

Section 13

Walking and Working Surfaces

13.1 Scope

This section sets safety standards and work practices for walking and working surfaces for both general and construction work at Bureau of Reclamation facilities. It specifically addresses making work locations safe for access, using scaffolds, requirements of work platforms, designing and constructing guardrails, and required inspection and training. Walking and working surfaces are used daily by all employees, so the requirements in this section apply to everyone working in Reclamation facilities.

13.2 General Requirements

Walking and working surfaces must be kept clean, orderly, and sanitary. Floors and walking surfaces shall be cleaned regularly and kept dry. Ensure surfaces can support the maximum intended load and are free of obstructions and hazards that will cause slips, trips, or falls.

13.3 Responsibilities

13.3.1 Regional and Area Office Safety Managers

- 13.3.1.1** Support development and implementation of this section and provide guidance in implementation.
- 13.3.1.2** Monitor and interpret developments in walking and working surface regulations and technologies.
- 13.3.1.3** Ensure a ladder safety program is in place and ladders are regularly inspected.

13.3.2 First-Line Supervisors

- 13.3.2.1** Ensure their employees are trained and can demonstrate proficiency prior to requiring work on ladders, scaffolding, and elevated work surfaces.
- 13.3.2.2** Regularly inspect work areas to ensure they are free of known work-surface hazards and good housekeeping is maintained.
- 13.3.2.3** Shall be present when employees are working from crane-supported scaffolding to ensure compliance with Reclamation Safety and Health Standards (RSHS) Section 19, *Hoisting and Pile Driving Equipment*.

13.3.3 Onsite Job Leads

- 13.3.3.1 Ensure a designated competent person is available for scaffolding work. Competent person roles are discussed in paragraph 13.4.3, “Proficiency Qualification.”

13.3.4 People Doing the Work

- 13.3.4.1 Reclamation employees must ensure they are physically able to do a task and are appropriately trained prior to starting a task.
- 13.3.4.2 All employees using ladders must ensure the ladder is inspected, labeled with critical information, capable of supporting the maximum intended load, and used properly.
- 13.3.4.3 Employees responsible for completing work while using scaffolding and work platforms and for maintaining walking and working surfaces must seek guidance from the supervisor or area safety manager and meet the general requirements set in paragraph 13.9.6 of this section.
- 13.3.4.4 Employees are responsible for identifying and correcting unsafe conditions within their control and reporting those they cannot, and voicing concerns to their coworkers and supervisors in a professional and respectful manner.

13.3.5 Project Manager/Acquisitions

- 13.3.5.1 Project Managers must be notified verbally or in writing of any changes to the design and use of scaffolding.

13.4 Training Requirements

13.4.1 Initial

Reclamation employees must receive relevant training prior to engaging in work.

- 13.4.1.1 **Ladders.** All employees who use ladders must complete ladder safety training and understand how to select and use the appropriate ladder. If a ladder safety device is required, employees must be trained in its operation before using it. Ladder safety training shall include, at a minimum, the selection, inspection, set up, and proper use of ladders available in their workplace.

13.4.1.2 Scaffolding

- 13.4.1.2.1 **Performing Work.** Each employee who performs work while on a scaffold must be 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:

- The nature of any electrical hazards, fall hazards, and falling object hazards in the work area;
- 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;
- The proper use of the scaffold and the proper handling of materials on the scaffold;
- The maximum intended load and the load carrying capacities of the scaffolds used; and
- Any other pertinent requirements of this section.

13.4.1.2.2

Operation and Maintenance. Each employee involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold must be trained by a competent person to recognize any hazards associated with the work. The training shall include the following topics, as applicable:

- The nature of scaffold hazards;
- The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in use;
- The design criteria, maximum intended load carrying capacity, and intended use of the scaffold; and
- Any other pertinent requirements of this section.

13.4.1.3

Aerial Lifts. Only trained and authorized persons are allowed to operate an aerial lift. Training should include the following topics:

- Explanations of electrical, fall, and falling object hazards;
- Procedures for dealing with hazards;
- Recognizing and avoiding unsafe conditions in the work setting;
- Instructions for correct operation of the lift (including maximum intended load and load capacity);
- Demonstrations of the skills and knowledge needed to operate an aerial lift before operating it on the job;
- When and how to perform inspections; and
- Manufacturer's requirements.

13.4.2 Refresher/Retraining

13.4.2.1

Refresher Training. Refresher training for ladders, scaffolding, and aerial lifts is required at least annually, or before starting work if work occurs on a less than annual basis.

13.4.2.2

Retraining. Additional retraining shall occur in the following circumstances:

- When changes at the worksite present a hazard about which an employee has not been previously trained;
- When changes in types of scaffold, fall protection, falling object protection, aerial lift, or other equipment are implemented; and

- If the supervisor believes the employee lacks the necessary skill, understanding, or proficiency to work safely.

13.4.3 Proficiency Qualification

OSHA scaffolding standards differentiate between a competent and a qualified person for various responsibilities. Detailed explanation can be found in the OSHA publication *A Guide to Scaffold Use in the Construction Industry*. A competent person can identify existing and predictable hazards and has authorization to act in order to eliminate them. A qualified person has, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, demonstrated ability to solve or resolve scaffolding problems.

13.4.4 Recordkeeping

Training shall be managed and recorded through the agency system of tracking training.

13.5 Hazard Identification, Assessment, and Safety Measures

13.5.1 General

First-line supervisors and employees working at their site are responsible for inspecting walking and working surfaces for hazards and unsafe conditions. Hazardous conditions must be corrected or repaired before an employee uses the surface again.

13.5.2 Wet Surfaces

If a walking and working surface is wet and the condition cannot be reasonably prevented, additional safety measures shall be in place. A reasonable effort must be made to reduce standing or running water on walking surfaces. Surface modifications, which include surface channeling the water, grooving, installing false floors, or installing platforms and mats, are recommended.

13.5.3 Snow and Ice

When hazardous conditions such as snow and ice are present, the walking and working surface must be shoveled and salted to reduce risk of slips, trips and falls.

13.6 Pre-job Briefing and Planning Requirements

13.6.1 Job Hazard Analysis (JHA)

Before starting work, employees must be briefed on the known safety hazards present in the work area. Job tasks with known and assumed risks shall have an existing JHA readily available and updated with any change in hazard or mitigation (see RSHS Section 4, *Work*

Safety Planning). Employees and supervisors must review JHAs annually or after any changes.

13.6.2 Crane-Supported Personnel Platforms

For crane-supported personnel platforms, place approved systems in operation only after a JHA is developed. The JHA must contain provisions for initially and periodically instructing the crane operator and all affected employees. A pre-lift meeting must be held before each personnel hoisting operation. The crane operator, involved employees, and supervisors must attend the pre-lift meeting.

13.7 Personal Protective Equipment (PPE)

Employees must wear PPE as required by their JHA.

13.7.1 Fall Protection

Fall protection is required for each employee exposed to a falling hazard of 4 feet or more. Depending on site conditions and job tasks, fall protection includes guardrails, toe boards, floor hole covers, fall arrest systems, stair railings, and handrails. Vertical or horizontal lifelines can be used. When working from an aerial lift, attach the fall-arrest system to the boom or basket. When using suspension scaffold, both a personal fall-arrest system and guardrail are required. Refer to RSHS Section 16, *Fall Protection*, for additional fall protection information and specific PPE.

13.7.2 Overhead Protection

When working on or near scaffolding, employees shall wear hard hats to prevent injury from falling objects. 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. Design overhead protection to meet the needs of the walking-working surface and the users being protected.

13.7.3 Ladder Safety

Employees must wear proper footwear when ascending and descending ladders. Footwear must be closed toe and non-slip material and defined heel. Where ladder safety devices are provided, employees must be trained and use them per manufacturer's instructions.

13.8 Other Safety Equipment

13.8.1 Crawling Boards

13.8.1.1 Use. Use crawling boards or chicken ladders, to help employees climb up and down sloped surfaces. Each employee on a crawling board shall be protected by a personal fall arrest system, a guardrail system, or a 3/4-inch diameter grab line or equivalent handhold securely fastened beside each crawling board.

13.8.1.2 Construction. Crawling boards shall extend from roof peak to eaves and be secured by ridge hooks or means with equivalent strength and durability. 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 raised cleats must equal the width of the crawl board. Secure the cleats with nails driven through the crawling board and clinched on the underside.

13.9 Safe Practices

13.9.1 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 personnel hoist 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 always pass freely. Walking and working surfaces shall be inspected regularly to ensure they are maintained and repaired to prevent hazardous conditions.

13.9.2 Ladders

A ladder safety program shall be implemented at all facilities and include standards and responsibilities of this Section.

13.9.2.1 Safety Codes. Ladder use must comply with the applicable ladder safety codes OSHA 1926.1053 (construction), OSHA 1910.23 (general industry) and ANSI A14.

13.9.2.2 Inspection. Regularly inspect and maintain all ladders to ensure hazardous conditions are corrected, repaired, and guarded against. Promptly repair broken or damaged ladders or remove them from service.

13.9.2.3 General Use. Ensure the proper ladder is selected for the task. Only one employee can use the ladder at a time, and the employee shall not climb higher than 20 feet. Employees shall face the ladder and keep hands free to climb when ascending and descending. Employees shall use at least one hand to grasp the

ladder when progressing up and down the ladder and shall not carry any object or load that could cause them to lose balance and fall.

13.9.2.4 Portable Ladders. Select, use, and maintain portable ladders according to the most current applicable ANSI A14 standard, OSHA 1910.23(c) or standards in this section, whichever is most stringent having jurisdiction. Use only type 1A extra heavy-duty industrial ladders or better. Store ladders to prevent any damage, clutter, obstruction, or hazardous conditions.

13.9.2.4.1 Selection. Ensure the ladder duty rating found on the specification label on the side of the ladder, is appropriate for the total load that will be supported. Total load is the weight and force of the employee and all tools, equipment, and materials being carried. Equip the ladder with safety shoes, spurs, spikes, tread feet, or other slip-resistant devices appropriate for the surface it will be used on.

13.9.2.4.2 Use. Ladders shall be used only for short-duration tasks and only when using light tools or materials. Place portable ladders at a slope of 4:1 (vertical to horizontal) on a firm foundation that can support the load. Secure the ladder to prevent displacement. Stepladders can be used without being secured. When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface.

13.9.2.4.3 Restrictions. Do not use extension sections of ladders as independent ladders, unless specifically designed, manufactured, and tested to be used independently. Do not use a metal ladder or a wood ladder with metal reinforcements for any electrical work or any area where employees can contact energized circuits. The cap and top step of a stepladder shall not be used as a step.

13.9.2.5 Fixed Ladders. Design, use, and maintain fixed ladders according to the current applicable ANSI A14 standard, OSHA 1910.23(d) or standards in this section, whichever is most stringent having jurisdiction. Keep the area around the top and bottom of a fixed ladder free from debris, material, equipment, or other obstructions.

13.9.2.5.1 Design. Equip new fixed ladders extending over 24 feet with a ladder safety system or personal fall arrest system. 2016 updates to OSHA 1910 Subpart D, *Walking-Working Surfaces*, require all fixed ladders to be equipped with a ladder safety or personal fall arrest system by November 18, 2036. Climbing devices must be installed so employees can connect or disconnect while standing on floors, platforms, or the ground. Ladders must be sufficiently wide to accommodate climbing devices while providing ample room for users to safely ascend and descend. Provide a landing at the top of all fixed ladders. Except for manhole ladders, extend side rails, stanchions, or other supports at least 42 inches above the landing. Ensure ladders have equal rung spacing for the entire length of the ladder and at least

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

13.9.2.5.2 Use. Where ladder safety or personal fall arrest systems are provided, use per manufacturer's instructions. Always use non-slip material on rungs in slippery areas. When 25 or more employees require access or two-way traffic is necessary, use two separate ladders or double-cleat ladders for access to and from work areas.

13.9.2.5.3 Restrictions. Do not use the reinforcing bar of fixed ladders as a rung or grab bar. Do not design ladders with cages and wells as a means of fall protection.

13.9.3 Guardrails

13.9.3.1 Compliance. Guardrail systems must comply with the OSHA fall protection requirements stated in OSHA 1910.29 or OSHA 1926.502, depending on application.

13.9.3.2 Design. The top-edge height of top rails or equivalent guardrail system members must be 42 inches, plus or minus 3 inches, above the walking-working surface. Midrails must be installed at a height midway between the top edge of the guardrail system and the walking-working surface. Guardrails shall be designed such that openings between vertical members are not more than 19 inches wide. Regardless of the material used, the guardrail must be able to withstand a load of 200 pounds, applied in a downward or outward direction at any point on the top rail, with minimum deflection. The design of railings that must withstand greater load than 200 pounds must have a minimum safety factor of 4. Refer to the scaffolding standards and references for scaffolding guardrail requirements and specifications.

13.9.3.3 Restrictions. Guardrails shall not be used as anchor points for fall protection systems.

13.9.4 Stairways

13.9.4.1 Standard Stairs.
Standard stairs are a fixed or permanently installed stairway providing access from one walking-working surface to another and must be in place when work requires regular travel between levels and regular access to platforms, especially when employees routinely carry tools or materials. Standard stairs must meet the general requirements described in OSHA 1910.25, *Stairways*.

13.9.4.2 Design. Standard stairs and temporary stairways shall be designed with any uniform combination of rise/tread dimensions within the following requirements:

- Minimum width of 22 inches between vertical barriers;
- Maximum riser height of 9.5 inches;

- Minimum tread depth of 9.5 inches;
- Maximum variation in tread height or depth of 1/4 inch;
- Minimum vertical clearance from stair tread to overhead obstruction of 6 feet, 8 inches, as measured from the leading edge of tread; and
- Each stair can support at least five times the normal anticipated live load, but never less than a concentrated load of 1,000 pounds.

Existing standard stairs, installed prior to January 17, 2017, may deviate from these dimensions if they are at an angle between 30 and 50 degrees or meet the requirements specified in Table D-1 of OSHA 1910.25.

13.9.4.3 Maintenance. Routinely maintain stairways, keeping stairs free from debris, materials, and slippery conditions.

13.9.4.4 Stair Rail Systems and Handrails. Stairs with four or more risers or rising more than 30 inches must have a stair rail system and handrails that are smooth-surfaced and do not create a projection hazard. Stair rail systems and handrails must meet the criteria established in OSHA 1910.29(f). The height of stair rail systems installed before January 17, 2017, is not less than 30 inches from the leading edge of the stair tread to the top surface of the top rail; the height of stair rail systems installed on or after January 17, 2017, is not less than 42 inches from the leading edge of the stair tread to the top surface of the top rail. Handrails are not less than 30 inches and not more than 38 inches, as measured from the leading edge of the stair tread to the top surface of the handrail. Handrails must provide an adequate handhold for employees grasping them to avoid falling and meet requirements in OSHA 1910.28(b)(11)(ii), Table D-2, "Stairway Handrail Requirements."

13.9.4.5 Platforms. Any flight of stairs with an unbroken rise of more than 12 feet must have a standard landing that extends at least the width of the stair and 30 inches in the direction of travel. Where doors or gates open directly onto the stairway, provide a platform. Protect platforms on all open sides with standard guardrails and toe boards, as required for falling object protection. The swing of the door or gate must not reduce the width of the platform to less than 20 inches if installed before January 17, 2017, or less than 22 inches if installed on or after January 17, 2017.

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

13.9.5 Ramps

Ramps and bridging devices must be designed, constructed, and maintained to support their maximum intended loads. When the ramp is used for public access, wheelchair accessibility is required. Ramps used by employees that have a ramp angle greater than 20 degrees from horizontal must be provided with handrails meeting standards set in paragraph 13.9.4.4, "Stair Rail Systems and Handrails." Ramp slope shall not exceed 30 degrees from horizontal. When there is any potential for objects to fall from above, install overhead protection between 7 and 9 feet above the ramp.

13.9.5.1 Temporary Ramps. Design temporary ramps with a safety factor of 5, with a minimum 100-pound-per-square-foot live load capacity. Temporary access ramps can be installed in place of stairs when the slope does not exceed 15 degrees. With approval by the area office safety manager, cleated ramps can be used for access on slopes up to 20 degrees. Ramps must be at least 18 inches wide, with standard guardrails on open sides and at least one handrail. Cleated ramps must have 1- by 2-inch cleats spaced no more than 14 inches apart. The cleats must span the full width of the ramp. Secure cleats 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 and secured to each side of the roadway.

13.9.5.2 Permanent Ramps. Permanent ramps must be at least 44 inches wide, and the slope must not exceed 1:12. The maximum allowable slope in any new construction is 1:12 with a maximum rise of 30 inches without a landing. A ramp with a slope of 1:12 can have a maximum length of 30 feet without a landing.

13.9.6 Scaffolds

Provide scaffolds, platforms, or temporary floors whenever employees perform work that they cannot perform safely from the ground or from solid construction. Scaffolds, both supported and suspension, must meet the requirements in OSHA 1926 Subpart L, *Scaffolds*. Do not use ladders or makeshift devices to increase scaffolding height. Keep scaffold working surfaces level and ensure good housekeeping to prevent slipping, tripping, or falling object hazards. A competent person must inspect scaffolds and components for visible defects before each work shift and after any occurrence that could affect the structural integrity and authorize prompt corrective action.

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- 13.9.6.1 Design.** Scaffolding with structural members or working surfaces that differ from those specified in this standard must be designed by a PE. Wood scaffolding design must meet the specifications stated in OSHA 1926 Subpart L, Appendix A, *Scaffold Specifications*. A PE must design or certify additional strengthening for material hoists on scaffolds. Scaffolds shall not be altered or moved horizontally unless specifically designed to be so.
- 13.9.6.2 Construction Integrity.** 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. Make sure poles, legs, and uprights are plumb. Brace them securely and rigidly to prevent swaying or displacement.
- 13.9.6.3 Loading.** Scaffolds and components must be capable of supporting at least four times the maximum intended load. Suspension rope and connecting hardware must be able to support at least six times the maximum intended load. Do not load scaffolds beyond their maximum intended load. Store only those supplies needed for immediate operations on scaffolds. All load-carrying timber members of scaffolds, except planks, must be a minimum of 1,500-pound-force per square inch (stress grade) construction-grade lumber.
- 13.9.6.4 Fall Protection.** Each employee on a scaffold shall be protected from falling in accordance with OSHA 1926 Subpart L. Fall protection is required for each employee on a scaffold more than 10 feet above a lower level. Fall protection includes guardrail systems and personal fall arrest systems. Vertical or horizontal lifelines can be used. Self-contained and suspension scaffolding require both a guardrail system and a fall arrest system. Do not use wire, synthetic, or natural fiber ropes as guardrails on scaffolds.
- 13.9.6.5 Enclosures and Overhead Protection.** When scaffolding is above a walkway or employees pass under scaffolding, the scaffolding must be enclosed on all open sides, ends, and spaces between decking and wall. The protective enclosure must be No. 18 U.S. Standard gauge wire, or equivalent protective material, with openings of 1/2 inch or less. Protect employees working on scaffolding from falling objects by installing overhead protection such as toe boards, screens, guardrail systems, catch platforms, canopy structures, or barricades.

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- 13.9.6.6 Access.** Always access scaffolding by separate or integral ladders or by stairways. Do not use structural members to access scaffolding.
- 13.9.6.7 Platforms and Planks.** Platforms must be designed and constructed to meet the requirements of OSHA 1926.451(b) and OSHA 1926 Subpart L, Appendix A. Platforms must be wide enough to prevent congestion of persons, materials, or equipment. When moving platforms or planking to another adjacent level, leave the old planking in place until new bearers are installed. A PE must design special work platforms, such as draft tube scaffolds and penstock jumbos, and recertify them every 5years. A competent person must inspect them before each use.
- 13.9.6.7.1 Materials.** Solid sawn wood used for scaffold planks must meet the specifications and compliance determinations listed in OSHA 1926 Subpart L, Appendix A. Fabricated planks and platforms can be used in lieu of solid sawn wood planks as long as rated load capacity meets or exceeds the capacity identified in OSHA 1926 Subpart L, Appendix A. All planks must be grade stamped or certified as scaffold plank grade and meet the specifications in ANSI A10.8, *Scaffolding Safety Requirements*.
- 13.9.6.7.2 Lapped, Flush, and Corner Planking.** When planking is lapped, it must overlap at least 12 inches and occur only over supports. When planking is installed flush, the butt joint must be at the centerline of a pole, and the plank ends must be supported by and secured to separate bearers. Where a scaffold changes direction (i.e., at a corner), place and secure planks to prevent tipping. Use diagonally installed bearers to support the intended load and to prevent tipping.
- 13.9.6.8 Supported Scaffolds.** Supported scaffolds consist of one or more platforms supported by outrigger beams, brackets poles, legs, uprights, posts, frames, or similar rigid support.
- 13.9.6.8.1 Requirements.** Supported scaffold design and construction must meet or exceed the requirements of OSHA 1926.451(c) or this section, whichever is more stringent having jurisdiction. Refer to OSHA 1926 Subpart L, Appendix A for guidelines regarding the requirements of OSHA 1926.451(c).
- 13.9.6.8.2 System Scaffolds.** Erect system scaffolding per the manufacturer's guidelines. Do not intermix or modify load-carrying members of system scaffolding from different manufacturers, unless approved by a PE. The manufacturer's guidelines must be on the job site 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.
- 13.9.6.8.3 Metal Scaffolds and Towers.** Erect such scaffolds and towers per the manufacturer's specifications. Do not exceed the
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manufacturer's rated load limits. 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 apart vertically. Provide metal scaffolds and towers with access ladders or stairways.

13.9.6.8.4 **Tube and Coupler Scaffolds.** All tube and coupler scaffolds shall comply with additional requirements in OSHA 1926.452(b). Design and construct tube and coupler scaffolds to the specifications set forth in this section. A PE must review and approve all scaffold designs over 125 feet in height.

13.9.6.8.4.1 **Required Dimensions.** Construct tube and coupler scaffolds of steel tubing not less than the minimum diameters and not more than the maximum spacing listed in Table 13.1.

TABLE 13-1. 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 and materials, when used, to support an equivalent load. Do not use dissimilar metals on the same scaffold frame.

13.9.6.8.4.2 **Bearers.** Any bearers must be at least 4 inches but not more than 12 inches longer than the post or runner spacing. Bearers must be installed transversely between posts. When bearers are coupled to posts, the inboard coupler must bear directly on the runner coupler and be as close to the posts as possible. Bearers must extend beyond the posts and runners and provide full contact with the coupler. The bottom bearers must be located as close to the base as possible.

13.9.6.8.4.3 **Runners.** Space runners no more than 6.5 feet apart on centers. Set the bottom runners as close to the base as possible.

13.9.6.8.4.4 **Transverse Bracing.** Install transverse bracing, in an "X," diagonally 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 counted horizontally from one end of the scaffold.

13.9.6.8.5 **Fabricated Frame Scaffolds.** All fabricated frame scaffolds (tubular welded frame scaffolds) shall comply with additional requirements in OSHA 1926.452(c). Use tubular welded frame scaffolding only if it is designed to safely support four times the

maximum intended load. Place the frames directly over one another, using couplings or stacking pins to vertically align the posts.

- 13.9.6.8.5.1 **Height Limitation.** A PE must prepare drawings and specifications for metal frame scaffolds that are more than 125 feet high.
- 13.9.6.8.5.2 **Uplift.** Lock frame members together vertically with pins or other equivalent means whenever there is a possibility that an uplift can occur.
- 13.9.6.8.5.3 **Cross Bracing.** Properly brace metal tubular frame scaffolding 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.
- 13.9.6.8.6 Mobile Scaffolds.** All mobile scaffolds shall meet the additional requirements in OSHA 1926.452(w).
- 13.9.6.8.6.1 **Moving.** The height to base width ratio of the scaffold during movement is two to one or less. When moving mobile scaffolds, apply manual force as close to the base of the scaffold as possible, but not more than 5 feet above the supporting surface. Power systems used to move mobile scaffolds shall be designed for such use. Stabilize the scaffold during movement. Use scaffolds only on firm, level, and broom-clean surfaces. Equip wheels and casters with a positive locking device to prevent the scaffold from accidentally moving.
- 13.9.6.8.6.2 **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 are installed on both sides of staging;
 - Wheels or casters are equipped with rubber or similarly resilient tires; and
 - Tools and materials are removed from or secured to the platform prior to moving the scaffold.
- 13.9.6.8.7 Figure-Four Form Scaffolds.** Do not use figure-four form scaffolds to support loads more than 25 pounds per square foot unless specifically designed for greater loading. Design and construct figure-four form scaffolds according to the dimensions shown in Table 13-2. The form scaffold must be an integral part of the form and nailed or bolted to the form studding.
- 13.9.6.8.8 Metal Bracket Form Scaffolds.** Metal bracket form scaffolds must be designed and constructed with a minimum safety factor of four times the maximum intended load. The metal brackets can be made of any metal that will support the maximum intended load. Equip them with standard guardrails and toeboards. Space metal

brackets no more than 8 feet apart on centers. The brackets can 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 the form walers are bolted to the form or secure them with snap ties or shea-bolts extending through the form and ensure brackets are anchored securely. Bolt or secure folding brackets in the extended position with locking pins.

TABLE 13-2. Figure-Four Scaffold Dimensions

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

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

13.9.6.8.9

Ladder Jack Scaffolds. Ladder jack scaffolds shall meet the additional requirements set in OSHA 1926.452. Use only type 1A ladders with ladder-jack scaffolds. The combined weight of workers, planks, equipment, and materials must not exceed the rated load of the ladders. The working platform of ladder-supported scaffolds must be no more than 20 feet high. To prevent ladders from moving, secure them at the top and bottom with brackets. Only one person can occupy a ladder-jack scaffold erected with wood scaffold planks. When using fabricated planks, allow no more than two people on the plank. Design ladder-jacks so that they bear on the ladder side rails, in addition to the ladder rungs, or so that they bear on a minimum length of 10 inches on each rung. Protect employees using ladder-supported scaffolds that are 6 feet or more above the ground or floor level with safety harnesses and lifelines.

13.9.6.9

Suspension Scaffolds. Suspension scaffolds are platforms suspended by ropes, or other non-rigid means, from an overhead structure.

13.9.6.9.1

Requirements. Suspension scaffold design and construction must meet or exceed the requirements of OSHA 1926.451(d) or this section, whichever is more stringent having jurisdiction. Only persons trained in operating, using, and inspecting that particular suspended scaffold can operate suspended scaffolds. Refer to OSHA 1926 Subpart L, Appendix A for specific guidelines regarding the requirements of OSHA 1926.451(d).

- 13.9.6.9.2** **Hoisting Devices and Safety Controls.** 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 to be able to go up and down. Design suspension scaffolds to stop independent of manual braking; they must not move when power is not applied. 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.
- 13.9.6.9.3** **Stability Control.** Always control suspension scaffolds with wire rope guides or equivalent means, such as taglines, to prevent sway. Install 3/4-inch manila rope tiebacks, or equivalent, on suspension scaffolds as a secondary means of anchorage.
- 13.9.6.9.4** **Inspection and Maintenance.** Prior to each work shift and after every occurrence that could affect the structural integrity, a competent person shall inspect the scaffold, including ropes, anchorage, rigging, and hoisting machines, and authorize prompt corrective actions. Maintain scaffolds and hoisting machines in safe, operable condition.
- 13.9.6.9.5** **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.
- 13.9.6.9.6** **Restrictions.** Ensure activities conducted on suspension scaffolding meet requirements of OSHA 1926.451 and 1926.452. 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.
- 13.9.6.9.7** **Platforms**
- 13.9.6.9.7.1** **Plank-Type Platforms.** Construct plank-type platforms of scaffold planks not less than 2 by 10 inches and cleated together on the underside. Install cleats within 6 inches of each end and at intervals no greater than 4 feet along planks. 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.
- 13.9.6.9.7.2** **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 1/2 inch apart. Hangers must not be more than 12 feet apart.
- 13.9.6.9.7.3** **Two-Point Suspension Platforms.** Two-point suspension platforms must be of plank, beam, or metal type. Construct platforms per 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. At each elevated workstation, 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.

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

13.9.6.9.8 *Boatswain's Chairs.* Use of single-point adjustable suspension scaffolds, or Boatswain's chairs, is prohibited.

13.9.7 Crane-Supported Personnel Platforms

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 section, 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 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 by a PE. Personnel must not work from crane-supported scaffolding except when under constant supervision of a general foreman, superintendent, or designated lift supervisor, and the crane and operation meet the requirements of this section and the section on cranes. Design, construction, and use of a crane-supported personnel platform must meet the requirements of OSHA 1926.1431. The use of crane-supported personnel platforms requires compliance with OSHA 1926 Subpart CC, *Cranes and Derricks in Construction*.

13.9.7.1 Hoist-Line Suspended Personnel Platforms

13.9.7.1.1 *Requirements.* Keep cranes level during operation, with outriggers fully extended and jack pads set on firm, level terrain or on substantial shoring. Select sites so that, when locating cranes for platform operation, no part can come within the minimum distance from energized lines, but do not use barriers, manufacturer's locks, or control level restraints to meet these requirements. Suspend the platform only from the main boom nose. Detach the platform before rigging the crane for material handling. 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. Employees must use personal fall protection equipment that meets the requirements of OSHA 1926.502, including a full body harness attached to the load block, headache ball, or a structural

member of the platform. Employees must keep all body parts inside the platform during raising, lowering, and positioning.

13.9.7.1.2

Restrictions. Per OSHA 1926.1431(k)(8), when wind speed exceeds 20 mph at the personnel platform or indications of dangerous weather create impending or existing danger, a qualified person must determine it is not safe to begin or continue operation. Do not handle materials lifts when personnel are on the platform. Do not belt off or otherwise attach a platform to an adjacent pole, structure, or equipment. Lifting and lowering speeds must not exceed 100 feet per minute. Do not move a mobile crane when employees are aloft.

13.9.7.2

Cranes. Install and test the crane periodically, as prescribed by the section on hoisting equipment. 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 load lines in a freewheeling or neutral position controlled by manual brake and/or dogs only. Use only the main hoist for personnel handling. 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. The minimum load hoist line wire rope safety factor must be at least 7 when using rotation-resistant rope. Install an anti-two-blocking device or two-blocking damage prevention feature and ensure that it is operating. The anti-two-blocking device must have automatic capabilities for controlling functions that can cause two-blocking conditions. Mark telescoping booms or equip them with a device that always shows the boom's extended length to the operator. 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.) Equip all critical hydraulic cylinders with a pilot-operated check valve or other appropriate device to prevent freefall or uncontrolled movement of the 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. Make sure the crane is level within 1 percent and located on firm footing. Extend and engage the outriggers.

13.9.7.3

Platforms

13.9.7.3.1

Design. The crane manufacturer or a PE must design the personnel platform. Suspension systems must be designed to minimize tipping of the platform caused by movement of employees on the platform. The entire platform must be designed with a minimum safety factor of 5. Provide at least 6 feet of headroom for employees on the platform. Provide each personnel platform with perimeter protection from the

floor to 42 inches above the floor. Perimeter protection must be either solid construction or expanded metal with openings no greater than 1/2 inch. Provide a grab rail inside the personnel platform. Access gates must swing inward and be equipped with a latch (restraining device) to prevent accidental opening. Provide overhead protection on the personnel platform when employees are exposed to falling objects.

13.9.7.3.2

Use. Grind smooth all exposed rough edges that employees on the platform could contact. A certified welder must perform all welding. Conspicuously post a plate or other permanent marking on the personnel platform that shows the weight and the rated load capacity of the personnel platform. Personnel platforms must be easily identifiable by color or marking. Use personnel platforms only to hoist personnel and approved tools and equipment. Use a wire rope bridle sling to connect the personnel platform to the load line. Bridles and associated rigging for suspending the personnel platform must be used only for the platform and the necessary employees, their tools and materials necessary to do their work. The bridles and associated rigging must not have been used for any purpose other than hoisting personnel. Close and lock hooks, headache ball assemblies, lower load blocks, or other attachment assemblies to eliminate the hook throat opening. Alternatively, use a shackle with a screw pin, nut, and retaining pin. Wire rope, shackles, rings, and other rigging hardware must have a minimum safety factor of 7.

13.9.7.4

Additional Inspections and Tests. At the beginning of each shift, a competent person must inspect cranes used to hoist personnel platforms. In addition, a competent person must inspect the crane after it has been used for any material handling operations before it will be used to hoist employees. Before hoisting employees for the first time at each new setup location, conduct a full-cycle operational test lift at 150 percent of the intended load of the personnel platform. 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. Before further use, correct any defects found during such inspections that will create a safety hazard. At the beginning of each shift, and after using the crane to hoist materials, conduct a trial lift with the unoccupied personnel platform to make sure all systems, controls, and safety devices are functioning properly.

13.9.7.5

Work Practices. The crane operator must always remain at the controls when the personnel platform is raised. Employees being hoisted must always remain in direct communication with the crane operator. A pre-lift meeting must be held and include the crane operator, involved employees, and the responsible general foreman, superintendent, or designated lift supervisor.

13.9.8 Aerial Lifts

Aerial lifts are devices, include any vehicle-mounted device, that telescopes or articulates in order to position personnel.

13.9.8.1 Requirements. The design, construction, and operation of aerial lifts must comply with OSHA 1910.67 (general industry) or 1926.453 (construction), which incorporates ANSI A92.2, *Vehicle Mounted Elevating and Rotating Aerial Devices*, by reference. Mount personnel platforms on a boom only when they conform with the manufacturer's requirements. A personal fall arrest or travel restraint system shall be worn in accordance with manufacturer's instructions when in a boom or basket while working from an aerial lift.

13.9.8.2 Controls. Articulating boom and extensible boom platforms, designed and used to position personnel, shall have both platform (upper) and lower controls. Platform controls shall be within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Lower controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

13.9.9 Safeguarding Openings in Work Surfaces

13.9.9.1 Floor and Roof Openings. Cover 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 section. Protect open sides of all uncovered floor or roof openings with a standard guardrail and toe board or provide a cover designed for the maximum intended load, and a minimum load of 250 pounds.

13.9.9.2 Stairways and Ladderways. Provide all stairway and ladderway floor openings with a standard guardrail and toe board on exposed sides (except the entrance). Offset entrances to stairways or ladderways or provide a self-closing safety gate to prevent persons from walking directly into the opening. A self-closing safety gate must swing away from the opening.

13.9.9.3 Hatchways and Chutes. Guard hatchways and chute floor openings with one of the following:

- 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.

- A removable standard guardrail or self-closing gate installed on just one side, and fixed standard guardrails and toe boards 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.
- Removable standard guardrails, secured to the floor on all open or exposed sides, installed to permit removal of only the portion necessary to perform the work. When the hatchway is not in use, immediately replace the guardrail and secure it.

13.9.9.4 Doors and Gates. Provide a platform wherever 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.

13.9.9.5 Walls. 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 toe board where the bottom of the wall opening is less than 4 inches above the working surface.

13.9.9.6 Floors and Platforms. Guard the perimeter of all floors, platforms, etc., that are elevated 4 feet (6 feet for construction activities) or more above adjacent floor or ground level by installing standard 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 toe boards where falling objects pose a hazard to persons or property. In locations where a hazardous condition exists (such as projecting reinforcing steel, moving equipment, or hazardous materials), provide standard guardrails around the perimeter of all floors, platforms, etc., regardless of working surface height.

13.9.10 Roofs

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. Refer to RSHS Section 16 for fall protection information. Adequate fall protection is required for employees working within 10 feet of the roof edge or when working anywhere on a roof with a slope ratio steeper than 1:3.

13.9.10.1 Warning Lines. A warning line is only acceptable on roofs with a slope ratio less than 1:3 and must be supplemented by a safety monitoring system. Warning lines must be erected around all open sides of roof work area and must meet the

requirements set forth in OSHA 1926.502(f). Do not work outside warning lines without fall protection.

13.9.10.2 Materials Handling and Storage at Roof Edges. When using guardrails at hoisting areas or roof-edge storage areas, erect at least 4 feet in length of guardrail on each side of the area. Place a self-closing safety gate across the opening between the guardrail sections and secure it in the closed position when employees are not handling materials. Protect employees working near the open guardrail with fall protection. 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 toe boards at the roof edge.

13.9.10.3 Roofing Brackets. Secure roofing brackets in place with nails as well as metal projections. If it is not practical to nail the brackets, use rope supports that are 3/4-inch manila rope or equivalent.

13.10 Definitions

Aerial lifts (device)	Any vehicle-mounted device, telescoping or articulating, or both, which is used to position personnel.
Articulating boom platform	An aerial device with two or more hinged boom sections.
Bearers	Horizontal transverse scaffold members (which may be supported by ledgers or runners) upon which the scaffold platform rests, and which joins scaffold uprights, posts, poles, and similar members.
Boatswain's chair	A single-point adjustable suspension scaffold consisting of a seat or sling designed to support one employee in a sitting position.
Competent person	One capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary or hazardous to employees and has authorization to take prompt corrective measures to eliminate them.
Extensible boom platform	An aerial device (except ladders) with a telescopic or extensible boom. Telescopic derricks with personnel platform attachments shall be considered extensible boom platforms when used with a personnel platform.
Fixed ladder	A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

Guardrail system	A barrier erected along an unprotected or exposed side, edge, or other area of a walking-working surface to prevent employees from falling to a lower level.
Handrail	A rail used to provide employees with a handhold for support.
Ladder safety system	A system designed to eliminate or reduce the possibility of falling from a ladder. A ladder safety system usually consists of a carrier, a safety sleeve, a lanyard, connectors, and a body harness. Cages and wells are not ladder safety systems.
Ladder-jack scaffolds	A supported scaffold consisting of a platform resting on brackets attached to ladders.
Ledger	The lengthwise horizontal spacing or bracing member, which may support the bearers.
Rated load	The manufacturer's specified maximum load to be lifted by a hoist or to be applied to a scaffold or scaffold component.
Maximum intended load	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.
Personal fall arrest system	A system used to stop an employee in a fall from a walking-working surface. It consists of a body harness, anchorage, and connector. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these.
Portable ladder	A ladder that can be readily moved or carried.
Qualified person	One, by possession of a recognized degree, certificate, or professional standing, or 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.
Runners	The lengthwise horizontal spacing or bracing member of a scaffold that may support the bearers.
Safety factor	The ratio of the ultimate breaking strength of a member or piece of material or equipment to the actual working stress or safe load when in use.
Stair rail	A barrier erected along the exposed or open side of a stairway to prevent employees from falling to a lower level.
Supported scaffold	Platforms supported by legs, outrigger beams, brackets, poles, uprights, posts, frames, or similar rigid support.

Suspension scaffold	One or more platforms suspended from an overhead structure by ropes or other non-rigid means.
System scaffold	A scaffold consisting of posts with fixed connection points that accept runners, bearers, and diagonals that can be connected at predetermined levels.

13.11 References

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