personnel platform unoccupied to make sure all systems, controls, and safety devices are functioning properly.

5. Work Practices

(a) The crane operator must remain at the controls at all times when the personnel platform is raised.

(b) Employees being hoisted must remain in direct communication with the crane operator at all times.

(c) Hold a prelift meeting before each personnel hoisting operation. The crane operator, employees involved, and the responsible general foreman, superintendent, or designated lift supervisor must attend the prelift meeting.

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

a. Scaffold Components. Do not intermix or modify the load-carrying members of system scaffolding manufactured by different manufacturers unless a competent person verifies that the resulting scaffold is structurally sound.

b. Erection. Erect the system scaffolding according to manufacturer's guidelines. The manufacturer's guidelines for erecting and using system scaffold must be on the jobsite while the scaffold is erected, used, and dismantled. A PE must design scaffolds erected or used in a manner not covered in the manufacturer's guidelines.

c. Erection. Erect posts plumb, with runners and bearers level. Install vertical, horizontal, and diagonal bracing as recommended by the scaffold manufacturer. Secure all connections on a scaffold level before assembling the next level.

13.3 Elevating and Rotating Work Platforms

Design and use elevating and rotating work platforms according to the standards set forth in applicable ANSI standards and these standards.

The design, construction, and operation of platforms and cranes must comply with the current edition of ANSI A92.2, "Vehicle Mounted Elevating and Rotating Aerial Devices," or the manufacturer or PE for personnel platform work must design and certify them. Mount personnel platforms on a crane boom only when they conform with the more stringent of these or manufacturer's requirements. Control all crane operations from the platform with an overriding crane control feature, except operations associated with travel. The crane and platform must meet design safety factors, and employees must operate them according to appropriate restrictions and requirements defined in this subsection.

13.4 Design and Construction of Guardrails

13.4.1 Standard Guardrails – Construction

a. Design. A standard guardrail must consist of a top rail, intermediate rail, toeboard, and posts. The guardrail must be 42 inches high.

b. Dimension. Wooden posts and toprails must be at least 2- by 4-inch construction grade lumber, or equivalent, with posts not more than 8 feet apart on centers. Intermediate rails must be at least 1 inch by 6 inches. Toeboards must be at least 4 inches high and installed within 1/2 inch of the floor.

c. Pipe Guardrails. Posts, toprails, and intermediate rails must be at least 1.5-inch inside diameter steel pipe with posts not more than 8 feet apart on centers.

d. Metal Guardrails. Posts, toprails, and intermediate rails must be 2- by 2- by 3/8-inch angle iron, or equivalent, with posts not more than 8 feet apart on centers.

e. Guardrail Strength. Regardless of material used, the guardrail must be able to withstand a loading of 200 pounds, applied in any direction at any point on the toprail, with minimum deflection. The design of railings that must withstand greater stress, because of the nature of use, must have a minimum safety factor of four.

f. Rope Guardrails. Do not use wire, synthetic, or natural fiber ropes as guardrails on scaffolds. Wire rope may be used for protective railings on permanent structures during construction. When used, wire rope must have sufficient tension so the maximum midspan deflection is less than 3 inches when applying a 200-pound force. Toprails and midrails must be at least 1/4-inch in diameter. When using wire rope for the top rail, flag it with high visibility material at intervals of 6 feet or less.

13.4.2 Standard Guardrails – Permanent

a. Design. Standard guardrails must have a top rail at least 42 inches from the adjacent surface. Fill the opening between the toprail and the adjacent surface with solid material, grills, or ornamental work, designed so that a 4-inch ball cannot pass through any opening. However, if an exception is made to use a midrail in industrial areas, the openings between the midrail and the toprail, or the midrail and the adjacent surface, must not exceed 21 inches.

b. Materials. Construct the toprail, grill material, and/or midrail of wood or metal, strong enough to withstand a 200-pound force applied in any direction with minimum deflection.

13.5 Safeguarding Floor and Roof Openings

13.5.1 Requirement. Cover the floor and roof openings, including skylights into which persons can fall, with material and bracing that is strong enough to support any imposed load, or protect it with a securely anchored enclosure meeting the requirements of this subsection.

13.5.2 Protective Enclosure. Enclose all uncovered floor or roof openings on open sides with a standard guardrail and toeboard, or provide a cover for them that can sustain the expected load. At a minimum, the cover must be able to sustain a load of 250 pounds.

13.5.3 Stairways and Ladderway Openings. Provide all stairway and ladderway floor openings with a standard guardrail and toeboard on exposed sides (except the entrance). Offset entrances to stairways or ladderways, or provide a gate to prevent persons from walking directly into the opening.

13.5.4 Hatchways and Chute Openings. Guard hatchways and chute floor openings with one of the following:

a. Hinged covers that are strong enough to carry anticipated loads and a standard guardrail with one exposed or open side. When the hatchway or chute opening is not in use, keep the cover closed or guard the exposed side with a removable standard guardrail.

b. A removable standard guardrail or self-closing gate installed on just one side, and fixed standard guardrails and toeboards on all other exposed sides. When not using the opening, keep the removable guardrails in place. Guard chute openings into which debris is manually dumped. Provide a guardrail on the side of the opening where employees stand when they dump debris.

c. Removable standard guardrails, secured to the floor on all open or exposed sides, installed to permit removal of only a section or side(s) sufficiently large to perform the work. When the hatchway is not in use, immediately replace the guardrail and secure it.

13.5.5 Doors and Gates. Provide a platform where doors or gates open directly on a stairway. Make sure the swing of the door or gate does not reduce the effective length of the platform to less than 20 inches.

13.6 Safeguarding Wall Openings

13.6.1 Requirement. If there is a drop of more than 4 feet from a wall opening, and the bottom of the opening is less than 3 feet above the working surface, provide a standard guardrail or guardrail components to afford protection to a height of 42 inches above the working surface. Provide a standard toeboard where the bottom of the wall opening is less than 4 inches above the working surface.

13.6.2 Extension Platforms. Provide a standard guardrail and toeboard for exposed sides of extension platforms, outside of wall openings, that provide access for materials, equipment, or personnel.

13.7 Safeguarding Open Floors and Platforms

13.7.1 Requirement. Guard the perimeter of all floors, platforms, etc., 6 feet or more above adjacent floor or ground level by installing guardrails or equivalent guarding, unless or until permanently enclosed to a height of 3 feet

or more above the floor or working surface. Provide standard toeboards where falling objects pose a hazard to persons or property.

13.7.2 Hazardous Locations. In locations where a hazardous condition exists (such as projecting reinforcing steel, moving equipment, or hazardous materials), provide standard guardrails, regardless of height.

13.7.3 Protection From Falling Objects. When employees must work under an open-sided wall opening or platform where a falling objects hazard exists, install effective protection, such as enclosed guardrails or nets, as described in this section and the section on fall protection.

13.8 Requirements for Roofing Protection

13.8.1 Requirement. Whenever employees work on roofs during construction, demolition, or repair and maintenance, and they are subject to falls exceeding 6 feet from the adjoining surface, provide adequate fall protection devices. Employees are subject to falls when working within 10 feet of the roof edge or when working in any place on a roof with a pitch steeper than 1:3.

13.8.2 Fall Protection. Adequate fall protection includes the following:

a. Restraining lines, harnesses, lanyards, and safety nets meeting the requirements in the section on fall protection.

b. Standard guardrails meeting the requirements of this section.

c. Catch platform.

d. Warning line system supplemented by a safety monitoring system is only adequate on roofs with pitch flatter than 1:3.

13.8.3 Warning Line System. Erect warning lines around all open sides of the work area. When mechanical equipment is not in use, erect the warning lines at least 6 feet from the roof edge or opening. When mechanical equipment is in use, erect the warning line at least 6 feet from the roof edge or opening that is parallel to the direction of mechanical equipment operation, and at least 10 feet from the roof edge or opening that is perpendicular to the direction of mechanical equipment operation. Do not work outside warning lines without fall protection.

a. The warning lines must be rope, wire, or chain, with a minimum breaking strength of 500 pounds. Attach warning lines to supporting stanchions. Mark the warning line with high-visibility material at intervals no more than 6 feet. Rig the warning line so that it is at least 34 inches from the roof surface at its lowest point and no more than 39 inches at its highest point.

b. After erection, the warning lines and stanchions must be able to support a minimum force of 16 pounds applied horizontally 30 inches above the floor.

c. Safety monitor. When using a warning line system, supplement it with a safety monitoring system. Assign a competent person to be the safety monitor. The safety monitor must ensure the safety of all employees working on the roof and warn any employee who appears unaware of a hazard or is acting unsafely. The safety monitor must be on the same roof as the employees, within visual sight of the employees, and close enough to verbally communicate with them. The safety monitor must not perform any other work.

13.8.4 Overhead Protection. Require overhead protection for all employees working under the roof edge. You may use temporary decking, suspended platforms, nets, or other equivalent devices to provide such overhead protection.

13.8.5 Roof Edge Materials Handling Areas and Materials Storage. When using guardrails at hoisting areas, bitumen pipe outlet areas, or roof edge storage areas, erect at least 4 feet of guardrail on each side of the area.

a. Place a chain or gate across the opening between the guardrail sections when not handling materials.

b. Protect employees working in the vicinity of the open guardrail with a safety belt or harness and lanyard system. Rig the safety belt system so that employees cannot move beyond the edge of the roof.

c. If roofs are more than 16 feet high, install a hoisting device, stairway, or progressive platform to supply material and equipment. Provide level landing platforms with guardrails and toeboards at the roof edge.

13.8.6 Crawling Boards (Chicken Ladders). Use crawling boards to help employees climb up and down steep roofs. Crawling boards must be at least 10 inches wide and 1 inch thick, with 1- by 1.5-inch cleats spaced not more than 24 inches apart. The lengthened cleats must equal the width of the crawl board. Secure the cleats with nails driven through the crawl board and clinched on the underside. The crawling board must extend from the ridge pole to the eaves. String a securely fastened grabline beside each crawl board. Grablines must be of 3/4-inch manila rope, or equivalent.

13.8.7 Roofing Brackets. Secure roofing brackets in place by nailing, in addition to using metal projections. If it is not practical to nail the brackets, use rope supports that are 3/4-inch manila rope, or equivalent.

13.8.8 Training. Implement a training program for all employees working on a roof. The training program must enable employees to recognize and deal

with the falling hazards associated with working near a roof perimeter or roof opening. The training must cover the following areas:

a. The nature of the fall hazards.

b. The function, use, and operation of the fall protection systems, warning line system, and safety monitoring systems in use.

c. Each employee's role in the safety monitoring system when this system is in use.

d. The correct procedures for handling and storing equipment and materials.