

# Chapter 8.7

## Ladders, scaffolds, and elevated platforms: how to work with them safely

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### *This could be you . . .*

*A worker was seriously injured when he fell about 20 feet from a ladder. He was the only person in a remote facility, and no one knew that he was there inspecting some pipes. He walked the ladder along the elevated piping to see additional sections and caused the ladder to fall. He had to crawl to a nearby area to get help.*

*Two workers miraculously survived but were permanently injured when the suspended scaffolding that they had improperly set up fell approximately 40 feet with them on it. They had the manufacturer's instruction and operation manual, but failed to read or apply it in the setup. They weren't experienced with suspended scaffolding, but had been given the task to assemble and use it.*

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### **1. Applicability of this chapter**

You are required to follow this chapter if you are a JSC civil service, contractor, or subcontractor employee who constructs, maintains, or uses:

- a. Ladders
- b. Scaffolds
- c. Safety nets
- d. Elevated platforms

Fall protection is required whenever you work over 4 feet above the ground doing general industry work, 6 feet above the ground doing construction work, or 10 feet above the ground on scaffolding. For more information, see Chapter 5.6, "Personal protective equipment," of this handbook.

### **2. What this chapter covers**

This chapter covers the minimum requirements for constructing, erecting, testing, assembling, using, disassembling, lowering, maintaining, or storing ladders, scaffolds, safety nets, or elevated platforms.

## *Requirements for ladders*

### **3. Requirements for using portable ladders**

Ladders are a means of allowing you to get from one work level to another. They aren't designed as a platform to work from for long periods of time. You may do short-term or quick jobs, such as changing a light bulb or connecting fixture wiring, from a ladder. You shall:

- a. Do longer-term or more complex jobs, such as changing out equipment, from work platforms such as scaffolding or man-lifts.
- b. Document the reason that you can't use a work platform if you must do any of these longer-term jobs with a ladder. Get approval for not using a work platform from the appropriate safety representative and the Safety and Test Operations Division. Also, describe the specifics of the fall protection system that you will use to protect yourself on a ladder.
- c. Always follow the manufacturer's recommendations when working with ladders, including Type I industrial stepladders, Type II commercial stepladders, and extension ladders.
- d. Follow 29 CFR 1910.25, "Portable Wood Ladders," 29 CFR 1910.26, "Portable Metal Ladders," and 29 CFR 1926.1053, "Ladders" (for construction).
- e. Maintain three points of contact with the ladder when ascending or descending (one hand and two feet, or two hands and one foot) and keep the center of your body between the ladder rails.
- f. Place ladders to prevent slipping, tie them off, or have someone hold the ladder in a steady position.
- g. Never have more than one person on a ladder unless it is specially designed for this use.
- h. Adjust extension ladders while standing at the base of the ladder and make sure that the locks are properly engaged. Don't make adjustments while standing on the ladder.
- i. Erect two-section extension ladders so that the upper section is resting on the bottom section. The minimum overlap for the two sections are listed below:

<i>Size of Ladder (feet) . . .</i>	<i>Overlap (feet) . . .</i>
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

- j. Extend the ladder a minimum of 3 feet above the point of support when you need to access a roof or other top surface.

- k. Never:
1. Use ladders in a horizontal position as platforms, runways, or scaffolds.
  2. Place them in front of doors opening toward the ladder unless the door is blocked, locked, or guarded. Don't lock an EXIT door.
  3. Place the ladder on boxes, barrels, or other unstable bases.
  4. Splice together short ladders to make long sections.
  5. Use ladders made by fastening cleats across a single rail.
  6. Use them as guys, braces, or skids, or for other than their intended purpose.
  7. Use the top or top step of stepladders as a step.
  8. Use portable stepladders longer than 20 feet.
  9. Climb on the bracing on the back legs of stepladders.
  10. Use a closed stepladder as a vertical ladder.
  11. Use metal ladders in close proximity to areas containing electrical circuits.
  12. Use the middle and top sections of sectional or window cleaner ladders unless you equip them with safety shoes.
- l. Use care in safely placing, securing, or holding a ladder being used on oily, metal, concrete, or slippery surfaces. Nonslip bases may not be adequate.

#### **4. Ladder inspection**

You shall inspect ladders before each use and inspect and test any ladder involved in an incident such as tipping over or one exposed to extreme heat (fire) for deflection and loss of strength and follow these requirements:

- a. In addition, supervisors or designees shall also inspect each ladder at least yearly. Document each yearly inspection on an inspection tag that shows the inspector's initials and date for next inspection. Use off-the-shelf inspection tags that fit into holders that are attached to the ladder or a similar method, such as a tape tag, for inspection documentation. You can get these tags in quantities of fewer than 20 from the Safety and Test Operations Division by calling x30394. Take any ladders out of service that have defects with an "Out of Service" tag (JSC Form 1243). Make sure defective ladders are repaired or destroyed.
- b. Ladder inspections shall cover the following and any additional items in the manufacturer's instructions:
1. Overall condition and maintenance
  2. Tight joints between the steps and side rails
  3. Securely attached fittings
  4. Movable parts – must move freely

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5. All rung and hardware connections and rivets for shearing
6. Loose or broken steps or rungs
7. Excessively dented rungs
8. Broken, split, or cracked uprights, braces, steps or rungs
9. Rail dents or bends
10. Loose nails, screws, bolts, rivets, rung-to-side-rail connections, or hardware connections
11. Missing, broken, or damaged safety shoes, nonslip bases, casters/wheels, or locking devices
12. Loose, bent, or broken hinges or spreaders on stepladders
13. Defective locks on extension ladders
14. Deteriorated or broken ropes or sheaves on extension ladders
15. General serviceability

### **5. How to keep portable ladders safe**

You shall always follow the manufacturer's recommendations when working with ladders and:

- a. Follow 29 CFR 1910.25, 29 CFR 1910.26, and 29 CFR 1926.1053 (for construction).
- a. Lubricate metal bearings of locks, wheels, and pulleys frequently.
- b. Equip bases of portable ladders with nonskid material or safety shoes of strong design.
- c. Keep rungs free of grease, oil, or other foreign materials.
- d. Apply a protective coating, such as varnish, to ladders that are subjected to certain acid or alkali solutions. Don't apply opaque paint to ladders; it would hide defects.
- e. Use portable rung ladders within reinforced rails only with metal reinforcement on the underside. Use this kind of ladder with great care near electrical conductors.

### **6. Requirements for working with fixed ladders**

You shall:

- a. Always follow the manufacturer's recommendations when working with fixed ladders.
- b. Design, build, use, and maintain fixed ladders as described in 29 CFR 1910.27, "Fixed Ladders."
- c. Face the ladder when climbing or descending.
- d. Raise or lower tools or other equipment with lanyards, tool belts, or aprons. Don't carry tools in your hands when ascending or descending a ladder.

- e. Allow only one person on a ladder section at a time.

## *Requirements for scaffolds*

### **7. Description of, and standards that apply to, scaffolds**

A scaffold is any *temporary* elevated platform (supported or suspended) and its supporting structure (including points of anchorage) used for supporting employees or materials or both. Two OSHA standards apply to scaffolds:

- a. 29 CFR 1926, Subpart L, “Scaffolding,” applies to scaffolds used in construction work. Construction work is any work for construction, alteration, or repair, including painting and decorating.
- b. 29 CFR 1910.28, “Safety Requirements for Scaffolding,” applies to any nonconstruction work.

### **8. Inspecting and maintaining scaffolds**

You shall:

- a. Design, build, erect, and maintain scaffolds as described in 29 CFR 1910.28 and 29 CFR 1926, Subpart L (for construction).
- b. Have trained scaffolding-competent persons designated by the scaffold manufacturer or employer. Never inspect, repair, or maintain scaffolds used in construction unless you are trained as described in subparagraph 18.d of this chapter.
- c. Maintain scaffolds and other devices in a safe condition. Correct any defects, unsafe conditions, or noncompliance immediately before further use. Never use any broken, bent, excessively rusted, altered, or otherwise structurally damaged frames or accessories.
- d. Never use scaffolding components from different manufacturers or systems together, unless specifically authorized to do so by the scaffolding manufacturer.
- e. Inspect scaffold equipment for defective parts and structural integrity at least twice a year, before each assembly, and daily during use. Your supervisor, safety representative, or the Safety and Test Operations Division may help you in these inspections. Record, date, and maintain the inspection reports in the office of the responsible organization.
- f. Inspect wire ropes, fiber ropes, slings, hangers, platforms, and other supporting parts for defects before each installation and daily during use.
- g. Periodically inspect all welded frames and accessories. Also inspect any maintenance, such as painting or minor corrections, authorized by the manufacturer before further use.
- h. Remove defective equipment from service immediately. Your designated scaffolding-competent person, safety representative, or supervisor shall put a **WARNING - DO NOT OPERATE** tag (JSC Form 19A) on the equipment until it is repaired or destroyed.

## **9. Erecting scaffolds**

Observe the requirements as described in 29 CFR 1910.28; 29 CFR 1926, Subpart L (for construction); the manufacturer's recommended work practices; and the following requirements for operations involving scaffolds:

- a. Use only designated competent, experienced personnel to erect scaffolds or to supervise the erection of scaffolds. Never erect, disassemble, or move scaffolds used in construction unless you are trained as described in subparagraph 18.d of this chapter.
- b. Make sure the footing or anchorage for scaffolds is sound, rigid, and capable of supporting the maximum intended load without settling or displacement. Never use unstable objects such as barrels, boxes, loose brick, or concrete blocks to support scaffolds or planks.
- c. Overlap all planking or platforms (minimum 12 inches) or secure them from moving.
- d. Provide an access ladder or equivalent safe access on scaffolds that have built-in ladders that decrease in width.
- e. Extend scaffold planks over their end supports not less than 6 inches and not more than 18 inches.
- f. Make sure the poles, legs, or uprights of scaffolds are plumb and securely and rigidly braced to prevent swaying and displacement.
- g. Make sure materials being hoisted onto a scaffold have a tag line.
- h. Provide overhead protection for personnel on or near a scaffold that is exposed to overhead hazards.
- i. Install guardrails and toe boards at all open sides on all scaffolds more than 10 feet above the ground or floor. Provide scaffolds with a screen between the toe board and the guardrail, extending along the entire opening, consisting of No. 18-gauge U.S. Standard Wire ½-inch mesh or the equivalent where persons are required to work or pass under the scaffolds.
- j. Set independent pole scaffolds as near to the wall of the building as practical.
- k. Separate the area under scaffolding or elevated work from other areas by suitable barricades to prevent personnel travel under the platform and to protect from falling objects.
- l. Install outriggers on scaffolding as directed by the manufacturer, or whenever the height of the scaffold system exceeds four times the minimum base width.
- m. Check for and avoid getting too close to electrical equipment; for example; crane rails.

## **10. Requirements for working on any scaffold**

To use scaffolding, you shall follow the manufacturer's recommended work practices as well as 29 CFR 1910.28 or 29 CFR 1926, Subpart L (for construction), and NEVER:

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- a. Assemble or disassemble scaffold used in construction unless you are trained as described in subparagraph 18.c of this chapter.
- b. Work on scaffolds used in construction unless you are trained as described in subparagraph 18.d of this chapter.
- c. Alter or move a scaffold horizontally while in use or occupied unless it is specifically intended for that purpose.
- d. Exceed the intended working load for the scaffold.
- e. Work on scaffolds during storms or high winds or if the scaffold is covered with ice or snow. Remove ice and snow and sand from the planking to prevent slips.
- f. Accumulate tools, materials, and debris in quantities that could cause a tripping hazard.
- g. Use “shore” or “lean-to”-type scaffolds.

### **11. Requirements for working with suspended scaffolding**

You shall observe the manufacturer’s recommended work practices; 29 CFR 1910.28 and 29 CFR 1926, Subpart L (for construction); and the following requirements for operations involving suspended scaffolding:

- a. If you erect, or supervise the erection of, suspended scaffolding, you shall be trained and designated by the scaffolding manufacturer or employer as a suspended scaffold-competent person. Never erect, disassemble, move, or use scaffolds in construction unless you are trained as described in subparagraph 18.d of this chapter.
- b. Use wire or fiber rope for scaffold suspension that is capable of supporting at least six times the intended load. Use thimbles in ropes attached to securing points to support the scaffold (both primary and secondary supports).
- c. Use wire-rope-supported scaffolding when acid solutions are used for cleaning buildings over 50 feet in height. Use only treated or protected fiber rope for or near any suspended scaffold work involving the use of corrosive substances or chemicals.
- d. Inspect all ropes, slings, hangers, platforms, and other supporting parts for defects, corrosion, or rusting before each installation and use. Replace wire ropes with six or more broken wires in any one lay of the wire rope. A “lay” is the distance it takes one strand to make a 360-degree wrap around the rope. Also replace damaged ropes or ropes in a deteriorated condition.
- e. Protect yourself while working in a suspended scaffold with a harness attached to an independently supported lifeline through a fall-arrest device (rope grab). Attach the lifeline to substantial members of the structure that are independent of the scaffolding.
- f. Secure all suspended scaffolding portable components that support the scaffold (such as parapet clamps or hooks) with secondary tiebacks to substantial members of the structure.

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- g. Allow only two workers (with their tools) on a suspension scaffold rated at a working load of 500 pounds and only three workers (with their tools) on a suspension scaffold rated at 750 pounds.
- h. Set up all suspended scaffolding portable components that support the scaffold (primary and secondary tiebacks) so that only one device is attached to a preformed exposed aggregate facade panel section.

### *Requirements for elevated platforms*

#### **12. Requirements for working with power-operated platforms**

You shall:

- a. Install, operate, use, maintain, and inspect power-operated platforms for exterior building maintenance as described in 29 CFR 1910.66, “Powered Platforms for Exterior Building Maintenance.” The requirements of this section don’t apply to firefighting equipment or to the vehicles with mounted aerial devices, except that the vehicle shall be a stable support for the aerial device.
- b. Never move, operate, repair, maintain, or inspect power-operated platforms used in construction unless you are trained as described in subparagraph 18.e of this chapter.
- c. Never disable any required safety device or electrical protective device, except when necessary during tests, inspections, and maintenance. Restore the devices to their normal operating condition immediately after completing such tests, inspections, and maintenance.
- d. Never operate powered platforms during severe adverse weather conditions as determined by your supervisor or the Safety and Test Operations Division.
- e. Make sure that each employee on the working platform has and uses a harness and lifeline as described in Chapter 5.6 of this handbook.
- f. Make sure that all powered platforms have an acceptance test to determine that all parts meet 29 CFR 1910.66 specifications and that all safety and operating equipment functions as required. Make a similar inspection and test after any alteration to an existing powered platform installation.

#### **13. Requirements for work with other elevated platforms**

You shall:

- a. Design, construct, test, operate, and maintain aerial devices, aerial ladders, articulating boom platforms, extensible boom platforms, and other types of vehicle-mounted elevating and rotating work platforms as described in 29 CFR 1910.67, “Vehicle-Mounted Elevating and Rotating Work Platforms.”



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- b. Never move, operate, repair, maintain, or inspect elevated platforms used in construction unless you are trained as described in subparagraph 18.e of this chapter.
- c. Consider the following when operating aerial lifts close to, under, over, by, or near electric power lines:
  - 1. For lines rated at 50 kV or less, the minimum clearance between the lines and any part of the aerial lift shall be at least 10 feet.
  - 2. When the lines are rated over 50 kV, the minimum clearance between the lines and any part of the aerial lift shall be at least 10 feet plus 0.4 inch for each kilovolt over 50 kV, or twice the length of the line insulator, but never less than 10 feet.
  - 3. These requirements don't apply if the work is performed from an aerial device insulated for the work and the work is performed by either telecommunications employees, line-clearance tree-trimming employees, or electric utility employees; or where the electric power transmission or distribution lines have been de-energized and visibly grounded at the point of work, or where insulating barriers, which are not a part of or an attachment to the aerial lift, have been erected to prevent physical contact with the lines.
- d. Treat any overhead wire as energized until the person owning the line, his/her representative, or the electrical utility authorities verify to you that it is de-energized and locked and tagged out as per the JSC NASA LO/TO specifications.
- e. Use proximity warning devices, but not in lieu of meeting the requirements contained in subparagraph a above.
- f. Notify the owner of the lines or his or her authorized representative and provide them with all pertinent information before beginning operations near electrical lines. In the case of JSC, the JSC Plant Engineering Division shall notify the utility company before starting work near electrical lines. Also, notify the owner of the electrical lines when the work is completed.

### **14. Requirements for working with ladder and tower trucks**

Before you move the truck for highway travel, you shall lower aerial ladders in the traveling position. Do this by locking the device above the truck cab and the manually operated device at the base of the ladder. You may also use other equally effective means such as cradles that prevent rotation of the ladder in combination with positive-acting linear actuators.

### **15. Requirements for working with elevating and articulating boom platforms**

Observe the manufacturer's recommended work practices and the following requirements when operating extensible and articulating boom platforms. You shall:

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- a. Never move, operate, repair, maintain, or inspect elevating and articulating boom platforms used in construction unless you are trained as described in subparagraph 18.e of this chapter.
- b. Immediately test lift controls of elevating and articulating boom platforms before use to determine that the controls are in safe working condition.
- c. Make sure that only trained persons operate an aerial lift.
- d. Never belt off to an adjacent pole, structure, or equipment while working from an aerial lift.
- e. Always stand firmly on the floor of the basket. Never sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.
- f. Wear a body harness and a lanyard attached to the boom or basket.
- g. Never exceed boom and basket load limits specified by the manufacturer.
- h. Set brakes and position outriggers on pads or a solid surface. Install wheel chocks before using an aerial lift on an incline.
- i. Never move an aerial lift truck when the boom is elevated in a working position with workers in the basket, unless the equipment is specifically designed for this operation as described in 29 CFR 1910.66.
- j. Make sure that articulating boom and elevating boom platforms, primarily designed as personnel carriers, have both platform (upper) and lower controls.
  - 1. Upper controls shall be in or beside the platform within easy reach of the operator.
  - 2. Lower controls shall provide for overriding the upper controls.
  - 3. Controls shall be plainly marked as to their function.
  - 4. Never operate the lower level controls unless you have permission from the employee in the lift, except in case of emergency.
- k. Never wear pole climbers while doing work from an aerial lift.
- l. Never alter the insulated portion of an aerial lift in any manner that might reduce its insulating value.
- m. Inspect each boom before moving an aerial lift for travel to see that it is properly cradled and outriggers are in a stowed position, except for equipment specifically designed for this type operation in accordance with the manufacturer's recommended work practices or 29 CFR 1910.66.

### **16. When and how to use a safety net**

You shall follow 29 CFR 1926.502, "Fall Protection Systems Criteria and Practices," or the following requirements for safety nets:

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- a. Provide a safety net for workplaces where other means of fall protection such as scaffolding, ground-supported personnel-lifting devices, lifelines, or safety harnesses cannot protect a worker due to the conditions of the elevated work area. These conditions may include:
  1. Structural ironwork where there is no tie-off.
  2. Working above water surfaces.
  3. The height of the work area is such that using ladders or erecting scaffolding would be a greater risk.
  4. The area isn't accessible with ground-supported personnel-lifting devices.
- b. You may also use safety nets where there is a danger of items dropping from the workplace and endangering people below.

### *Other requirements for working at heights*

#### **17. PPE and clothing to use when using ladders, scaffolding, or elevating work platforms**

You shall wear PPE consistent with the guidelines below. For more information on personal protective equipment, see Chapter 5.6 of this handbook.

<i>If . . .</i>	<i>You shall wear . . .</i>
Objects could fall on your head, you could bump your head, or you could come in contact with electrically energized equipment	Hard hats.
Objects could fall into or be blown into your eyes	Safety glasses with side protection, goggles, and a face shield if required (such as for grinding).
You must lift sharp or pointed objects by hand	Gloves.
You must lift heavy objects over your feet, or you may step on sharp or pointed objects	Industrial work shoes; safety toed or equipped with metatarsal protection (as needed).
You could fall	All items specified by the manufacturer's recommended work practices.  <b>Note:</b> Going from one level to another level on portable ladders does not require fall-protection equipment.
You are working in a suspended scaffold	A harness with a rope grab device attached to an independently supported lifeline.

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<i>If . . .</i>	<i>You shall wear . . .</i>
You are working in a boom lift, a scissor lift, or an aerial platform	A harness secured to the platform, unless specifically waived by the manufacturer's recommended work practices.  <b>Note:</b> While on powered platforms with hand or guardrails in place, you shall be secured in the platform and keep your feet on the deck to prevent fallout in case the platform tips.
You are using a ladder as a work platform for longer-term or more complex jobs (short-term jobs such as changing a light bulb or adjusting an air-conditioning ducting mixing chamber are acceptable)	A fall-protection system and document the reasons why you can't do the work on a standard platform.
You work 4 feet above grade (6 feet in construction) without a fall-protection system in place	Independently supported lifelines properly connected to an anchorage rated at 5,000 pounds or more, harness, and shock absorber (if needed to limit impact force to 1,800 pounds), or a work-positioning system.

### 18. Required training before using ladders, scaffolding, or elevated work platforms

Your training shall cover the requirements recommended by the manufacturer of the equipment that you intend to use. See Chapter 4.1, "Program Description" (for safety and health training), of this handbook for more requirements on training. If you:

- a. Supervise the construction, erection, testing, assembly, use, disassembly, lowering, maintenance, or storage of ladders, scaffolds, or work platforms or do these functions unsupervised, you shall be trained in the safe work practices described in this chapter and the referenced OSHA standards.
- b. Do any of the functions listed in a above, you shall be specifically designated and classified by your employer as being competent and qualified due to your:
  1. Knowledge and experience.
  2. Awareness of the hazards associated with the specific equipment in the specific environment.
- c. Work on any kind of scaffold used in construction, you shall have the Scaffold Users Training.
- d. Erect, disassemble, move, operate, repair, maintain, or inspect scaffolds used in construction, you shall be trained in the requirements of 29 CFR 1926.454(b), "Training Requirements," and Appendix D, Subpart L, of 29 CFR 1926.
- e. Move, operate, repair, maintain, or inspect any kind of aerial lift used in construction, you shall be trained in the requirements of 29 CFR 1926.453, "Aerial Lifts." Aerial lifts include the following:
  1. Power-operated platforms

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2. Other elevated platforms
3. Extensible and articulating boom platforms