

MIL-L-12197E
4 February 1975
SUPERSEDING
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1 April 1969

MILITARY SPECIFICATION

LADDERS, FIRE, EXTENSION; LADDERS, METAL, FIRE, SINGLE;

AND LADDERS, FIRE, A-FOLDING EXTENSION

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers extension, single (roof), and A-folding aluminum or magnesium ladders.

1.2 Classification. Ladders shall be of the following classes and lengths as specified (see 6.2):

Class 1 - Extension

20-foot, 2-section.

24-foot, 2-section.

36-foot, 3-section.

Class 2 - Single (roof)

12-foot.

14-foot.

16-foot.

Class 3 - A-folding extension

14-foot, 2-section.

21-foot, 3-section.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein:

SPECIFICATIONS

Federal

T-R-605

T-T-616

- Rope, Manila and Sisal.

- Treatment: Mildew Resistant, for
Rope and Cord.

FSC 4210

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QQ-S-781
PPP-B-601
PPP-C-650
PPP-T-97

- Strapping, Steel, and Seals.
- Boxes, Wood, Cleated-Plywood.
- Crates, Wood, Open and Covered.
- Tape, Pressure-Sensitive Adhesive, Filament Reinforced.

Military

MIL-T-704
MIL-W-5044

- Treatment and Painting of Materiel.
- Walkway Compound, Nonslip, and Walkway Matting, Nonslip.

STANDARDS

Military

MIL-STD-105
MIL-STD-129
MIL-STD-130

- Sampling Procedures and Tables for Inspection by Attributes.
- Marking for Shipment and Storage.
- Identification Marking of US Military Property.

(Copies of specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

A14.2 - American National Standard Safety Requirements for Portable Metal Ladders.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 107 - Magnesium-Alloy Extruded Bars, Rods, Shapes, Tubes, and Wire.
B 221 - Aluminum-Alloy Extruded Bars, Rods, Shapes, and Tubes.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Tariff Order Section, 1616 P Street, NW, Washington, DC 20036.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE Handbook.

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15086.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, ATTN: Tariff Publishing Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Description. The ladders shall be as shown on Figures 1 through 4, and as specified herein.

3.2 Material. The ladders shall be of aluminum or magnesium, as specified (see 6.2). Material not specified shall be selected by the supplier and shall be subject to all provisions of this specification.

3.2.1 Aluminum. Aluminum shall conform to ASTM B 221, Composition 6061, Temper T6.

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3.2.2 Magnesium. Magnesium shall conform to ASTM B 107.

3.2.3 Rope. Rope shall have a minimum breaking strength of 600 pounds and shall be not more than 3/8 inch in diameter. The rope shall conform to T-R-605, Type M, and shall be rendered fungus resistant in accordance with T-T-616.

3.3 Side rails. Side rails shall be straight and parallel. The side rails shall be of channel, tubular, I-beam, or combination section, and may be integral or built-up construction. The web may be continuous or interrupted between rungs for weight reduction.

3.4 Rungs. Rungs shall be tubular and shall be circular, D-shaped or rectangular in cross section. Rungs shall be not less than 1-1/4 inches in diameter, or 1-1/4 inches lesser dimension for rectangular rungs. Load-bearing surfaces shall be corrugated, knurled or dimpled. The rungs shall be welded, riveted, expanded, or bolted to the side rails. Rungs shall not twist or loosen under any condition of service. Expanded rungs shall have a minimum of 1/4-inch metal expanded against the side rail. Rung sleeves bolted to the side rails shall have a minimum surface of 3/4 inch on each side. The rungs shall be parallel to each other and at right angles to the side rails and shall be spaced 14 inches, plus or minus 1/16 inch, on centers. The first and last rungs on each ladder shall be not more than 14 inches from the end of the side rail. The rungs (and the side rails) shall support a load of not less than 1000 pounds placed on any individual rung at one time.

3.5 Locks and guides. The ladders shall be equipped with locks and guides that make the extension ladders equal in strength to ladders of the same length having continuous side rails. The locks shall be automatic in action. The guides shall prevent the upper sections from tipping or falling when the ladder is hoisted, lowered, or in use.

3.6 Identification marking. Each ladder shall be identified in accordance with MIL-STD-130.

3.7 Treatment and painting. The ladders shall not be painted unless painting is specified (see 6.2). When painting is specified, the ladders shall be treated and painted in accordance with MIL-T-704, Type A, Color No. 34087, unless another color is specified (see 6.2).

3.8 Class 1, extension ladders. Class 1 ladders shall be as shown on Figure 1, and shall consist of two telescoping sections for the 20- and 24-foot ladders, and three telescoping sections for the 36-foot ladder.

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The side rails of the upper section shall fit between the side rails of the lower section. The ladders shall be equipped with guide grooves and rails. Locks and stops shall be provided to prevent the ladders from extending beyond the specified lap and shall positively lock the section in place. Rail sections shall move freely and smoothly. Overlapping sliding sections shall operate without hazard to the hands or fingers of operating personnel. The dimensions of Class 1 ladders shall be as shown in Table I. Each ladder shall support a weight of not less than 250 pounds without fracture or permanent deformation in excess of 1/100 of the effective length when tested as specified in 4.4.2.1.

Table I. Dimensions of Class 1 Ladders

	20-foot	24-foot	36-foot
Distance between outside side rails (bottom section) (maximum)	24 in.	24 in.	24 in.
Distance between inside side rails (top section) ^{1/} (minimum)	16 in.	16 in.	16 in.
Length (open) (minimum)	20 ft.	24 ft. 6 in.	35 ft. 10 in.
Overlap between sections (minimum)	4 ft.	4 ft.	4 ft. 6 in.
Length (closed) (minimum)	12 ft.	14 ft.	14 ft. 10 in.
(maximum)	13 ft.	15 ft.	15 ft. 4 in.
Thickness (closed over hardware) (maximum)	6-3/4 in.	6-3/4 in.	9 in.

^{1/} Distance shall be measured between innermost projection of the side rails.

3.8.1 Shackles and pulleys. Class 1 ladders shall be equipped with shackles and pulleys, together with necessary rope to enable the sections to be raised and locked in place from the ground. Shackles and pulleys shall be installed in such a manner as not to weaken the rungs or the side rails.

3.8.2 Rigging. The 20- and 24-foot ladders shall be rigged in accordance with the supplier's standard commercial practice. Rigging of the 36-foot ladder shall be such that the two extended sections raise simultaneously from a single rope or cable. Raising shall be accomplished from the ground with a pull of not more than 130 pounds. A reel that automatically retracts the rope shall be provided below the first rung of

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the butt section. The reel shall be so designed and mounted that it does not interfere with storage and use of the ladder. The reel shall be not less than 6 inches from the ground and shall be nested between the rails.

3.8.3 Shoes. The side rails of the lower sections shall be equipped with hinged shoes. The shoes shall be equipped with nonskid tread. Shoes shall extend not more than 1-1/2 inches beyond the side rails.

3.9 Class 2, single (roof). Class 2 ladders shall be as shown on Figure 2, and shall be single (nonextension) ladders with a hook at the top of each side rail. The hooks shall be not less than 5/8-inch-diameter rod. The hooks shall be provided with a corrosion-resistant coating. The hooks shall be semicircular with an inside diameter between 3-1/2 and 5 inches. The arc shall extend between 170 and 180 degrees. The top of arc shall be the same height as the top of the side rail. The hooks shall be equipped with spring locks to hold the hook in "closed" position (parallel to the rungs) or "open" position (at right angles to the rungs). The distance between the inside of the side rails shall be between 15-1/2 and 15-7/8 inches. The ends of the hooks shall support a 400-pound load on the ladder when the ladder is in a vertical position.

3.9.1 Shoes. Class 2 ladders shall be equipped with shoes as specified in 3.8.3.

3.10 Class 3, A-folding ladders.

3.10.1 Spike feet. Spiked feet or ice pick plates shall be provided on the lower end of one set of side rails and hinged retractable shoes shall be provided on the other set of side rails on the A-frame. When the shoes are in the retracted position, spike ends or ice pick plates shall be exposed.

3.10.2 Nonslip coating. The bottom edge of the side rails of Class 3 ladders shall be coated with a nonslip material conforming to MIL-W-5044, Type I, Class 2, to minimize slippage when the ladder is resting against a metal surface of an aircraft skin. The bottom edge is defined as the inner surface of the A-frame section and the lower edge of the extension.

3.10.3 14-foot ladder. The 14-foot A-folding ladder shall be as shown on Figure 3 and shall consist of two 7-foot sections hinged together at the top. Three configurations shall be possible with this ladder, i.e.:

- (a) The side rails folded together to form a 7-foot double ladder.
- (b) The side spread apart to form an A-frame ladder.
- (c) The side rails extended (end-to-end) to form a 14-foot ladder.

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A hinge-lock shall be provided to engage the hinged end of the second butt section to prevent movement. The hinge-lock shall be equipped with a quick-release mechanism to allow fast, efficient unlocking. It shall be possible to positively lock the hinge when the ladder is in either the extended, A-frame, or folded position. When locked in the extended position, the hinge-lock shall prevent the ladder from collapsing and shall insure a rigid, stable configuration. The hinge-lock shall not hinder longitudinal movement of the fly section. The quick-release mechanism shall be located on the first butt section in such a manner that it is easily accessible and requires only one hand to actuate when the ladder is set up in any of its positions. When in the extended position, the ladder shall support a weight of 250 pounds when tested as specified in 4.4.2.1.

3.10.4 21-foot ladder. The 21-foot A-folding ladder shall be as shown on Figure 4 and shall consist of an A-folding section as specified in 3.10.3, plus an extension rising along one of the legs. Three configurations shall be possible with this ladder, i.e.:

- (a) The two A-frame legs folded together to form an extension ladder, with the extension free to slide along one leg.
- (b) A-frame set up as illustrated in the figure. In this position the ladder shall be free standing.
- (c) With the A-frame extended end-to-end forming an extension ladder. The sliding section shall move along both legs of the A-frame when the A-frame is extended.

A locking device shall be provided to rigidly lock the A-frame legs in each position. When in the A-frame position, the legs shall form an angle of 72 degrees, plus or minus 3 degrees, with a horizontal surface. When in the extended position, the extended leg shall engage the sliding portion of the ladder. When in the extended position, the ladder shall support a load of not less than 800 pounds at any point when tested as specified in 4.4.2.5. With the A-frame in position, the sliding portion fully extended, and the ladder free standing, the top rung of the sliding portion shall support a load of not less than 800 pounds without tipping.

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3.10.4.1 Outriggers. The 21-foot A-folding ladder shall be equipped with outriggers as shown on Figure 4. The outriggers shall retract and nest against each side rail of the rear A-frame section. The outriggers shall snap and lock into either the folded or extended position. When in the extended position, the outriggers shall provide a minimum effective base of 48 inches. The length or foot position of each outrigger shall be individually adjustable, extending not less than 4 inches above and 4 inches below the ladder foot. The outrigger foot shall automatically lock in any position. The extending or folding of the outriggers and adjusting of the foot length shall be accomplished without the use of tools. The plane of the outriggers, in folded and extended positions, shall be in a plane with the ladder. When tested as specified in 4.4.2.5.1, the outriggers shall support the full load without damage, permanent deformation or slipping of the feet.

3.11 Workmanship.

3.11.1 Metal fabrication. Metal used in fabrication shall be free from kinks and sharp bends. The straightening of material shall be done by methods that will not cause injury to the material. Corners shall be square and true. All bends shall be made with controlled means to insure uniformity of size and shape. External surfaces shall be free of burrs, sharp edges and corners, except when sharp edges or corners are required or where they are not detrimental to safety.

3.11.2 Riveted connections. Rivets shall fill the holes completely. The upset rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member, and shall be in accordance with SAE J492.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. The supplier is responsible for insuring that components and materials used are manufactured, examined and tested in accordance with referenced specifications and standards.

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4.2 Classification of inspections. Inspections shall be classified as follows:

- (a) Quality conformance inspection (see 4.3).
- (b) Inspection of preparation for delivery (see 4.5).

4.3 Quality conformance inspection.

4.3.1 Sampling. Sampling for examination and testing shall be in accordance with MIL-STD-105, Inspection Level III.

4.3.2 Examination. Samples selected in accordance with 4.3.1 shall be examined for the defects specified in 4.4.1. AQL shall be 2.5 percent defective for major defects and 6.5 percent defective for minor defects.

4.3.3 Tests. Samples selected in accordance with 4.3.1 shall be subjected to the tests specified in 4.4.2.1 through 4.4.2.5.1 as applicable. Failure to pass any test shall be cause for rejection of the lot.

4.4 Inspection procedure.

4.4.1 Examination. The ladders shall be examined as specified herein for the following defects:

Major

- 101. Material not as specified.
- 102. Dimensions not as specified.
- 103. Load-bearing surfaces of rungs not corrugated, knurled, or dimpled.
- 104. Rungs not tight in the side rails; not spaced as specified; not parallel.
- 105. Rigging of Class 1, 36-foot ladder not as specified.
- 106. The hooks on Class 2 ladders not as specified; hooks not equipped with spring locks to lock them in "open" or "closed" position.
- 107. Shoes or spiked feet not as specified.
- 108. Side rails not as specified; not straight.
- 109. A-frame (Class 3 ladders only) slope not as specified.
- 110. Outriggers (Class 3 ladders only):
 - (a) Do not lock in folded and extended positions.
 - (b) Require tools to extend or retract.
 - (c) Feet not adjustable; do not lock in any position; require tools.
- 111. Workmanship not as specified.

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Minor

- 201. Painting and color not as specified, when painting and color are specified.
- 202. Marking not as specified, missing or illegible.
- 203. Nonskid material (Class 3 ladders only) not as specified; not applied as specified.

4.4.2 Tests.

4.4.2.1 Bending strength. The ladders shall be extended to the full length and placed in a horizontal position. A support shall be placed 6 inches from each end. Each support shall support both side rails. A load of 250 pounds shall be applied over a 3-1/2-inch area covering both side rails. The load shall remain for not less than 5 minutes. The load shall be removed and the ladder examined. Any evidence of fracture or permanent deformation greater than 1/100 of the effective length of the ladder shall constitute failure of this test.

4.4.2.2 Rung strength. The test unit shall be set at a working angle of 75-1/2 degrees to the horizontal. A distributed load of 800 pounds shall be applied, for a minimum period of one minute, on a 3-1/2-inch-wide white pine wood block shaped to the contour of the rung and resting on the center of the widest like cross-section braced and unbraced rungs. The permanent allowable set in the rung shall not exceed 1/100 of the rung length between the inside webs of the side rails when tested in accordance with ANSI A14.2. Any evidence of permanent deformation of the rung or side rails shall constitute failure of this test.

4.4.2.3 Hooks (Class 2 only). The ladder shall be suspended vertically by ends of the roof hooks. A 400-pound weight, centered on the center 3-1/2 inches, shall be suspended from the bottom rung and allowed to remain for not less than one minute. Any damage to the hooks, the hook supports, or side rails shall constitute failure of this test.

4.4.2.4 A-frame strength.

4.4.2.4.1 14-foot A-frame ladder. With the ladder in the A-frame position, a downward load of 1000 pounds shall be applied for one minute on the center 3-1/2 inches of the top rung on one leg, and then to the other leg. Any evidence of fracture, permanent deformation, or spreading of the legs shall constitute failure of this test.

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4.4.2.4.2 14-foot ladder, open. The ladder shall be opened to its full length and tested as specified in 4.4.2.1. Failure criteria shall be as specified in 4.4.2.1.

4.4.2.5 21-foot ladder, A-frame, extended. With the A-frame in the extended position, and the extension fully extended, an 800-pound weight shall be suspended from the center 3-1/2 inches of the top rung. The ladder shall be free standing with the outriggers folded during this test. Any evidence of permanent deformation of any part of the ladder, sliding of the extension, or tipping of the ladder shall constitute failure of this test.

4.4.2.5.1 Outrigger test. The outriggers shall be extended and the feet of the outriggers shall be lowered not less than 2 inches so that the outriggers support the full weight. The test specified in 4.4.2.5 shall be repeated. Any evidence of damage to the outriggers or slipping of foot extensions shall constitute failure of this test.

4.5 Inspection of preparation for delivery.

4.5.1 Quality conformance inspection of pack.

4.5.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.5.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.5.1.3 Examination. Samples selected in accordance with 4.5.1.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

- 112. Materials, methods and containers not as specified for Level A or B. Each incorrect material, method or container shall constitute one defect.
- 113. Blocking, bracing, cushioning, and tiedown not provided as specified for Level A.
- 114. Packing not as specified for Level A or B.
- 115. Corner protectors not used under strapping for Level B.
- 116. Strapping of containers not as specified for Level A.
- 117. Marking illegible, incorrect, incomplete, or missing.

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5. PREPARATION FOR DELIVERY

5.1 Packing. Packing shall be Level A, B or C, as specified (see 6.2).

5.1.1 Level A. Complete ladders of like description, when comprised of 7-foot sections, shall be packed in wood cleated-plywood boxes conforming to PPP-B-601, Overseas Type, Grade B, in quantities not to exceed the weight limitations of the box specification. Ladders and ladder sections exceeding 7 feet shall be packed in crates conforming to PPP-C-650, Type II, Style A. Blocking, bracing, cushioning, and tiedowns shall be provided to prevent movement and damage to the contents. The boxes and the crates shall be closed and strapped in accordance with the appendix to the applicable specification. Strapping shall conform to QQ-S-781, Class 1, type and size as applicable, and shall be zinc coated unless otherwise specified (see 6.2).

5.1.2 Level B. Two complete ladders, or ladder sections of like size and description, shall be bundled together and secured with tape conforming to PPP-T-97, Type II, 1 inch wide; soft annealed steel wire; or strapping conforming to QQ-S-781. The movable parts shall be secured with tape conforming to PPP-T-97, Type II or soft annealed wire. Corner protectors shall be used under the steel wire or strapping to prevent damage to the ladders.

5.1.3 Level C. The ladders shall be packed to assure carrier acceptance and safe delivery to destination at lowest ratings in compliance with Uniform Freight Classification rules or National Motor Freight Classification rules.

5.2 Marking. The ladders and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The ladders are intended to be used by fire-fighting personnel in combating fires.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Class and length of ladder required (see 1.2).
- (c) Whether the ladders shall be of aluminum or magnesium (see 3.2).
- (d) When the ladders shall be painted and the color required if other than as specified in 3.7.
- (e) Level of packing required (see 5.1).
- (f) When other than zinc-coated strapping is required (see 5.1.1).

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6.3 Information figures. Figures 1 through 4 show types of ladders which have been found acceptable; however, the figures are included for illustration only and are not intended to preclude the furnishing of other ladders which conform to this specification.

6.4 Classification change. Styles have been eliminated since they are no longer required.

Custodians:

Army - ME
Navy - YD
Air Force - 84

Preparing activity:

Army - ME
Project No. 4210-0274

Review activity:

DSA - CS

User activities:

Army - CE
Navy - MC

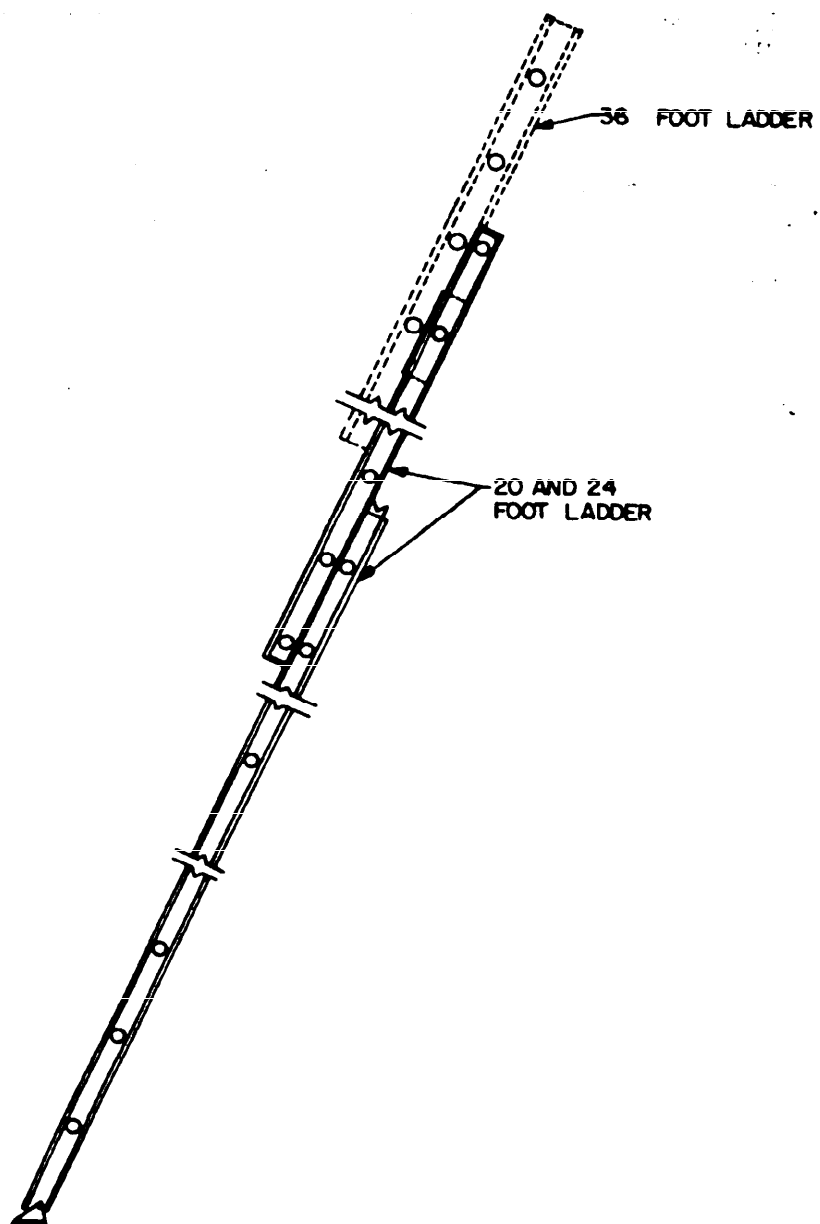


FIGURE 1. EXTENSION LADDER

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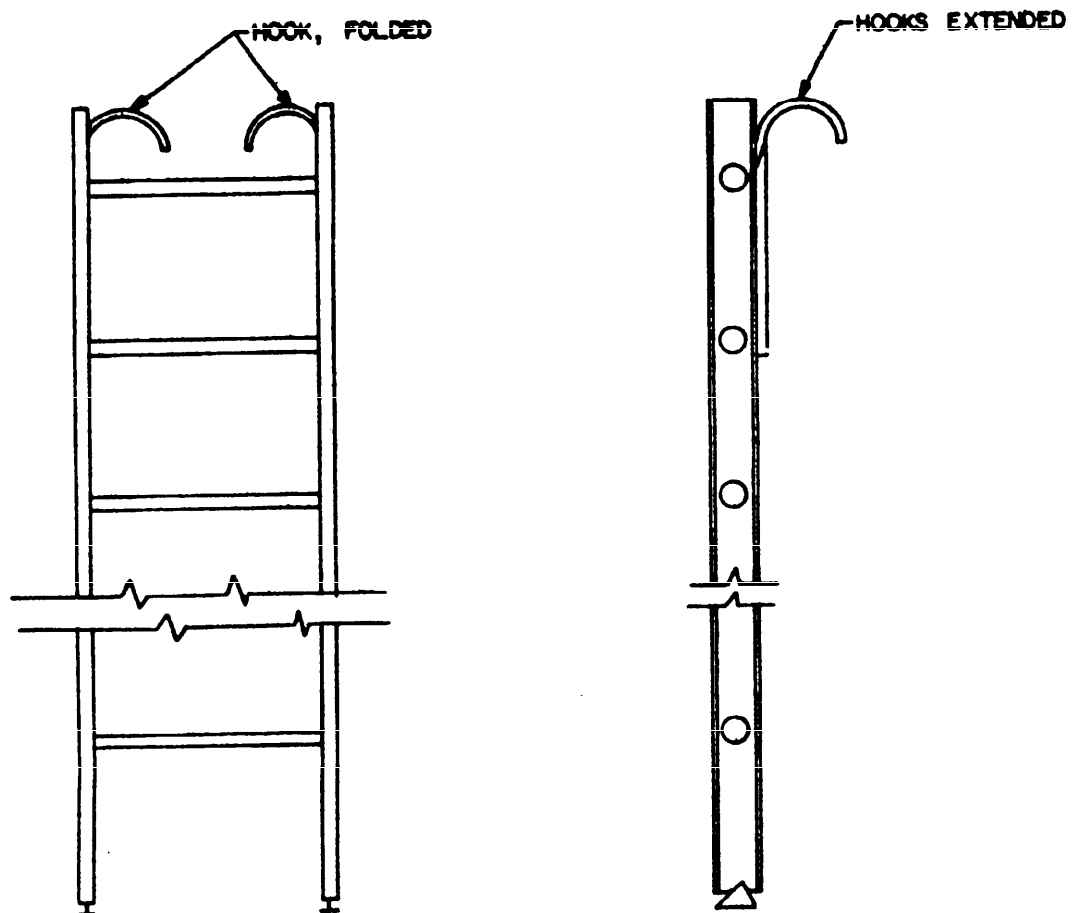


FIGURE 2. SINGLE (ROOF) LADDER

X-2793

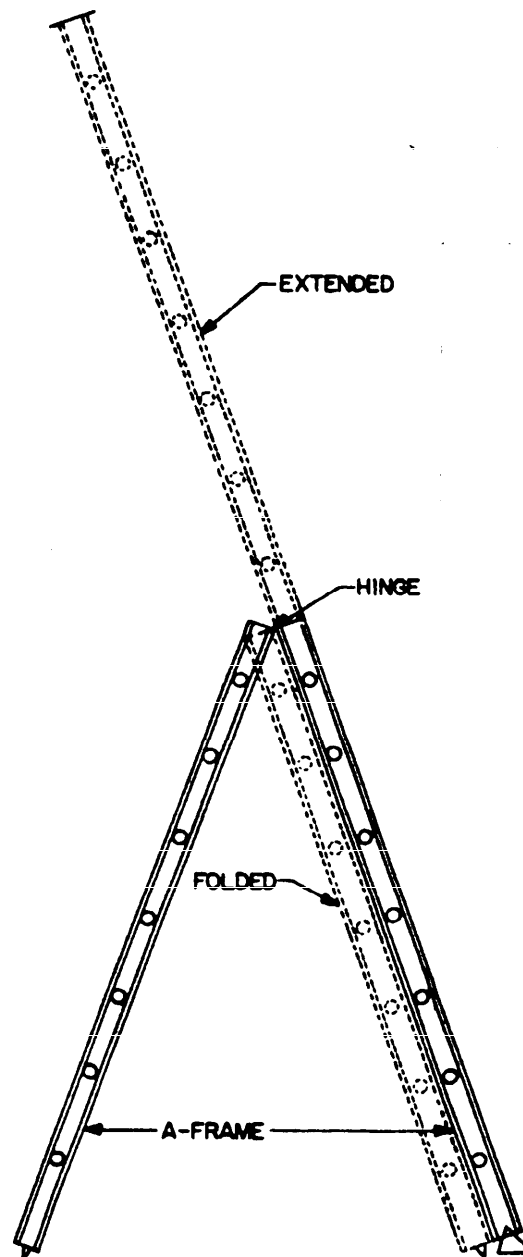


FIGURE 3. 14-FOOT A-FOLDING EXTENSION LADDER

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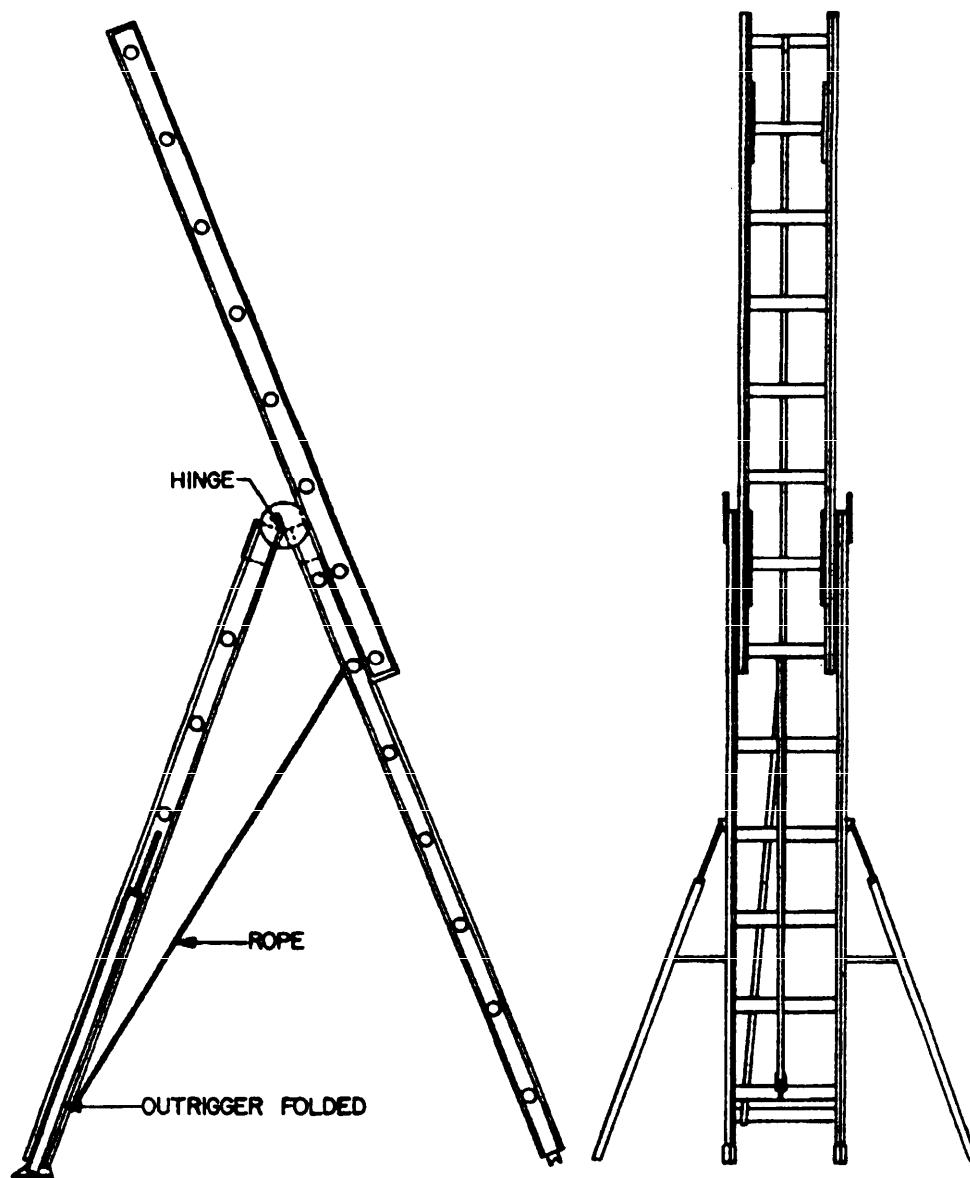


FIGURE 4. 21 FOOT A-FOLDING LADDER

X-1575A

FOLD

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