

# LADDER SAFETY

NIST S 7101.66

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## 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;

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<sup>1</sup> For revision history, see Appendix A.

- 38 (7) Step bolts;  
39  
40 (8) Manhole steps; and  
41  
42 (9) Step stools.  
43  
44 c. This suborder does not apply to the following equipment:  
45  
46 (1) Ladders integrated into equipment for access;  
47  
48 (2) Ladders related to emergency services equipment;  
49  
50 (3) Ladders associated with powered platforms covered by 29 CFR 1910.66(j); and  
51  
52 (4) Ladders associated with aerial lifts covered by 29 CFR 1910.67(c)(2)(v).  
53  
54 d. This suborder does not apply to personal fall protection and fall arrest systems associated  
55 with the use of ladders. This topic is covered in NIST S 7101.67.  
56  
57

#### 58 **4. REFERENCES**

- 59 a. OSHA 29 CFR 1910.21 to 1910.30 Subpart D, [Walking and Working Surfaces](#)  
60  
61 b. OSHA 29 CFR 1910.140 Subpart I, [Personal Fall Protection Systems](#)  
62  
63 c. OSHA 29 CFR Part 1960, [Basic Program Elements for Federal Employees](#)  
64  
65 d. American National Standards Institute (ANSI)/ASC A14.1-2007: *Wood Ladder Safety*  
66 *Requirements*  
67  
68 e. ANSI/ASC A14.2-2007: *Portable Metal Ladder— Safety Requirements*  
69  
70 f. ANSI/ASC A14.3-2008: *Fixed Ladder Safety Requirements*  
71  
72 g. ANSI/ASC A14.5-2007: *Portable Reinforced Plastic Ladder Safety Requirements*  
73  
74 h. ANSI/ASC A14.7-2011: *Mobile Ladder Stands and Mobile Ladder Stand Platforms*  
75  
76

77 **5. APPLICABLE NIST OCCUPATIONAL SAFETY AND HEALTH SUBORDERS**

78 a. NIST S 7101.20: [Work and Worker Authorization Based on Hazard Reviews](#)

79

80 b. NIST S 7101.23: [Safety Education and Training](#)

81

82 c. NIST S 7101.67: [Fall Protection](#)

83

84 d. NIST S 7101.73: [Out of Service](#)

85

86 e. NIST S 7401.01: [Fire Protection and Life Safety for Design & Construction](#)

87

88

89 **6. REQUIREMENTS**

90 a. Design Requirements

91

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

94

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

96

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

99

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

101

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

103

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

105

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

107

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

109

110 i. Taken out of service by the effective date; or

111

112 ii. Replaced by the effective date.

113

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

116

- 117 (a) Ladders and step stools not meeting these requirements shall be removed from service  
118 per NIST S 7101.73.  
119
- 120 (4) Ladders and step stools shall be permanently marked with the following information:  
121
- 122 (a) Manufacturer's name or logo;
  - 123
  - 124 (b) Model number;
  - 125
  - 126 (c) Date of manufacture;
  - 127
  - 128 (d) Where applicable according to the standards listed in Section 6.a(1) of this  
129 suborder:
    - 130
    - 131 i. ANSI standard compliant;
    - 132
    - 133 ii. Type;
    - 134
    - 135 iii. Duty rating;
    - 136
    - 137 iv. Maximum length or height, including the following, if applicable:
      - 138
      - 139 (i) Number of sections, and
      - 140
      - 141 (ii) Total length of sections;
      - 142
      - 143 v. Rated load;
      - 144
      - 145 vi. Number of users;
      - 146
      - 147 vii. Highest standing level; and
      - 148
      - 149 viii. Usage guidelines and other warning statements.
      - 150
    - 151 (e) When the information is illegible or missing, the ladder shall be taken out of  
152 service.
      - 153
      - 154 i. If the information can be obtained from the manufacturer and affixed to  
155 the ladder, it may be put back into service.
      - 156

157                   ii. If the information cannot be obtained, the ladder shall be properly  
158                   disposed of.

159  
160           (5) Step stools, ladder stands, and platforms that have wheels or casters shall be equipped  
161           with a system that impedes horizontal movement when an employee is on the unit.

162  
163           (6) Fixed ladders that do not have cages or wells shall have:

164  
165           (a) Clear width of at least 16 inches (40 cm) between the vertical rails of the ladder and  
166           the vertical rails shall flare out to between 24 and 30 inches (clear width) and extend  
167           at least 42 inches above the elevated surface being accessed;

168  
169           (b) Clear width of at least 15 inches (38 cm) on each side of the ladder centerline to the  
170           nearest permanent object; and

171  
172           (c) A minimum perpendicular distance of 30 inches (76 cm) from the centerline of the  
173           steps or rungs to the nearest object on the climbing side.

174  
175           i. When obstructions are unavoidable, clearance may be reduced to 24 inches  
176           (61 cm) if deflector plates are installed.

177  
178           (7) Step bolts and manhole steps:

179  
180           (a) Installed prior to January 17, 2017, shall support their maximum intended load; and

181  
182           (b) Installed after January 17, 2017, shall comply with OSHA 1910.24, *i.e.*, be capable of  
183           supporting at least four times their maximum intended load.

184  
185           (8) Fixed ladders that access elevations 24 feet or more above the work surface below, shall  
186           be equipped with a personal fall arrest system or a ladder safety system as per the  
187           requirements establish in NIST S 7101.67.

188  
189           **Note:** Ladder cages can be used to control access or protect users from other hazards,  
190           but they are no longer permitted for fall protection and when installed they shall not  
191           interfere with the operation of any fall protection systems.

192  
193           b. Inspection

194  
195           (1) Ladders and step stools shall be inspected prior to each use.

196

- 197 (a) Where an individual is using the same ladder for multiple tasks in a single shift, the  
198 initial inspection shall be sufficient unless there is the need for a reinspection, please  
199 see Section 6.b(2).  
200
- 201 (b) Where multiple individuals are using the same ladder during a single shift, the initial  
202 inspection shall be sufficient unless there is the need for a reinspection, please see  
203 Section 6.b(2).  
204
- 205 (c) Where ladder usage spans multiple shifts, the ladder shall be inspected prior to use of  
206 each shift.  
207
- 208 (2) Ladders and step stools shall be inspected after any occurrence that could affect their safe  
209 use, such as falling object damage or being struck by equipment.  
210
- 211 (3) An inspection checklist should be used to facilitate inspections; see Appendix B.  
212
- 213 (4) If the inspection shows any condition adversely affecting the safety of the ladder or step  
214 stool:  
215
- 216 (a) The ladder or step stool shall be tagged “DANGER – Do not use” and removed from  
217 service in accordance with NIST S 7101.73; and  
218
- 219 (b) The condition shall be immediately reported to the individual responsible for the  
220 care and maintenance of the ladder or step stool.  
221
- 222 (5) Personal fall protection, ladders safety systems and fall arrest systems associated with the  
223 use of ladders shall be inspected per the requirements of NIST S 7101.67.  
224
- 225 c. Use of Ladders  
226
- 227 (1) Ladders shall be used in accordance with:  
228
- 229 (a) Manufacturer’s instructions; and  
230
- 231 (b) The hazard review or job hazard analysis developed for the specific activity.  
232
- 233 i. OSHE shall develop generic job hazard analysis(es) for use of a ladder. This  
234 job hazard analysis can be:  
235
- 236 (i) Used to cover simple use of a ladder; or

237 (ii) Incorporated into a job-specific hazard review or job hazard analysis  
238 for which ladder use is a part of the work.

239  
240 Upon request, OSHE will train staff on the job hazard analysis(es).

241  
242 (2) Set-up.

243  
244 (a) Ladders shall be used on stable and level surfaces unless one of the following is done  
245 to prevent displacement of the ladder:

- 246  
247 i. Firmly securing the ladder to a fixed object;  
248  
249 ii. Stabilizing the ladder against a fixed object; or  
250  
251 iii. Use ladders with cleats or non-slip safety feet that will prevent the ladder from  
252 slipping.

253  
254 (b) Ladders used on slippery surfaces shall be secured and stabilized.

255  
256 (c) Ladders should not be used within 10 feet of any uninsulated energized electrical  
257 equipment.

258  
259 (d) Non-self-supporting ladders (*e.g.*, straight or extension ladders) shall:

- 260  
261 i. Use the 4-to-1 rule where the distance base of the ladder to where the ladder  
262 touches its support is one quarter of the working length of the ladder (see  
263 Figure 1);  
264  
265 ii. Have both side rails supported unless the ladder is equipped with a single  
266 support attachment designed for the ladder; and  
267  
268 iii. Have the side rails extend at least 3 feet (0.9 m) beyond the upper surface  
269 when using the ladder to gain access to an elevated surface (*i.e.*, platform or  
270 roof).

271  
272

274

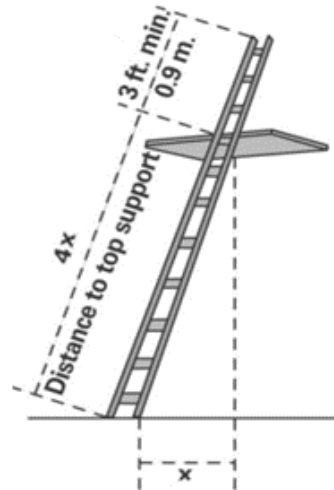


Figure 1: The “4 to 1” rule for portable non-self-supporting ladders.

287

288

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

291

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

294

295 (3) Individuals using a ladder shall:

296

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

298

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

301

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

303

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

306

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

309

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

312



- 313 (g) Refrain from carrying objects or loads that could cause a loss of balance;  
314  
315 i. Tools and materials should be brought up:  
316  
317 (i) Separately by rope and bucket/container;  
318  
319 (ii) On the person using a utility belt or backpack; or  
320  
321 (iii) Handed up once personnel are in place;  
322  
323 (h) Refrain from loading a ladder above its maximum intended load.  
324  
325 (i) Not use ladders horizontally, *e.g.*, as walkways or scaffolding, unless they're  
326 specifically designed to be used in that manner.  
327  
328 (j) Maintain a ladder landing area that is free of objects that could pose a hazard to an  
329 individual stepping off the ladder.  
330  
331 (4) Ladders shall not be moved when someone is on the unit.  
332  
333 (5) Users who tire easily, or who have physical limitations such as fainting, and/or are on  
334 medication or prescription drugs that could cause physical impairment shall inform their  
335 supervisor and be prohibited from using fixed ladders 24 feet long or greater.  
336  
337 (6) For outdoor work:  
338  
339 (a) Ladders should not be ascended or descended during active storms of any kind (*e.g.*,  
340 rain, snow, sleet) or high winds (20 miles per hour or more); and  
341  
342 (b) Ladders shall only be used if they are adequately cleaned of ice/frost, snow, or debris.  
343  
344 d. Use of Step Stools  
345  
346 (1) Step stools shall be used in accordance with manufacturer's instructions.  
347  
348 (2) Set-up.  
349  
350 (a) Step stools shall be used on stable and level surfaces.  
351  
352 (b) Step stools used on slippery surfaces shall be secured and stabilized.

- 353 (3) Individuals using a step stool shall:  
354  
355 (a) Wear appropriate footwear, *i.e.*, fits snugly, provides good support, and has sturdy  
356 non-slip soles;  
357  
358 (b) Refrain from carrying objects or loads that could cause a loss of balance; and  
359  
360 (c) Refrain from loading the step stool above its maximum intended load.  
361  
362 (4) Step stools shall not be moved when someone is on the unit.  
363  
364 e. Care and Maintenance  
365  
366 (1) All ladders and step stools shall be maintained and stored in accordance with the  
367 manufacturer's guidance.  
368  
369 (2) Structural repairs or modification of ladders and step stools shall be made in compliance  
370 with the design requirements identified in Section 6.a.(1) of this suborder.  
371  
372 (3) All repairs of personal fall protection and fall arrest systems associated with the use of  
373 ladders shall be made in accordance with the requirements of NIST S 7106.67.  
374  
375 f. Training  
376  
377 (1) Training shall be provided, documented, and recorded in accordance with the  
378 requirements of the NIST S 7101.23.  
379  
380 (2) Employees and covered associates to whom this suborder applies shall receive the  
381 following information and training prior to their initial use of a ladder or related piece of  
382 equipment:  
383  
384 (a) General training provided by OSHE on ladder safety; and  
385  
386 (b) Activity-specific ladder safety training provided by their OUs.  
387  
388 (3) Employees and covered associates who will use personal fall protection and fall arrest  
389 systems associated with the use of ladders shall receive training in accordance with the  
390 requirements of NIST S 7106.67.  
391  
392

393 **7. DEFINITIONS**

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

395 The definitions specific to this suborder are as follows:

396

397 a. Cage – An enclosure mounted on the side rails of a fixed ladder or fastened to a structure  
398 behind the fixed ladder that is designed to surround the climbing space of the ladder. A cage  
399 also is called a "cage guard" or "basket guard".

400

401 b. Combination Ladder – A portable ladder that can be used as a stepladder, extension ladder,  
402 trestle ladder. The components of a combination ladder also may be used separately as a  
403 single ladder.

404

405 c. Extension Ladder – A non-self-supporting portable ladder that is adjustable in length.

406

407 d. Fall Protection – Any equipment or device, including a personal fall arresting system or a  
408 lifeline system, that prevents an individual from falling from an elevation or mitigates the  
409 effect of such a fall.

410

411 e. Fixed Ladder – A ladder with rails or individual rungs that is permanently attached to a  
412 structure, building, or equipment. Fixed ladders include individual-rung ladders, but not ship  
413 stairs, step bolts, or manhole steps.

414

415 f. Ladder – Any one of the following pieces of equipment:

416

417 (1) Fixed ladders;

418

419 (2) Portable ladders;

420

421 (3) Mobile ladder stands;

422

423 (4) Mobile ladder stand platforms;

424

425 (5) Step ladders;

426

427 (6) Combination ladders;

428

429 (7) Step bolts<sup>2</sup>;

430

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<sup>2</sup> Equipment using step bolts and manhole steps are not considered "ladders" per OSHA requirements but are included here for completeness.

- 431 (8) Manhole steps<sup>3</sup>; and  
432  
433 (9) Trestle ladder.  
434
- 435 g. Ladder Safety System – A system designed to eliminate or reduce the possibility of falling  
436 from a ladder. A ladder safety system usually consists of a carrier, safety sleeve, lanyard,  
437 connectors, and body harness. Cages and wells are not ladder safety systems.  
438
- 439 h. Lower Level – A surface or area to which an employee could fall. Such surfaces or areas  
440 include, but are not limited to, ground levels, floors, roofs, ramps, runways, excavations, pits,  
441 tanks, stored materials, water, equipment, and similar surfaces and structures, or portions  
442 thereof.  
443
- 444 i. Manhole Steps – Steps that are individually attached to, or set into, the wall of a manhole  
445 structure.  
446
- 447 j. Mobile Ladder Stand (Ladder Stand) – A mobile, fixed-height, self-supporting ladder that  
448 usually consists of wheels or casters on a rigid base and steps leading to a top step. A mobile  
449 ladder stand also may have handrails and is designed for use by one employee at a time.  
450
- 451 k. Mobile Ladder Stand Platform – A mobile, fixed-height, self-supporting unit having one or  
452 more standing platforms that are providing access to equipment, materials, another platform,  
453 or an egress point.  
454
- 455 l. Personal Fall Arrest System – A system that consists of a body harness, anchorage, and  
456 connector and is used to protect individuals from falls. The means of connection may include  
457 a lanyard, deceleration device, lifeline, or a suitable combination of these.  
458
- 459 m. Personal Fall Protection System – A system (including all components) that provides  
460 protection from falling or to safely arrest an individual's fall if one occurs. Examples of  
461 personal fall protection systems include personal fall arrest systems, positioning systems, and  
462 travel restraint systems.  
463
- 464 n. Portable Ladder – A ladder that can readily be moved or carried and usually consists of side  
465 rails joined at intervals by steps, rungs, or cleats.  
466
- 467 o. Roof – The exterior surface on the top of a building. This does not include floors or  
468 formwork which, because a building has not been completed, temporarily become the top  
469 surface of a building.  
470

- 471 p. Rung, Step, or Cleat – The cross-piece of a ladder that is stepped on to climb up and down.  
472
- 473 q. Step Bolt (Pole Step) – A bolt or rung attached at intervals along a structural member used  
474 for foot placement and as a handhold when climbing or standing.  
475
- 476 r. Stepladder – A self-supporting, portable ladder that has a fixed height, flat steps, and a  
477 hinged back.  
478
- 479 s. Step Stool – A type of self-supporting, portable ladder that has flat steps, side rails, a fixed  
480 height not exceeding 32 inches (81 cm) at the top cap [although side rails or handles may  
481 extend above the top cap and serve as a handle] and does not have a pail shelf. A stepstool is  
482 designed so an individual can climb and stand on all steps including the top cap.  
483
- 484 t. Trestle Ladder – A self-supporting portable ladder that is adjustable in length, consisting of a  
485 Trestle Ladder base and a vertically adjustable Extension section with a means for locking  
486 the ladders together.  
487
- 488 u. Well – A permanent, complete enclosure around a fixed ladder.  
489
- 490 v. Work Area – A subpart of a NIST workplace.  
491

## 493 **8. ACRONYMS**

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

- 496
- 497 a. ANSI – American National Standards Institute  
498
- 499 b. CFR – Code of Federal Regulations  
500
- 501 c. NFPA – National Fire Protection Association  
502
- 503 d. NIST – National Institute of Standards and Technology  
504
- 505 e. OSHA – Occupational Safety and Health Administration  
506
- 507 f. OSHE – Office of Safety, Health, and Environment  
508
- 509 g. OU – Organizational Unit  
510

511 **9. RESPONSIBILITIES**

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

514

515 a. OU Directors are responsible for:

516

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

521

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

524

525 b. NIST AMD is responsible for:

526

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

529

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

531

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

534

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

536

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

540

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

542

543

544 **10. AUTHORITIES**

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

547

548

549 **11. DIRECTIVE OWNER**

550 Chief Safety Officer

551	<b>12. APPENDICIES</b>
552	A. Revision History
553	
554	B. Ladder and Step Stool Evaluation Guidance
555	
556	C. Sample Sign: Danger– Do Not Use
557	

558  
559

### Appendix A. Revision History

Version No.	Approval Date	Effective Date	Brief Description of Change; Rationale
1	09/05/2023	04/01/2024	<ul style="list-style-type: none"><li>• None – Initial document</li></ul>

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561



562

**Appendix B. Ladder and Step Stool Evaluation Guidance**

**Fixed, Portable, Extension and Mobile Ladder Inspection Guidance**

User/Inspector:	Step Stool	Combination	Date:	
Ladder ID:	Step Ladder	Extension	Mobile	Fixed
MFR, Serial #:	Wood	Metal	Fiberglass	Other

563

**All units shall be visually inspected before first use of the day & every shift thereafter if use continues.**

#	Item	Yes	No	NA
<b>1. General: Applies to ALL Ladders and Step Stools</b>				
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 on vertical supports/ends are not damaged or excessively worn			
k.	Feet with locking mechanisms operate as designed.			
l.	Unit is stable, not wobbly when set up or ready to use			
m.	Labeled with manufacture name, date of manufacture and model			
<b>2. Step and Combination Ladders</b>				
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 are smooth not sharp			
<b>3. Extension Ladders</b>				
a.	All extension locks are present, none are loose or broken			
b.	All locks seat properly when ladder is extended			
c.	Ropes are not frayed or worn			
d.	Single ladder is 30' or less, Two-section ladder is 48'(metal) or 60' (wood) or less			
<b>4. Mobile Ladders and Step Stools</b>				
a.	Locking mechanism is engaged or engages when stepping on the unit			
b.	Locking mechanism prevents unit from moving when engaged			
c.	All handrails & guardrails are intact with smooth surfaces (when present)			
<b>5. Fixed Ladders (24 feet or Greater)</b>				
a.	Well or cage is fully intact [Note: Cage will need to be replaced with LFS by June 2036]			
b.	Adequate Clearance around ladder and inside the well or cage is obstruction free.			
c.	Ladder Safety System/Fall Protection Systems functions properly (if present)			

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568

Appendix C. Sample Sign: **Danger -Do Not Use**

Based on NIST S 7101.73: Out of Service



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573  
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