

LADDER SAFETY

NIST S 7101.66

Document Approval Date: 11/18/2024

Effective Date:¹ 04/01/2024

1. PURPOSE

The purpose of this program is to establish requirements and associated roles and responsibilities to protect NIST employees and covered associates from hazards associated with the use of ladders (see Section 7, **DEFINITIONS**) in the performance of their duties.

2. BACKGROUND

NIST O 7101.00: *Occupational Safety and Health Management System* requires adherence to applicable portions of OSHA (Occupational Safety and Health Administration) 29 Code of Federal Regulations (CFR) Subpart D 1910.23, *Ladders*.

3. APPLICABILITY

- a. The provisions of this suborder apply to all NIST employees and covered associates whose work activities involve the use of ladders and step stools at any NIST workplace.
- b. This suborder applies to the following equipment:
 - (1) Fixed ladders;
 - (2) Portable ladders;
 - (3) Mobile ladder stands;
 - (4) Mobile ladder stand platforms;
 - (5) Step ladders;
 - (6) Combination ladders;

¹ For revision history, see Appendix A.

(7) Trestle ladders;

(8) Step stools;

(9) Step bolts; and

(10) Manhole steps.

c. This suborder does not apply to the following equipment:

(1) Ladders integrated into equipment for access;

(2) Ladders related to emergency services equipment;

(3) Ladders associated with powered platforms covered by 29 CFR 1910.66(j); and

(4) Ladders associated with aerial lifts covered by 29 CFR 1910.67(c)(2)(v).

d. This suborder does not apply to personal fall protection and fall arrest systems associated with the use of ladders. This topic is covered in NIST S 7101.67.

4. REFERENCES

a. OSHA 29 CFR 1910.21 to 1910.30 Subpart D, [*Walking and Working Surfaces*](#)

b. OSHA 29 CFR 1910.140 Subpart I, [*Personal Fall Protection Systems*](#)

c. OSHA 29 CFR Part 1960, [*Basic Program Elements for Federal Employees*](#)

d. American National Standards Institute (ANSI)/ASC A14.1-2007: *Wood Ladder Safety Requirements*

e. ANSI/ASC A14.2-2007: *Portable Metal Ladder— Safety Requirements*

f. ANSI/ASC A14.3-2008: *Fixed Ladder Safety Requirements*

g. ANSI/ASC A14.5-2007: *Portable Reinforced Plastic Ladder Safety Requirements*

h. ANSI/ASC A14.7-2011: *Mobile Ladder Stands and Mobile Ladder Stand Platforms*

5. APPLICABLE NIST OCCUPATIONAL SAFETY AND HEALTH SUBORDERS

- a. NIST S 7101.20: [Work and Worker Authorization Based on Hazard Reviews](#)
- b. NIST S 7101.23: [Safety Education and Training](#)
- c. NIST S 7101.67: [Fall Protection](#)
- d. NIST S 7101.73: [Out of Service](#)
- e. NIST S 7401.01: [Fire Protection and Life Safety for Design & Construction](#)
- f. NIST PR 7101.00: [Procedure for Requesting Safety-Related Variances and Waivers](#)

6. REQUIREMENTS

a. Design Requirements

(1) All newly acquired ladders and step stools shall meet the design and construction requirements as established in the appropriate standard for material type and use:

(a) ANSI-ASC A14.1-2007: *Wood Ladder Safety Requirements*;

(b) ANSI-ASC A14.2-2007: *Portable Metal Ladder Safety Requirements*, (includes design information on step stools);

(c) ANSI/ASC A14.3-2008: *Fixed Ladder Safety Requirements*; and

(d) ANSI-ASC A14.5-2007: *Portable Reinforced Plastic Ladder Safety Requirements*.

(e) ANSI-ASC A14.7-2011, *Mobile Ladder Stands and Mobile Ladder Stand Platforms*.

(2) The use of in-house fabricated ladders and step stools is prohibited.

(a) Any in-house fabricated ladders and step stools is currently in use at NIST shall be:

i. Taken out of service by the effective date in accordance with the requirements of NIST S 7101.73; or

ii. Replaced by the effective date.

(3) All ladders and step stools currently in use shall meet the design and construction requirements as per Section 6.a(1) of this suborder.

(a) Ladders and step stools not meeting these requirements shall be taken out of service in accordance with the requirements of NIST S 7101.73.

(4) Permanent Markings on Ladders²:

(a) Portable ladders:

i. The minimum information shall be permanently marked (*e.g.*, manufacturer's label) on portable ladders:

- (i) Manufacturers or distributors name (may be logo);
- (ii) Model number or name;
- (iii) Maximum rated load;
- (iv) Ladder size;
- (v) Type and duty rating;
- (vi) ANSI compliance;
- (vii) Maximum working length (if extension ladder); and
- (viii) Total length of sections (if extension ladder).

ii. When the information is illegible or missing, the portable ladder shall be taken out of service in accordance with the requirements of NIST S 7101.73.

(i) If the information can be obtained from the manufacturer and affixed to the ladder, it may be put back into service.

(ii) If the information cannot be obtained, the ladder shall be properly disposed of.

(b) Mobile ladder stands, mobile ladder stand platforms, and step stools (*i.e.*, 32" high or less at top cap/step):

i. The minimum information should be permanently marked (*e.g.*, manufacturer's label) on mobile ladder stands, mobile ladder stand platforms, and step stools:

- (i) Manufacturers or distributors name (may be logo); and
- (ii) Maximum rated load

² Neither OSHA nor ANSI have labeling requirements for fixed ladders, step bolts, or manhole steps.

- ii. When the information is illegible or missing, line management shall use the pre-use checklist (Appendix B) for a minimum evaluation to determine if the mobile ladder stand, mobile ladder stand platform, or step stool should continue to be used or disposed of.

- (i) If the mobile ladder stand, mobile ladder stand platform, or step stool is deemed appropriate for use by line management, a label indicating such shall be affixed to the unit (please see Appendix C).

- (6) Step stools, ladder stands, and platforms that have wheels or casters shall be equipped with a system that impedes horizontal movement when a worker is on the unit.

- (7) Fixed ladders that do not have cages or wells shall have:

- (a) Clear width of at least 16 inches (40 cm) between the vertical rails of the ladder and the vertical rails shall flare out to between 24 and 30 inches (clear width) and extend at least 42 inches above the elevated surface being accessed;

- (b) Clear width of at least 15 inches (38 cm) on each side of the ladder centerline to the nearest permanent object; and

- (c) A minimum perpendicular distance of 30 inches (76 cm) from the centerline of the steps or rungs to the nearest object on the climbing side.

- i. When obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm) if deflector plates are installed.

- (8) Step bolts and manhole steps:

- (a) Installed prior to January 17, 2017, shall support their maximum intended load; and

- (b) Installed after January 17, 2017, shall comply with OSHA 1910.24, *i.e.*, be capable of supporting at least four times their maximum intended load.

- (9) Fixed ladders that access elevations 24 feet or more above the work surface below, shall be equipped with a personal fall arrest system or a ladder safety system as per the requirements establish in NIST S 7101.67.

NOTE: Ladder cages can be used to control access or protect users from other hazards, but they are no longer permitted for fall protection and when installed they shall not interfere with the operation of any fall protection systems.

b. Inspection

(1) Ladders and step stools shall be inspected prior to each use.

(a) Where an individual is using the same ladder for multiple tasks in a single shift, the initial inspection shall be sufficient unless there is the need for a reinspection, please see Section 6.b(2).

(b) Where multiple individuals are using the same ladder during a single shift, the initial inspection shall be sufficient unless there is the need for a reinspection, please see Section 6.b(2).

(c) Where ladder usage spans multiple shifts, the ladder shall be inspected prior to use of each shift.

(2) Ladders and step stools shall be inspected after any occurrence that could affect their safe use, such as falling object damage or being struck by equipment.

(3) An inspection checklist should be used to facilitate inspections; see Appendix B.

(4) If the inspection shows any condition adversely affecting the safety of the ladder or step stool, it shall be:

(a) Removed from service in accordance with the requirements of NIST S 7101.73 (please see appropriate tag or sign shown in Appendix D): and

(b) Disposed of.

NOTE: Staff may request a waiver, in accordance with the requirements of NIST PR 7101.00, if it is believed the ladder or step stool may be sufficiently repaired such that the ladder or step stool can be safely used.

(5) Personal fall protection, ladders safety systems and fall arrest systems associated with the use of ladders shall be inspected per the requirements of NIST S 7101.67.

c. Use of Ladders

(1) Ladders shall be used in accordance with:

(a) Manufacturer's instructions; and

(b) The hazard review or job hazard analysis developed for the specific activity.

(2) Set-up.

(a) Ladders shall be used on stable and level surfaces unless one of the following is done to prevent displacement of the ladder:

i. Firmly securing the ladder to a fixed object;

ii. Stabilizing the ladder against a fixed object; or

iii. Use ladders with cleats or non-slip safety feet that will prevent the ladder from slipping.

(b) Ladders used on slippery surfaces shall be secured and stabilized.

(c) Ladders should not be used within 10 feet of any uninsulated energized electrical equipment.

(d) Non-self-supporting ladders (*e.g.*, straight or extension ladders) shall:

i. Use the 4-to-1 rule where the distance base of the ladder to where the ladder touches its support is one quarter of the working length of the ladder (see Figure 1);

ii. Have both side rails supported unless the ladder is equipped with a single support attachment designed for the ladder; and

iii. Have the side rails extend at least 3 feet (0.9 m) beyond the upper surface when using the ladder to gain access to an elevated surface (*i.e.*, platform or roof).

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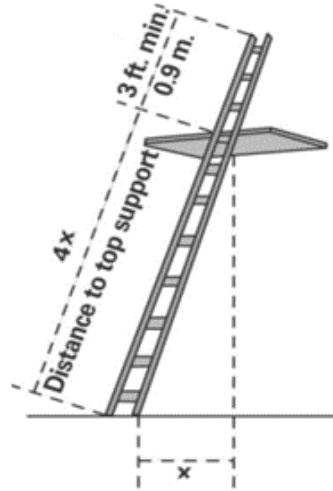


Figure 1: The “4 to 1” rule for portable non-self-supporting ladders.

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(e) Temporary barricade(s) such as cones or caution tape shall be required when placing ladders in passageways, doorways, or driveways.

(f) When using a ladder within the swing of a door, the door shall be secured or a coworker shall guard the ladder base.

(3) Individuals using a ladder shall:

(a) Always face the ladder when climbing up or down;

(b) Only one person should be on a ladder at a time unless the ladder is specifically designed for more than single person use;

(c) Maintain their center of mass between the vertical rails of the ladder;

(d) Wear appropriate footwear that is kept reasonably clean to reduce slips, *i.e.*, footwear, that fits snugly, provides good support, and has sturdy, non-slip soles;

(e) Maintain 3-points of contact with the ladder, *i.e.*, always use at least one hand when ascending or descending;

(f) Follow manufacture’s guidance on markings and labels, including weight limits, appropriate use, and what steps can and cannot be used.

(g) Refrain from carrying objects or loads that could cause a loss of balance;

i. Tools and materials should be brought up:

(i) Separately by rope and bucket/container;

(ii) On the person using a utility belt or backpack; or

(iii) Handed up once personnel are in place;

(h) Refrain from loading a ladder above its maximum intended load.

(i) Do not use ladders horizontally, *e.g.*, as walkways or scaffolding, unless they're specifically designed to be used in that manner.

(j) Maintain a ladder landing area that is free of objects that could pose a hazard to an individual stepping off the ladder.

(4) Ladders shall not be moved when someone is on the unit.

(5) Users who tire easily, or who have physical limitations such as fainting, and/or are on medication or prescription drugs that could cause physical impairment shall inform their supervisor and be prohibited from using fixed ladders 24 feet long or greater.

(6) For outdoor work:

(a) Ladders should not be ascended or descended during active storms of any kind (*e.g.*, rain, snow, sleet) or high winds (20 miles per hour or more); and

(b) Ladders shall only be used if they are adequately cleaned of ice/frost, snow, or debris.

d. Use of Step Stools

(1) Step stools shall be used in accordance with manufacturer's instructions.

(2) Set-up.

(a) Step stools shall be used on stable and level surfaces.

(b) Step stools used on slippery surfaces shall be secured and stabilized.

(3) Individuals using a step stool shall:

(a) Wear appropriate footwear, *i.e.*, fits snugly, provides good support, and has sturdy non-slip soles;

(b) Refrain from carrying objects or loads that could cause a loss of balance; and

(c) Refrain from loading the step stool above its maximum intended load.

(4) Step stools shall not be moved when someone is on the unit.

e. Care and Maintenance

(1) All ladders and step stools shall be maintained and stored in accordance with the manufacturer's guidance.

(2) Structural repairs or modification of ladders and step stools shall be made in compliance with the design requirements identified in Section 6.a.(1) of this suborder.

(3) All repairs of personal fall protection and fall arrest systems associated with the use of ladders shall be made in accordance with the requirements of NIST S 7101.67.

f. Training

(1) Training shall be provided, documented, and recorded in accordance with the requirements of the NIST S 7101.23.

(2) Employees and covered associates to whom this suborder applies shall receive the following information and training prior to their initial use of a ladder or related piece of equipment:

(a) General training provided by OSHE on ladder safety; and

(b) Activity-specific ladder safety training provided by their OUs.

(3) Employees and covered associates who will use personal fall protection and fall arrest systems associated with the use of ladders shall receive training in accordance with the requirements of NIST S 7101.67.

7. DEFINITIONS

Definitions common to all NIST OSH suborders can be found in Section 6 of NIST O 7101.00.

The definitions specific to this suborder are as follows:

- a. Cage – An enclosure mounted on the side rails of a fixed ladder or fastened to a structure behind the fixed ladder that is designed to surround the climbing space of the ladder. A cage also is called a "cage guard" or "basket guard".
- b. Combination Ladder – A portable ladder that can be used as a stepladder, extension ladder, or trestle ladder. The components of a combination ladder also may be used separately as a single ladder.
- c. Extension Ladder – A non-self-supporting portable ladder that is adjustable in length.
- d. Fall Protection – Any equipment or device, including a personal fall arresting system or a lifeline system, that prevents an individual from falling from an elevation or mitigates the effect of such a fall.
- e. Fixed Ladder – A ladder with rails or individual rungs that is permanently attached to a structure, building, or equipment. Fixed ladders include individual-rung ladders, but not ship stairs, step bolts, or manhole steps.
- f. Ladder – Any one of the following pieces of equipment:
 - (1) Fixed ladders;
 - (2) Portable ladders;
 - (3) Mobile ladder stands;
 - (4) Mobile ladder stand platforms;
 - (5) Step ladders;
 - (6) Combination ladders;
 - (7) Trestle ladder;
 - (8) Step stools;

(9) Step bolts³; and

(10) Manhole steps³.

- g. 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, safety sleeve, lanyard, connectors, and body harness. Cages and wells are not ladder safety systems.
- h. Lower Level – A surface or area to which a worker could fall. Such surfaces or areas include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits, tanks, stored materials, water, equipment, and similar surfaces and structures, or portions thereof.
- i. Manhole Steps – Steps that are individually attached to, or set into, the wall of a manhole structure.
- j. Mobile Ladder Stand (Ladder Stand) – A mobile, fixed-height, self-supporting ladder that usually consists of wheels or casters on a rigid base and steps leading to a top step. A mobile ladder stand also may have handrails and is designed for use by one worker at a time.
- k. Mobile Ladder Stand Platform – A mobile, fixed-height, self-supporting unit having one or more standing platforms that are providing access to equipment, materials, another platform, or an egress point.
- l. Personal Fall Arrest System – A system that consists of a body harness, anchorage, and connector and is used to protect individuals from falls. The means of connection may include a lanyard, deceleration device, lifeline, or a suitable combination of these.
- m. Personal Fall Protection System – A system (including all components) that provides protection from falling or to safely arrest an individual's fall if one occurs. Examples of personal fall protection systems include personal fall arrest systems, positioning systems, and travel restraint systems.
- n. Portable Ladder – A ladder that can readily be moved or carried and usually consists of side rails joined at intervals by steps, rungs, or cleats.
- o. Roof – The exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily become the top surface of a building.

³ Equipment using step bolts and manhole steps are not considered "ladders" per OSHA requirements but are included here for completeness.

- p. Rung, Step, or Cleat – The cross-piece of a ladder that is stepped on to climb up and down.
- q. Step Bolt (Pole Step) – A bolt or rung attached at intervals along a structural member used for foot placement and as a handhold when climbing or standing.
- r. Stepladder – A self-supporting, portable ladder that has a fixed height, flat steps, and a hinged back.
- s. Step Stool – A type of self-supporting, portable ladder that has flat steps, side rails, a fixed height not exceeding 32 inches (81 cm) at the top cap [although side rails or handles may extend above the top cap and serve as a handle] and does not have a pail shelf. A stepstool is designed so an individual can climb and stand on all steps including the top cap.
- t. Trestle Ladder – A self-supporting portable ladder that is adjustable in length, consisting of a Trestle Ladder base and a vertically adjustable Extension section with a means for locking the ladders together.
- u. Well – A permanent, complete enclosure around a fixed ladder.
- v. Work Area – A subpart of a NIST workplace.

8. ACRONYMS

Acronyms common to all NIST OSH suborders can be found in Section 7 of NIST O 7101.00. The acronyms specific to this suborder are as follows:

- a. ANSI – American National Standards Institute
- b. CFR – Code of Federal Regulations
- c. NFPA – National Fire Protection Association
- d. NIST – National Institute of Standards and Technology
- e. OSHA – Occupational Safety and Health Administration
- f. OSHE – Office of Safety, Health, and Environment
- g. OU – Organizational Unit

9. RESPONSIBILITIES

Roles and responsibilities common to all NIST OSH suborders can be found in Section 8 of NIST O 7101.00. The roles and responsibilities specific to this suborder are as follows:

a. OU Directors are responsible for:

(1) Establishing policies and procedures, as needed, for the requirements of this program to be met as it applies to their employees and covered associates to mitigate hazards associated with ladders and step stools in their OU-assigned space and ensuring that those policies and procedures are implemented; and

(2) Ensuring subordinate managers have the authority, resources, and training needed to implement OU-established policies and procedures.

b. NIST Acquisitions Management Division is responsible for:

(1) Including applicable OSHA, ANSI, and NFPA design requirements for ladders in all applicable purchases and contracting requests for quotes (RFQs).

c. OSHE Program Manager for this Program is responsible for:

(1) Providing safety consultation and guidance pertaining to the use of ladders and step stools in accordance with regulations, consensus standards, and industry best practices;

(2) Upon request, providing activity-specific ladder safety training;

(3) Reviewing this suborder at least annually and updating it when necessary to ensure its effectiveness in protecting employees and covered associates from the hazards of ladder and step stool use at NIST workplaces; and,

(4) Making this suborder available to employees and covered associates, and upon request.

10. AUTHORITIES

There are no authorities specific to this suborder alone. For authorities applicable to all NIST OSH suborders, see section 9 of NIST O 7101.00.

11. DIRECTIVE OWNER

Chief Safety Officer

551 **12. APPENDICIES**

552 A. Revision History

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554 B. Optional Pre-Use Checklist for Fixed, Portable, Extension, and Mobile Ladder Inspection

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556 C. Label for mobile ladder stands, mobile ladder stand platforms, and step stools related to
557 Section 6.a(4)(b)i.

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559 D. Sample Sign: Out of Service/Danger -Do Not Use

Appendix A. Revision History

Version	Approval Date	Effective Date	Brief Description of Change; Rationale
1	09/05/2023	04/01/2024	<ul style="list-style-type: none"> None – Initial document
2	05/21/2024	05/21/2024	<ul style="list-style-type: none"> Section 5 – added NIST PR 7101.00. Section 6.a(4) – reworded for clarity. Section 6.b(2) – added examples of incidents that could affect the safe use of a ladder. Section 6.b(4) – modified language for clarity and removed statement that OSHA will create generic JHA for use of a ladder. Section 6.c(2) – added (a)iii, (c), and (f). Section 6.c(3) – added (c) and (i) Appendix B updated
3	11/18/2024	11/18/2024	<ul style="list-style-type: none"> Section 6.a(4) – modified language related to labeling requirements for mobile ladder stands, mobile ladder stand platforms, and step stools. New Appendix C

564 Appendix B. Optional⁴ Pre-Use Checklist for Fixed, Portable, Extension, and Mobile
565 Ladder Inspection

Optional Pre-Use Checklist for Fixed, Portable, Extension, and Mobile Ladder Inspection					
User/Inspector:	Step Stool	Combination	Date:		
Ladder ID:	Step Ladder	Extension	Mobile	Fixed	
MFR, Serial #:	Wood	Metal	Fiberglass	Other	
All units shall be visually inspected before first use of the day & every shift thereafter if use continues.					
#	Item	Yes	No	NA	
1. General: Applies to ALL Ladders and Step Stools					
a.	Steps, cleats or rungs are ridged, not loose (can be moved by hand).				
b.	No nails, screws, bolts, or other loose materials are present.				
c.	No cracked, split, or broken uprights; braces, steps, or rungs are present.				
d.	Rungs, cleats, and steps are uniformly spaced.				
e.	Rungs/steps on metal ladders corrugated or knurled to prevent slipping.				
f.	Contact areas are free of grease, oil, or slippery materials (clean if needed).				
g.	Wooden components do not have opaque coatings.				
h.	Wooden components are free from decay.				
i.	All movable parts operate freely.				
j.	Feet or non-slip material on vertical supports/ends are not damaged or excessively worn.				
k.	Feet/legs with locking mechanisms operate as designed.				
l.	Unit is stable, not wobbly when set up or ready to use.				
m.	Labeled with manufacture name and model and weight limit (excluding fixed ladders).				
2. Step, Articulating and Combination Ladders					
a.	Overall height is less than 24 feet.				
b.	Hinge spreaders are intact, not loose, broken or bent.				
c.	All stops/locks on hinge spreaders are functional.				
d.	Edges on spreaders/hinges are smooth not sharp.				
3. Extension Ladders					
a.	All extension locks are present, none are loose or broken.				
b.	All locks seat properly when ladder is extended.				
c.	Rope(s) are not frayed or worn.				
d.	Single ladder is 30' or less, Two-section ladder is 48' (metal) or 60' (wood) or less				
4. Mobile Ladders and Step Stools					
a.	Locking mechanism is engaged or engages when stepping on the unit.				
b.	Locking mechanism prevents unit from moving/sliding when engaged.				
c.	All handrails & guardrails are intact with smooth surfaces (when present).				
5. Fixed Ladders (24 feet or Greater)					
a.	Ladder well or cage is fully intact ¹ .				
b.	Adequate Clearance around ladder and inside the well or cage is obstruction free.				
c.	Ladder Safety System (LSS)/Fall Protection Systems (FPS) functions properly (if present).				
¹ All fixed ladders that extend more than 24 feet above a lower level are to be equipped with a personal fall arrest system or ladder safety system by November 2036.					

⁴ Required to be used when Section 6.b(4)(b)ii applies.

**Appendix C. Label for mobile ladder stands, mobile ladder stand platforms, and step stools
related to Section 6.a(4)(b)i.**

NOTICE	
This unit has been approved for use by OU line management in accordance with the requirements of NIST S 7101.66: <i>Ladder Safety</i>	
<i>Applies only to Mobile Ladder Stands, Ladder Platforms, and Stepstools</i>	
_____ Approving Line Manager / Division	_____ Date

Appendix D: Sample Sign: Out of Service/Danger -Do Not Use

Based on NIST S 7101.73: Out of Service

