

SECTION 24

SAFE ACCESS, LADDERS, FLOOR & WALL OPENINGS, STAIRS AND RAILING SYSTEMS

24.A SAFE ACCESS - GENERAL

24.A.01 Safe access shall be provided to work areas and where danger exists of workers falling through floor, roof, or wall openings, or from platforms, runways, ramps, or fixed stairs.

- a. A stairway, ladder, ramp, or personnel hoist shall be provided where there is a break of 19 in (48.2 cm) or more in a route of access.
- b. Means of access constructed of metal shall not be used for electrical work or where the potential exists to contact electrical conductors.
- c. Means of access between levels shall be kept clear to allow free passage of workers. If work is performed in an area that restricts free passage, a second means of access shall be provided.
- d. For all USACE-owned/operated facilities, every open-sided floor or platform 4 ft (1.2 m) or more above adjacent floor or ground level shall be guarded by a railing system (or equivalent) along all open sides (except where there is an entrance to a ramp, stairway or fixed ladder. The railing system shall be provided with a toeboard when necessary. > **See 21.E.01.**

24.A.02 An AHA, accepted by the GDA for the activity in which means of access are to be used shall delineate the following:

- a. The design, construction, and maintenance of the means of access, and

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b. Erection and dismantling procedures of scaffolds, including provisions for providing fall protection during the erection or dismantling when the erection or dismantling involves work at heights. See Sections 21.J.02, Fall Protection; and 22.A.03, Work Platforms.

24.A.03 Job-made means of access shall be designed to support, without failure, at least four times the maximum intended load and shall be constructed according to Section 22 of this manual.

24.A.04 Means of access shall not be loaded beyond the maximum intended load for which they were designed or beyond their manufacture rated capacity. When loaded, planking and decking shall not deflect more than 1/60 the span length.

24.A.05 The width of access ways shall be determined by the purpose for which they are built, shall be sufficient to provide safe passage for materials and movement of personnel and (except for ladders) shall not be less than 18 in (45.7 cm).

24.A.06 Access ways shall have overhead protection equal to 2 in (5 cm) solid planking whenever work is performed over them or if personnel are exposed to hazards from falling objects.

24.A.07. Access ways shall be inspected daily.

a. The walkway must be free of tripping hazards, obstructions and cannot impede or restrict the travel of personnel. In addition, access ways shall be kept free of ice, snow, grease and mud or any other environmental hazards.

b. Where access ways are slippery, abrasive material shall be used to assure safe footing.

c. All obstructions or projections into an access way shall be removed or conspicuously marked. Obstructions or projections that are sharp, pointed or that may cause lacerations, contusions, or abrasions shall be covered with protective material.

d. Access ways, including their accessories that become damaged or weakened shall not be used. These defective items shall be repaired or replaced.

24.A.08 When moving platforms to the next level, the old platform shall be left undisturbed until the new bearers have been set to receive the platform planks.

24.A.09 Safe Roof Access.

a. Level, guarded platforms shall be provided at the landing area on the roof.

b. Crawling boards.

(1) Crawling boards shall be not less than 10 in (25 cm) wide and 1 in (2.5 cm) thick, having cleats 1 in x 1.5 in (2.5 cm x 3.75 cm).

(2) Cleats shall be equal in length to the width of the board and spaced at equal intervals not to exceed 24 in (60 cm).

(3) Nails shall be driven through and clinched on the underside. Screws may be used in lieu of nails.

(4) Crawling boards shall be secured and extend from the ridge pole to the eaves when used with roof construction, repairs, or maintenance.

(5) A firmly fastened lifeline of at least 0.75 in (2 cm) diameter rope, or equivalent, shall be strung beside each crawling board for a handhold.

c. Access paths shall be erected as follows:

(1) Points of access, materials handling areas and storage areas shall be connected to the work area by a clear access path formed by two warning lines.

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(2) When the path to a point of access is not being used, one of the following shall be used:

(a) A rope, wire, or chain, equal in strength and height to the warning line, shall be placed across the path at the point where the path intersects the warning line erected around the work area, or

(b) The path shall be offset such that a person cannot walk directly into the work area.

24.B LADDERS

24.B.01 The construction, installation, and use of ladders shall conform to ANSI A14.1, ANSI A14.2, ANSI A14.3, and ANSI A14.4, as applicable.

24.B.02 Length of ladders.

a. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.

b. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.

(1) When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.

(2) In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.

c. The length of portable stepladders shall not exceed 20 ft (6 m).

d. When splicing of side rails is required to obtain the required length, the resulting side rail must be at least equal in strength to a one-piece side rail made of the same material.

24.B.03 Width of ladders.

a. The minimum clear distance between the sides of individual-rung/step ladders shall be 16 in (40.6 cm).

b. The minimum clear distance between side rails for all portable ladders shall be 12 in (30.4 cm).

24.B.04 Spacing of rungs, cleats, and steps on ladders.

a. On portable ladders, spacing of rungs shall be 8 in (20.3 cm) - 14 in (35.5 cm) on center and uniform.

b. On step stools, spacing shall be not less than 8 in (20.3 cm) or more than 12 in (30.4 cm) apart, as measured from their centerlines.

c. On extension trestle ladders, spacing on the base section shall be not less than 8 in (20.3 cm) or more than 18 in (45.7 cm) apart, as measured from their centerlines. On the extension section, spacing shall not be less than 6 in (15.2 cm) or more than 12 in (30.4 cm) apart, as measured from their centerlines.

24.B.05 Ladders shall be surfaced so as to prevent injury to an worker from punctures or lacerations and to prevent snagging of clothing.

24.B.06 Wooden ladders shall not be coated with any opaque covering, except for identification or warning labels that may be placed on only one face of a side rail.

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24.B.07 A metal spreader bar or locking device shall be provided on each stepladder to hold the front and back sections in an open position.

24.B.08 Set-up of ladders.

a. Ladders shall not be placed in passageways, doorways, drives, or any locations where they may be displaced by any other work unless protected by barricades or guards.

b. Portable ladders shall be used at such a pitch that the horizontal distance from the top support to the foot of the ladder will not be greater than $\frac{1}{4}$ the vertical distance between these points.

c. Wooden job-made ladders, with spliced rails, shall be used at an angle such that the horizontal distance is $\frac{1}{8}$ the length of the ladder.

d. Ladders shall be secured by top, bottom, and intermediate fastenings, as necessary to hold them rigidly in place and to support the loads that will be imposed upon them.

e. The steps or rungs of all ladders shall be set to provide at least 7 in (17.7 cm) toe space from the inside edge of the rung to the nearest interference.

f. The top of a non-self supporting ladder shall be placed with the two rails supported equally, unless the ladder is equipped with a single support attachment.

g. Step-across distance. The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 in (30.5 cm) or less than 2- $\frac{1}{2}$ in (6.4 cm).

24.B.09 Use of ladders.

- a. Ladders shall be restricted to their intended use.
- b. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "**DO NOT USE**," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.
- c. Ladders shall not be moved, shifted, or extended while occupied.
- d. Ladders shall not be climbed by more than one person at a time, unless it is designed to be climbed by more than one person.
- e. Portable ladders used as means of access to ascend and descend to a work location do not require fall protection, however only light work for short periods of time shall be performed on portable ladders. No work requiring lifting of heavy materials or substantial exertion shall be done from ladders.
- f. When ladders are the only means of access to or from a working area for 25 or more workers, or when a ladder is to serve simultaneous two-way traffic, double-cleated ladders shall be used.
- g. Portable ladders shall have slip-resistant feet.
- h. The top or top step of a stepladder, shall not be used, as a step unless it has been designed to be so used by the manufacturer.
- i. Ensure latches are in place before climbing an extension ladder.

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j. Keep loose tools off the steps and top platform.

24.B.10 Job made ladders will be made in accordance with ANSI A14.4.

24.B.11 Single-rail ladders shall not be used. Three-legged ladders may be used for specific tasks, if accepted by the GDA.

24.B.12 The use of ladder climbing devices shall be in accordance with 21.I.

24.B.13 Articulated ladders are allowed if they meet ANSI A14.2 standard.

24.B.14 Any ladder accessory, including but not limited to, ladder levelers, ladder stabilizers or stand-off devices, ladder jacks or ladder straps or hooks, that may be installed or used in conjunction with ladders must be installed and used per manufacturer's instructions.

24.C HANDRAILS

24.C.01 A standard handrail shall be of construction similar to a standard guardrail (reference Section 21.E.01) except that it is mounted on a wall or partition and does not include a midair.

24.C.02 Handrails shall have smooth surfaces along the top and both sides.

24.C.03 Handrails shall have an adequate handhold for anyone grasping it to avoid falling.

24.C.04 Ends of handrails shall be turned into the supporting wall or partition or otherwise arranged so as to not constitute a projection hazard.

24.C.05 The height of handrails shall be not more than 38 in (86.3 cm) nor less than 34 in (76.2 cm) from upper surface of handrail to

surface of tread, in line with face of riser or to surface of ramp. Existing installations need not be modified if they meet the building code that was in effect at the time the facility was built.

24.C.06 All handrails and railings shall be provided with a clearance of approximately 3 in (7.6 cm) between the handrail or railing and any other object.

24.D FLOOR, WALL AND ROOF HOLES AND OPENINGS.

24.D.01 Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. See 21.F for covering and labeling requirements.

< Skylights located in floors or roofs are considered floor or roof hole/openings.

24.D.02 All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system. See Sections 21.E and 21.F.

24.D.03 All floor and roof holes through which equipment, materials, or debris can fall shall be covered.

24.D.04 Conduits, trenches, and manhole covers and their supports, when exposed to vehicles or equipment, shall be designed to carry a truck rear axle load of 2 times the maximum anticipated load.

24.D.05 Every hatchway and chute floor opening shall be guarded by a hinged floor-opening cover. The opening shall be barricaded with railings so as to leave only one exposed side. The exposed side shall be provided either with a swinging gate or offset so that a person cannot walk into the opening. When operating conditions

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require the feeding of material into a hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

24.D.06 Wall openings from which a fall could occur shall be protected with a standard guardrail or equivalent. A toe board shall be provided where the bottom of the wall opening, regardless of width, is less than 4 in (10.1 cm) above the working surface. See Section 21.E.01.

24.D.07 An extension platform outside a wall opening onto which materials can be hoisted for handling shall have a standard railing that meets criteria in Section 21.E.01 of this manual. However, one side of an extension platform may have removable railings to facilitate handling materials, if appropriate fall protection is used.

24.D.08 Roof openings and holes shall be provided with covers, guardrail systems or warning lines systems on all exposed sides.

a. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered according to Section 21.F.

b. All covers for openings shall be identified in accordance with Section 21.F.

c. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.

d. Workers are prohibited from standing/walking on skylights.

24.E STAIRWAYS

24.E.01 On all structures 20 ft (6 m) or more in height, stairways shall be provided during construction.

a. Where permanent stairways are not installed concurrently with the construction of each floor, a temporary stairway shall be provided to the work level.

b. Alternatives to the use of stairways shall be addressed in the AHA and shall be acceptable to the GDA.

24.E.02 Design of stairways.

a. Temporary stairways shall have landings not less than 30 in (76.2 cm) in the direction of travel and extend at least 22 in (55.8 cm) in width at every 12 ft (3.6 m) or less of vertical rise.

b. Stairs shall be installed between 30° and 50° from horizontal.

c. Risers shall be of uniform height and treads of uniform width.

24.E.03 Metal pan landings and metal pan treads, when used, shall be secured in place and filled with concrete, wood, or other material at least to the top of each pan.

24.E.04 Wooden treads shall be nailed in place.

24.E.05 Every flight of stairs with four or more risers or rising more than 30 in (76.2 cm) shall have standard stair railings (defined below) or standard handrails unless omitted by design.

a. On stairways less than 44 in (111.7 cm) wide having both sides enclosed, at least one standard handrail shall be installed, preferably on the right descending side.

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b. On stairways less than 44 in (111.7 cm) wide having one side open, at least one standard stair railing shall be installed on the open side.

c. On stairways less than 44 in (111.7 cm) wide having both sides open, one standard stair railing shall be installed on each side.

d. On stairways more than 44 in (111.7 cm) wide, but less than 88 in (223.5 cm) wide, one standard handrail shall be installed on each enclosed side, and one standard stair railing installed on each open side.

e. On stairways more than 88 in (223.5 cm) wide, one standard handrail shall be installed on each enclosed side, one standard stair railing on each exposed side, and a standard handrail in the middle of the stairway.

24.E.06 Standard stair railing shall be installed around all stairwells.

a. The height of stair rails shall be 42+/- 3 in (cm) from the upper surface of the top rail to surface of tread in line with face of riser at forward edge of tread. Existing installations need not be modified. Existing installations need not be modified.

b. Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be provided between the toprail and the stairway steps.

(1) Midrails shall be located at a height midway between the top edge of the stairway system and the stairway steps.

(2) Screens or mesh, when used, shall extend from the toprail to the stairway steps and along the entire opening between rail supports.

(3) Intermediate vertical members, when used, shall be not more than 19 in (48.2 cm) apart.

(4) Other structural members, when used, shall be installed in such a manner that there are no openings in the stair rail system that are more than 19 in (48.2 cm) wide.

24.E.07 Doors or gates opening onto a stairway shall have a platform; and swinging of the door shall not reduce the width of the platform to less than 20 in (50.8 cm).

24.E.08 Spiral stairways shall not be permitted, except for special limited usage and secondary access where it is not practical to provide a conventional stairway.

24.E.09 Three points of contact shall be maintained at all times when ascending or descending spiral stairs, ship stairs, or alternating tread stairs. Three point contact means that either both hands and one foot, or both feet and one hand are in contact with the climbing device at all times.

24.F RAMPS, RUNWAYS, AND TRESTLES

24.F.01 Ramps, runways, and platforms shall be as flat as conditions will permit. Where the slope exceeds 1ft:5 ft (0.3 m:1.5m), traverse cleats shall be applied to the working surface.

24.F.02 Vehicle ramps, trestles, and bridges on which foot traffic is permitted shall be provided with a walkway and guardrail outside the roadway. The roadway structures shall be provided with wheel guards, fender logs, or curbs not less than 8 in (20.3 cm) high placed parallel and secured to the sides of the runway.

24.F.03 All locomotive and gantry crane trestles that extend into or pass over a work area, except where a crane is hoisting between rails, shall be decked solid with not less than 2-in (5-cm) planking, or the equivalent, for the full length of the extension into the working area.

24.F.04 When used in lieu of steps, ramps shall be provided with cleats to ensure safe access.

24.G PERSONNEL HOISTS AND ELEVATORS

24.G.01 Design, construction, installation or erection, operation, inspection, testing, and maintenance of personnel hoists and elevators shall be in accordance with the manufacturer's recommendations and the applicable ANSI standard.

- a. Track-guided personnel hoist systems and structures that are temporarily installed inside or outside buildings during construction, alteration, or demolition shall be in compliance with ANSI A10.4;
- b. Rope-guided personnel hoist systems that are temporarily erected during construction, alteration, or demolition shall be in compliance with ANSI A10.22;
- c. Non-guided personnel hoist systems that are temporarily erected during construction, alteration, or demolition shall be in compliance with ANSI A10.8 and ANSI A10.22. (An air-tugger hoist, or the equivalent meeting the criteria in section 4.2 of ANSI A10.22, may be substituted for a base-mounted hoist.)
- d. Elevators operating in permanent hoistways on the permanent guide rails for handling personnel during construction shall be in compliance with ANSI/ASME A17.1
- e. A copy of the manufacturer's manual covering construction, installation or erection, operation, inspection, testing, and maintenance and a copy of the applicable ANSI standard shall be available on site.
- f. Personnel hoists and elevators shall comply with applicable requirements from Section 16 of this manual.

24.G.02 Personnel hoists used in bridge tower construction shall be approved by a registered engineer and erected under the supervision of a registered engineer competent in this field.