



Standard Specifications for Personal Climbing Equipment¹

This standard is issued under the fixed designation F887; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

^{ε1} NOTE—A Summary of Changes section was added editorially in December 2012.

1. Scope*

1.1 This standard covers the specifications and qualification testing of the following:

- Climbers,
- Climber straps,
- Climber Pads,
- Climber Footplates,
- Body Belts,
- Positioning Devices with Locking Snaphooks/Carabiners,
- Wood Pole Fall Restriction Devices (WPFRD),
- Harnesses,
- Shock Absorbing Lanyards.

These devices are used by workers in the climbing of poles, trees, towers, and other structures. Minimum performance criteria for arc resistance of harnesses and shock absorbing lanyards are included for workers who may be exposed to thermal hazards of momentary electric arcs or flame.

1.2 Three types of climbers, Types A, B, and C, and two types of climber straps, Types A and B, are covered.

1.3 Two types of body belts, Types A and B, are covered.

1.4 Four types of positioning devices: three positioning straps, Types A, B, and C, and adjustable positioning lanyards are covered.

1.5 Two types of WPFRD, Types A and AB, are covered.

1.6 Two types of harnesses, Types A and B, are covered.

1.7 Two types of shock absorbing lanyards, Types A and B, are covered.

1.8 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.9 The following safety hazards caveat pertains only to the test method portions, 9.2, 10.3, 11.2, 14.4, 15.3, 15.4, 19.2,

22.2, 23, 24, and 25 of these specifications: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

B117 Practice for Operating Salt Spray (Fog) Apparatus
F1891 Specification for Arc and Flame Resistant Rainwear
F1958/F1958M Test Method for Determining the Ignitability of Non-flame-Resistant Materials for Clothing by Electric Arc Exposure Method Using Mannequins

2.2 ANSI Standard:³

Z359.0-2009 Definitions and Nomenclature Used for Fall Protection and Fall Arrest
Z359.1 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
Z359.13-2009 Personal Energy Absorbers and Energy Absorbing Lanyards

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *adjustable positioning lanyard (APL)*, *n*—a component of a work positioning or fall restriction system (may be used for applications such as transitioning past an obstruction during ascent or descent).

3.1.2 *billet*, *n*—the free (buckle hole) end of a belt or strap as opposed to the buckle end, which is designed to pass through the buckle for closing.

3.1.3 *body belt attachment*, *n*—a system of straps and buckles which allow the harness wearer to use a body belt in conjunction with the harness.

¹ These specifications are under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and are the direct responsibility of Subcommittee F18.15 on Worker Personal Equipment.

Current edition approved Oct. 15, 2012. Published December 2012. Originally approved in 1984. Last previous edition approved in 2011 as F887 – 11. DOI: 10.1520/F0887-12.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from the American National Standards Institute, ANSI, 25 W. 43rd St., 4th Floor, New York, NY 10036.

*A Summary of Changes section appears at the end of this standard

3.1.4 *climber*, *n*—device used to assist in ascending and descending wood poles or trees. Climbers generally consist of leg iron, gaff, sleeves, straps and pads.

3.1.5 *dee-ring*, *D-ring*, *n*—a steel straight-sided (no protrusions along edge of dee-ring; see Fig. 1) forging in a circle configuration with an integral stirrup to accept the belt, assembled into a body belt for the purpose of accepting the snaphooks of a positioning device.

3.1.6 *design test*, *n*—for arc and flame resistant materials, one made on a sample treated as representative of an industrial product; these tests will not generally be repeated in quantity production.

3.1.7 *dripping*, *n*—in electric arc testing, a material response evidenced by flowing of the fiber polymer, the fabric, or the fabric coating, and the evidence of droplets from the material, that characterizes overall performance relative to reducing the transfer of heat that is sufficient to cause a second-degree burn.

3.1.8 *electric arc ignition*, *n*—as related to electric arc exposure, a response that causes the ignition of the material which is accompanied by heat and light, and then subsequent burning for at least 5 s, or consumption of at least 25 % of the exposed test specimen area.

3.1.9 *fall arrest*, *n*—the action or event of stopping a free fall or the instant where the downward free fall has been stopped. (See ANSI Z359.0-2009.)

3.1.10 *fall restriction*, *n*—the act of preventing or limiting free fall from a work position, or while ascending or descending a wood pole.

3.1.11 *full body harness*, *n*—a component with a design of straps which is fastened about the person in a manner so as to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest, and shoulders with means for attaching it to other components or sub-systems.

3.1.12 *gaff*, *n*—a component of a pole or tree climber attached to the climber shank, similar to a spur, which is shaped to permit the secure penetration of the pole or tree trunk.

3.1.13 *keeper*, *n*—a component of the snaphook, used as a latching device and held in a closed position by a spring (see Fig. 2).

3.1.14 *leg iron*, *n*—a component of a pole or tree climber. The base or frame of the climber consisting of a shank and

stirrup section. (see Fig. 3 for illustration of a leg iron with attached gaff and sleeve).

3.1.15 *length adjusting device (LAD)*, *n*—a device designed to add or take up slack in an adjustable positioning lanyard so that the system will accommodate various circumferences.

3.1.16 *locking mechanism*, *n*—a component of the snaphook used in conjunction with the keeper to retain the keeper in a closed position until intentionally released and opened. A snaphook thus equipped, becomes a “locking snaphook.”

3.1.17 *locking snaphook*, *n*—a snaphook with a locking mechanism (see 3.1.16).

3.1.18 *nose*, *n*—the curved end of the snaphook which the keeper rests on. It is rounded and overlaps the keeper latch in such a manner as to prevent the dee-ring from inadvertently releasing the snaphook (see Fig. 2).

3.1.19 *part (body belt)*, *load-bearing*, *n*—a part of the body belt or positioning strap that, when in use with both snaphooks of the positioning strap engaged in one dee-ring of the body belt, will be required to support all or part of the mass of the user. This includes all the material in the positioning strap, and, in the case of the body belt, the material to which the dee-rings are directly fastened, and the material of the buckle strap that passes across the wearer’s abdomen.

3.1.19.1 *Discussion*—This definition and the strength requirements described in 15.3.2 are designed to ensure that the buckle strap is strong enough to withstand certain emergency conditions, but are not to be construed as approval of attaching both snaphooks to the same dee-ring when working aloft. OSHA Subpart M (1926.502) prohibits working with two load-bearing snaphooks in the same dee-ring unless snaphooks are of the locking type and designed for such application.

3.1.20 *part (harness)*, *load bearing*, *n*—a component of a harness to which arrest forces are directly transmitted in the event of a fall.

3.1.21 *permanent deformation*, *n*—a deformation occurring beyond the yield point so that the structure will not return to its original dimensions after removal of the applied force.

3.1.22 *protector*, *gaff*, *n*—a cap or guard designed to cover the points of pole or tree gaffs to protect the gaffs from damage or from injuring people or from damaging equipment.

3.1.23 *shock absorbing lanyard*, *n*—a lanyard containing a component whose primary function is to dissipate energy and limit deceleration forces which the system imposes on the body during fall arrest.

3.1.24 *stirrup*, *climber*, *n*—the footrest of the pole or tree climber.

3.1.25 *stirrup*, *snaphook/dee-ring*, *n*—the closed rectangular portion of the positioning strap snaphook, or body belt dee-ring (see Fig. 1 and Fig. 2), that accepts the strap or belt material in a permanent manner.

3.1.26 *wood pole fall restriction device (WPF RD)*, *n*—a device that when properly adjusted and combined with other subcomponents and elements, allows the climber to remain at his or her work position with both hands free, and that

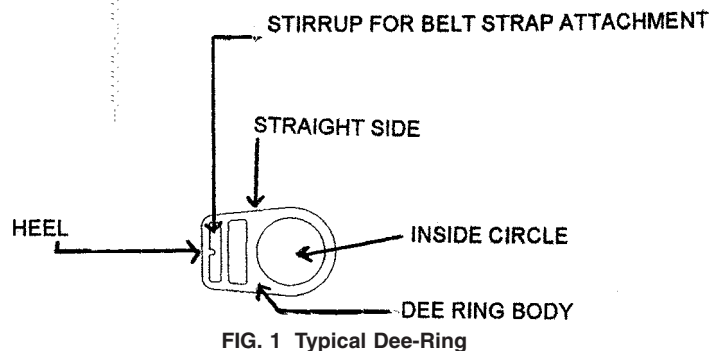


FIG. 1 Typical Dee-Ring

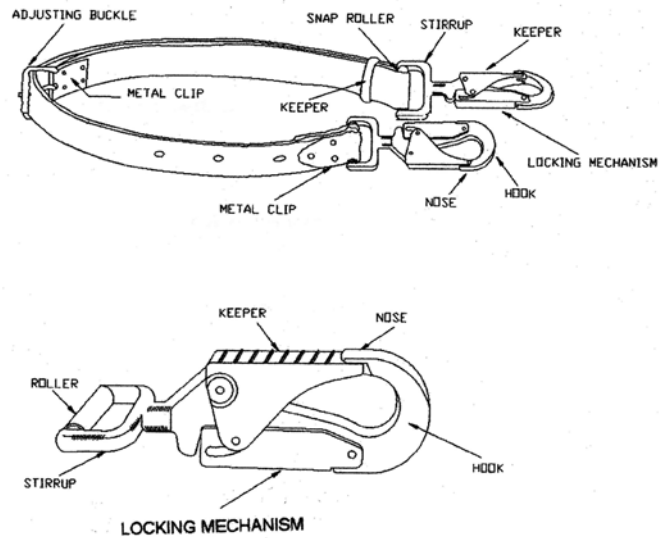


FIG. 2 Components of Positioning Strap

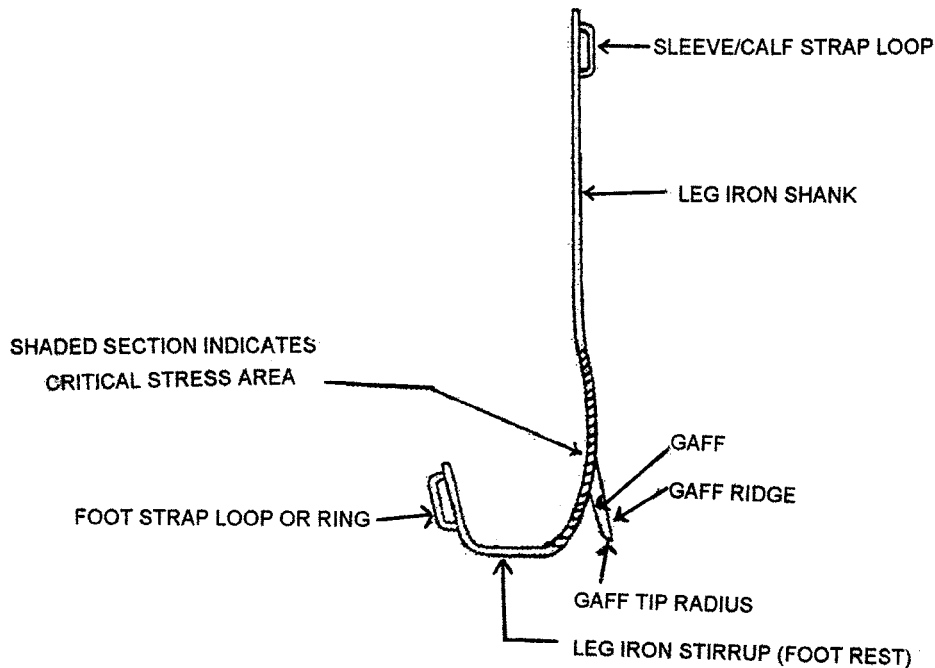


FIG. 3 Critical Stress Area of the Climber

performs a fall restriction function if the climber loses contact between his or her gaffs and the pole.

3.1.27 *work positioning, n*—the act of supporting the body with a positioning system for the purpose of working with hands free. (See ANSI Z359.0-2009.)

4. Significance and Use

4.1 The following personal tools or equipment covered by these specifications are:

4.1.1 Climbers and climber straps used to ascend and descend poles and trees.

4.1.2 Body belts and positioning devices utilized for work positioning on poles, ladders, or structures.

4.1.3 WPRFD and adjustable positioning lanyards are used as components of a work positioning and fall restriction system and utilized in conjunction with a body belt.

4.1.4 Full body harnesses and shock absorbing lanyards utilized in preventing and arresting falls.

4.2 Test methods included in these specifications are intended to provide uniform test procedures.

4.3 Snaphooks (non-locking)—(not permitted by this standard).

4.3.1 Locking snaphooks (required by this standard) manufactured to meet the requirements of these specifications, effectively prevent rollout from occurring and are able to be operated with one hand when working aloft.

4.4 Illustrations are furnished only to amplify the text. They are not to be considered restrictive as to specific design details, except where so stated.

4.5 Except for the restrictions set forth in these specifications because of design limitations, the use and maintenance of this equipment is beyond the scope of the standard.

4.5.1 For this type of protective equipment, it is common practice and the responsibility of the manufacturer to provide instructions regarding proper use, care and maintenance of the equipment and for the user's employer to provide training in and procedures for the safe use of such equipment.

POLE AND TREE CLIMBERS

5. Classification

5.1 Climbers covered under these specifications shall be designated as Type A, B, or C, as follows:

5.1.1 *Type A*—Fixed length, non-adjustable, with permanently attached gaffs.

5.1.2 *Type B*—Adjustable length, with permanently attached gaffs.

5.1.3 *Type C*—Adjustable length, with replaceable and interchangeable gaffs (that is, pole to tree).

5.2 Climber straps covered under these specifications shall be designated as Type A or B, as follows:

5.2.1 *Type A*—One-piece straps that pass through the loops or rings on climbers and buckle one end to the other.

5.2.2 *Type B*—Two-piece ankle or bottom straps made so that each section can be attached to the climber ring, leaving the buckle end free to engage with the free billet end of the other piece.

6. Ordering Information

6.1 Orders for equipment under this specification shall include the following information:

- 6.1.1 Nomenclature,
- 6.1.2 Type,
- 6.1.3 Material,
- 6.1.4 Size, and
- 6.1.5 Gaff type (pole or tree).

6.2 The listing of equipment, types, and sizes is not intended to mean that all shall necessarily be available from the manufacturer; this listing signifies only that, if made, the equipment, types, and sizes shall conform to the details of these specifications.

7. Pole and Tree Climbers

7.1 Sizes:

7.1.1 Type A shall be available in sizes from 14 to 22 in. (355.6 to 558.8 mm) in ½ in. (12.7 mm) graduations.

7.1.2 Types B and C shall be available with the size adjustment capability of 14¾ to 21 in. (374.7 to 533.4 mm) by increments of ¼ in. (6.4 mm).

7.1.3 Adjustable climbers shall be equipped with positive locking, length-adjusting sections that can be double locked securely to the leg iron, permitting full compliance with standards established for fixed length climbers.

7.2 *Materials and Properties*—Leg irons manufactured utilizing quality alloy steel, aluminum or titanium alloys shall meet the performance requirements of this standard. SAE 4140, SAE 8630 and SAE 8640 steel alloys with quenched and tempered structure, 2014 T6 aluminum alloy and Ti6AL4V titanium alloy are recommended.

7.2.1 Materials other than those stated herein are permitted only when it can be demonstrated by testing that all applicable performance requirements of this standard are met and that the durability, reliability and other properties pertinent to the intended uses have been evaluated and determined suitable by testing. Any restrictions on the use of such leg irons shall be marked on the leg iron.

7.3 *Processing*—If required, manufacturers shall use a heat treatment to provide the required characteristics of the leg iron. Overheating shall be avoided. Scaling, pitting, and surface decarbonization shall be removed on the inside critical section of the leg iron from 2 in. (50.8 mm) below the gaff to 6 in. (152.4 mm) above the gaff (see Fig. 3).

7.4 *Design*—The design of the climber shall be such that the maximum tensile stress at the point where maximum stress occurs when subjected to a fluctuating bending force of 300 lbf (1.34 kN) applied to the center of the stirrup section with sleeve in position shall be as indicated in the table below. The climber shall be held in the climbing position by the gaff and at the top of the climber with the sleeve extended to provide a 16 in. (406.4 mm) length.

Leg Iron	Max Tensile Stress, psi (MPa)
Type A—Steel	27 000 (185)
Type B—Aluminum	9 000 (60)
Type C—Titanium	27 000 (185)

7.5 *Finish*—Leg irons shall be free of surface cracks and seams. All steel leg irons shall be finished with a rust-resistant coating.

7.6 Testing, Inspection and Marking:

7.6.1 Testing:

TABLE 1 Typical Material Properties for Climbers

	For Fixed Gaff Climbers	For Replaceable Gaff Climbers ^A
<i>Steel:</i>		
Elongation in 2 in. (5 cm), min	14 %	14 % ^A
Hardness	23 to 38 HRC 243 to 353 HB ^B	32 to 40 HRC ^A 300 to 375 HB ^B
Yield strength, min, psi (MPa)	118 000 (815)	130 000 (895) ^A
<i>Aluminum:</i>		
Elongation in 2 in. (5 cm), min	...	10 %
Hardness	...	125 to 140 HB ^B
Yield Strength, min, psi (MPa)	...	65 000 (450)
<i>Titanium:</i>		
Elongation in 2 in. (5 cm), min	...	10 %
Hardness	...	30 to 40 HRC 286 to 371 HB ^B
Yield Strength, min, psi (MPa)	...	120 000 (828)

^A Data from Federal Specification RR-C-430 C. (Cancelled)

^B Brinell hardness number with 3000-kg load, 10-mm ball.

7.6.1.1 Deformation Test—The purpose for this test is to aid in the elimination of climber failure in the event it is used in an unusual manner such as descending a pole with large steps. The climber shall be held rigidly in the climbing position with the top of the shank parallel to a mounting fixture, the stirrup freely suspended and perpendicular to the fixture. The climber equipped with a pole gaff must also be mounted at the gaff tip in a rigid surface to prevent gaff penetration. Gradually apply a static load of 750 lbf (3.3 kN) at the center of the stirrup and parallel to the fixture and hold for 3 min. Maximum deformation through any part of the climber shall not exceed 0.100 in. excluding measurement error after removal of the load. See Fig. 4.

7.6.1.2 Fatigue Test—When tested at room temperature (approx. 68°F), the climber as a minimum shall withstand without failure 100 000 cycles of a 300 lb (1334.5 N) load. The load must be applied parallel to the shank at the center of the stirrup section with sleeve in position. The climber equipped with a pole gaff shall be held in the climbing position by the gaff and at the top of the climber with the longest sleeve manufactured extended to provide maximum length. The gaff must be supported by a rigid surface so that the gaff will not penetrate the support. Failure shall be considered as any condition which renders the climber non-useable. See Fig. 5.

7.6.1.3 Ductility Test—(a) Leg iron: The leg iron shall withstand without fracture or cracking, a 180 degree bend about a 2 in. (51 mm) diameter mandrel near the midpoint of the shank area. (b) Gaff: The gaff shall withstand, without fracture, a cold bend in a direction away from the leg iron. The center of the bend shall be approximately 5/8 in. (16 mm) from the tip of the gaff. Permanent deflection of the tip of 3/8 in. (9.5 mm) with respect to the straight outer edge of the upper section shall be produced.

7.6.1.4 Plane Test—This test may be used to determine that the gaff is correctly shaped and sharpened to properly penetrate the pole. Place the climber on a flat, soft pine or cedar board. Holding it upright with the shank parallel to the board surface, but with no pressure on the stirrup, push the climber forward along the board as shown in Fig. 6a. If the gaff is properly

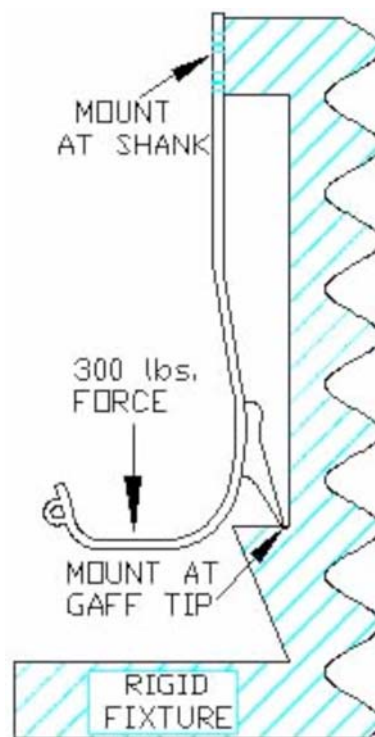


FIG. 5 Fatigue Test Fixture

shaped and sharpened and if the gaff angle with the wood is sufficient, the gaff point will dig into the wood and begin to hold within a distance of approximately 1 in. (2.54 cm). If the climber gaff slides along the wood without digging in, or merely leaves a mark or groove in the wood as shown in Fig. 6b, the gaff is either not properly sharpened and shaped or the gaff angle is too small. The gaff angle is built into the climber by the manufacturer and should be between 11 and 17 degrees with the climber placed parallel to the surface of the wood.

7.6.1.5 Pole Cut Out Test—This test shall be performed on a section of a treated (that is, creosote, penta, etc.) pole in an area that is free from knots and checks. Place the climber on your leg holding the sleeve with your hand. With your leg at an approximate 30° angle to the pole and your foot about 12 in. (30.5 cm) off the ground. Lightly jab the gaff into the pole to a depth of approximately ¼ in. (6.4 mm). Keep enough pressure on the stirrup to keep the gaff in the pole but not so much as to cause the gaff to penetrate any deeper. See Fig. 7a. Push the climber and your hand closer to the pole by moving your knee until the strap loop of the climber sleeve is against the pole. Make certain the strap loop is held against the pole with pressure from your leg. Gradually exert full pressure of your foot straight down on the stirrup without raising your other foot off the floor or ground, so as to maintain balance if the gaff does not hold. See Fig. 7b. The tip of the gaff shall cut into the wood and hold (dig itself in) in a distance of not more than 2 in. (5.1 cm), measured from the point of gaff entry into the pole to the bottom of the cut on the pole surface.

7.6.2 All climbers shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the climbers meet all requirements set forth in these specifications.

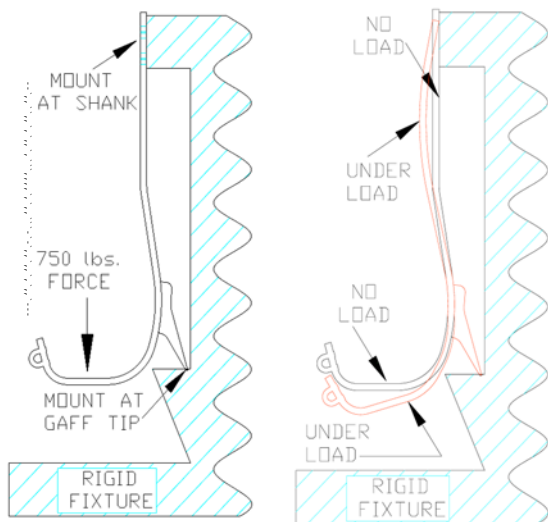


FIG. 4 Deformation Test Fixtures

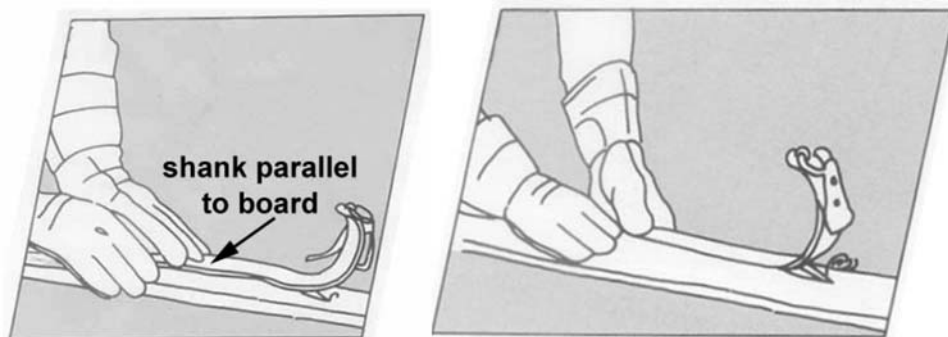


FIG. 6 a & b Plane Test

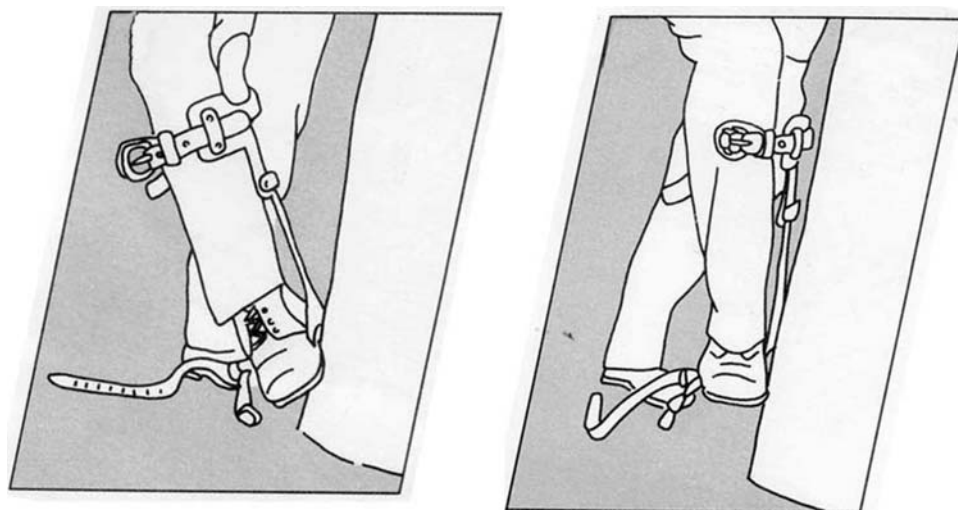


FIG. 7 a & b Pole Cut Out Test

7.6.3 Completed climbers shall be permanently marked by the manufacturer with the manufacturer's name, ASTM F887 standard, size (if fixed size), right or left, and the month and year of manufacture. Right or left markings shall be in a visible area (that is, toe, stirrup) not covered by other equipment.

8. Climber Gaffs

8.1 *Sizes*—Pole gaffs shall measure at least $1\frac{7}{16}$ in. (36.5 mm) on the underside. Tree gaffs shall measure not more than

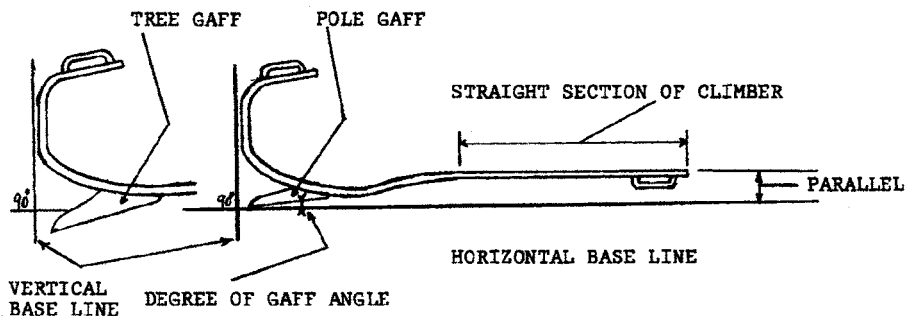
$3\frac{1}{2}$ in. (88.9 mm), nor less than $2\frac{1}{4}$ in. (57.2 mm) on the underside. Gaff design shall be as shown in Fig. 8.

8.2 *Material*—All gaffs shall be forged of forging-quality steel having the properties listed in Table 2.

8.3 Finish:

8.3.1 All fins or burrs shall be removed from the cutting edges of gaff.

8.3.2 All gaffs shall be finished with a rust-resistant coating.



NOTE 1—Degree of angle of the gaff, measured as shown, shall range from 11° to 17° , and the point of the gaff shall be a minimum of $\frac{3}{8}$ in. (9.6 mm) above the lowest point of the climber stirrup. Tree gaffs are excluded from this requirement. The inside flat surface of the gaff at the tip shall be finished with a radius of approximately $\frac{1}{4}$ in. (6.4 mm) in accordance with the gage profile.

FIG. 8 Gaff Design

TABLE 2 Properties of Steel Alloy Acceptable for Gaffs

Elongation in 2 in. (5 cm), min	12 %
Hardness (tip)	45 to 55 HRC ^A 421 to 546 HB ^B
Yield strength, psi (MPa)	212 000 (1460)

^A There may be a variation of no more than three points in the Rockwell Hardness readings taken from the tip of the gaff to a point 1¼ in. (3.2 cm) back from the tip on the fixed gaff climber, 1 in. (2.5 cm) from the tip on replaceable gaff climbers.

^B Brinell hardness number with 3000-kg load, 10-mm ball.

8.4 Inspection:

8.4.1 All gaffs shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall certify that the gaffs meet all requirements set forth in these specifications.

8.4.2 The size and shape of gaffs shall be checked with a gauge available from the same manufacturer.

NOTE 1—Replaceable gaffs, whether pole or tree, fit only the climber iron of the particular manufacturer.

9. Climber Straps

9.1 *Sizes*—Climber straps shall be a minimum of 1 in. (25.4 mm) in width and ⅛ in. (3.18 mm) in thickness. The length shall be not less than 22 in. (55.9 cm) for the calf strap, or 24 in. (61 cm) for the one-piece ankle strap. Two-piece ankle straps shall be not less than 24 in. (61 cm) in length.

9.2 Material and Properties:

9.2.1 Leather used in the manufacture of climber straps shall be top grain cowhide and shall have a breaking strength of not less than 450 lbf/in. (78.9 kN/m) of width with buckle holes. The buckle holding strength of leather shall be not less than 200 lbf (0.89 kN) static load when determined as follows:

9.2.1.1 Punch a hole ⅜ in. (4.76 mm) in diameter, centrally located in a 1 in. (25.4 mm) wide piece of strap, 1 in. (25.4 mm) from the end of the test piece. Into this hole, fit the tongue of a 1 in. assembled buckle of the design to be supplied with the climber strap. Apply the load to the buckle and to the free end of the strap. The buckle tongue shall not tear the leather under the specified static load of 200 lbf (0.89 kN).

9.2.2 The leather shall show no cracking on the grain side when bent slowly over a ½ in. (12.7 mm) diameter mandrel, grain side out, through an angle of 180°. The leather shall not show piping or wrinkling of the grain side when bent over a mandrel 1 in. (25.4 mm) in diameter, with the grain side in, through an angle of 180°.

9.2.3 Fabric used in the manufacture of climber straps shall have a breaking strength of not less than 600 lbf/in. (105.1 kN/m) of width with buckle holes. Construction shall be a minimum of four plies of thickness of folded nylon, or of woven nylon, or equivalent material, constructed in such a way that no raw edges are exposed. The fabric shall be impregnated with neoprene or its equivalent, so that the plies or strands are not readily separable, except by chemical means.

9.2.4 The buckle holding strength of the finished fabric strap shall be not less than 300 lbf (1.34 kN) static load without evidence of failure. Buckle tear shall be in the direction of load application when tested to failure.

9.3 *Hardware*—Buckle frames shall be of welded wire or forged construction. Tongues shall be of an adequate gage wire to meet the strength criteria of 9.2.

9.4 *Design*—Buckle holes in the climber straps shall not exceed ⅜ in. (4.76 mm) in diameter. Straps shall be riveted to the buckles by at least two rivets, with the strap keeper centered between the rivets. The completed assembly shall meet the strength requirements of 9.2. Buckle pads or chafes may be added when desired.

10. Climber Pads

10.1 Climber pad assemblies are intended for use with the climber to enhance comfort.

10.2 Velcro⁴ style wrap pads covered under these specifications cover the function of both the climber strap and pad.

10.3 *Materials*—Materials used in the manufacture of pads shall be of a type that will result in a finished product capable of meeting the requirements for this section outlined below.

10.3.1 Wrap style pads shall maintain a minimum wrap that shall not release at a force of less than 1000 lbf (4.45 kN) when statically tested.

10.3.2 Wrap style pads must display a minimum wrap location warning. Warning must be permanently attached (label or marking).

10.3.3 Sleeve retaining straps (see Fig. 9a) shall be a minimum of 1 in. (25.4 mm) in width. Leather sleeve retaining straps shall have a breaking strength of not less than 450 lbf/in. (78.9 kN/m) of width. Finished fabric sleeve retaining straps shall have a breaking strength of not less than 600 lbf/in. (105.1 kN/m) of width.

10.3.4 Sleeve retaining straps shall be capable of withstanding a direct pull of 175 lbf (0.78 kN). (See Fig. 9a).

10.3.5 Sleeve retaining straps in place within the climber sleeve shall be capable of withstanding a direct pull of 700 lbf (3.12 kN) (see Fig. 9b).

11. Climber Footplates

11.1 Climber footplate assemblies are intended for use with the climber to enhance comfort.

11.2 *Materials and Properties*—Materials used in the manufacture of footplates shall be of a type that will result in a finished product capable of meeting the requirements for this section outlined below. Material used in the manufacture of footplates must maintain its integrity and resist permanent deformation under normal use conditions for the expected life of the product.

11.3 *Removable*—Footplates if removable shall be equipped with positive locking fasteners to secure the footplates to the climber stirrup.

11.4 *Articulation*—Footplates may swivel slightly on the climber stirrup to allow for ease of movement when working aloft.

⁴ Velcro is a trademark of Registrant Velcro Industries, B.V. Limited Liability Company Netherlands, Castorweg 22–24, Curacao Netherlands Antilles.

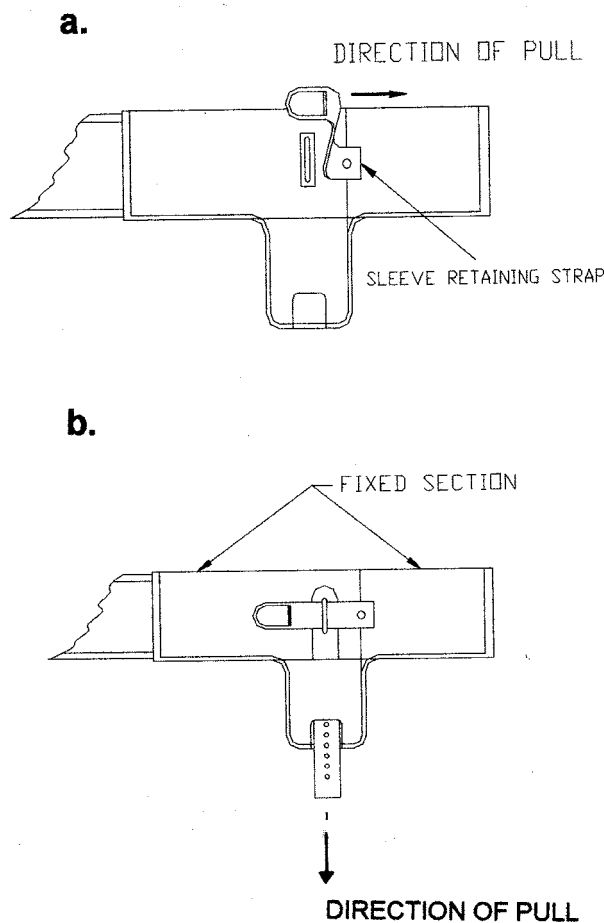


FIG. 9 a & b Sleeve Retaining Straps on Velcro Wrap Style Pads

11.5 *Shape*—Shape must be smaller than the outsole of a standard climbing boot while providing sufficient support to the outsole.

11.6 *Non-Skid*—Bottom surfaces of the footplate must be as a minimum 90 % covered by a rubber sole or an equivalent non-skid coating.

11.7 Steel footplates are not intended for and may not be used on aluminum climbers unless provisions are implemented to prevent premature wear on the climber.

11.8 Footplates shall be permanently marked by the manufacturer with the manufacturer's name, month and year of manufacture and designated as right and left.

11.9 *Finish*—Footplates shall be free of surface cracks and seams. All steel or ferrous material footplates shall be finished with a rust-resistant coating.

BODY BELTS, POSITIONING DEVICES AND WOOD POLE FALL RESTRICTION DEVICES (WPRFD)

12. Classification

12.1 Body belts covered under these specifications shall be designated as Type A or B, as follows:

12.1.1 *Type A*—Belt with dee-ring piece in fixed position.

12.1.2 *Type B*—Belt with dee-ring piece that has limited freedom of movement.

12.2 Positioning devices covered under this specification shall be designated as follows:

12.2.1 *Positioning Straps*:

12.2.1.1 *Type A*—Adjustable length, with tongue buckle.

12.2.1.2 *Type B*—Adjustable length, with friction buckle.

12.2.1.3 *Type C*—Nonadjustable length strap.

12.2.2 *Adjustable Positioning Lanyard*:

12.2.2.1 *Type A*—Adjustable length rope lanyard with Length Adjusting Device (LAD).

12.2.2.2 *Type B*—Web (woven nylon) lanyard with friction buckle, and

12.2.2.3 *Type C*—6 to 10 ft retractable web.

12.3 WPRFD covered under these specifications shall be designated as Type A or AB as follows:

12.3.1 *Type A*—Equipment for use on dry, wet, conduit-covered poles as described in this specification.

12.3.2 *Type AB*—Equipment is for use on dry, wet, conduit-covered, and icy poles as described in this standard.

13. Ordering Information

13.1 Orders for equipment under these specifications should include the following information:

- 13.1.1 Nomenclature,
- 13.1.2 Type,
- 13.1.3 Style,
- 13.1.4 Material, and
- 13.1.5 Size.

13.2 The listing of equipment, types, styles, and sizes is not intended to mean that all shall necessarily be available from the manufacturer. The listing signifies only that, if made, the equipment, types, styles, and sizes shall conform to the details of these specifications.

14. Body Belts

14.1 *Sizes*—The “dee” measurement will be the nominal distance from the heel or bar of one dee ring to the heel or bar of the other dee ring (see Fig. 10). Body belts shall be marked with the “dee” sizes since the dee size is the most critical. Body belts are normally furnished in the combination belt strap and dee sizes listed in Table 3 (see Fig. 11), however, belt strap measurements may vary on different style belts and with different manufacturers.

14.2 Materials:

14.2.1 *Leather*—Top grain leather or leather substitute may be used in the manufacture of body belts and accessories, but shall not be used alone as a load bearing component of the assembly.

14.2.2 *Fabric*—Plied fabric used in the manufacture of load bearing parts of body belts shall be constructed in such a way that no raw edges are exposed. Fabric shall be impregnated with neoprene, or its equivalent, so that the plies are not readily separable, except by chemical means. If webbing is used, it need not be impregnated.

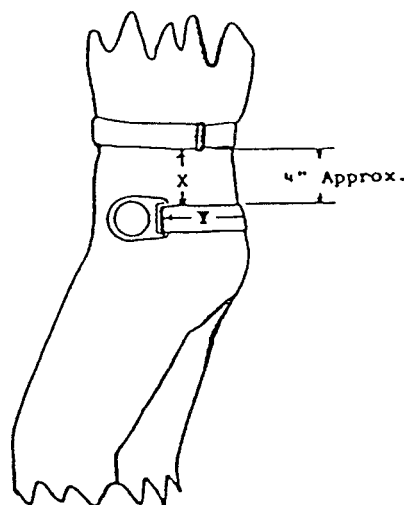
14.3 Design:

14.3.1 *Body Pad*—The cushion part of the body belt shall contain no exposed rivets on the inside and shall be at least 3 in. (76.2 mm) in width. The belt shall have pocket tabs extending at least 1½ in. (38.1 mm) down, and with the point of attachment at least 3 in. (76.2 mm) back of inside of the circle of dee-rings on each side for attachment of plier or tool pockets (see Fig. 12). On shifting dee belts, the measurement for pocket tabs shall be taken when the dee ring section is centered.

14.3.2 *Belt Straps*—Belt straps shall be made of fabric described in 14.2.2. Buckle holes shall be spaced on 1 in. (25.4 mm) centers, round or oval, to accommodate the tongue of the belt buckle. Buckle holes shall be shaped not in excess of ¼ in. (6.3 mm) in diameter if round, or ¼ by ⅜ in. (6.3 by 9.5 mm) if oval shaped, the greater dimension to be in the direction of

TABLE 3 Available Body Belts Listed by Dee Size With Corresponding Belt Strap Size

Dee Size		Min		Center Hole		Max		No. of Tool Loops
in.	cm	in.	cm	in.	cm	in.	cm	
D18	46	32	81	36	91	40	102	3
D19	48	33	84	37	94	41	104	3
D20	51	34	86	38	97	42	107	3
D21	53	36	91	40	102	44	112	4
D22	56	37	94	41	104	45	114	4
D23	58	38	97	42	107	46	117	4
D24	61	40	102	44	112	48	122	4
D25	64	41	104	45	114	49	124	4
D26	66	42	107	46	117	50	127	4
D27	69	44	112	48	122	52	132	4
D28	71	45	114	49	124	53	135	4
D29	74	46	117	50	127	54	137	4
D30	76	47	119	51	130	55	140	4



X—Distance from waist or top of hip bone to where body belt is worn.
Y—Measurement is from front of hip bone around the back to the front of the other hip bone. This measurement is the Dee size.

FIG. 11 A Method Showing Where to Measure to Determine Correct “Dee” Size for a Body Belt

the length of the strap. For grommet construction, holes shall be no larger than No. 2 grommet. No hole shall be permitted within 4 in. (101.6 mm) of the end of the strap. The nominal body strap width shall be 1¾ in. (44.5 mm) (see Fig. 13).

14.3.3 *Tool Loops*—Tool loops shall be so situated on the body of the belt that 4 in. (101.6 mm) of the body belt in the center of the back, measuring from dee-ring to dee-ring, shall be free of tool loops and any other attachments (see Fig. 12).

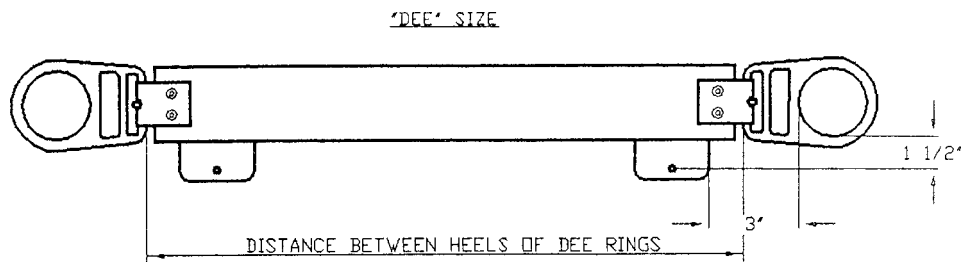


FIG. 10 “Dee” Measurement

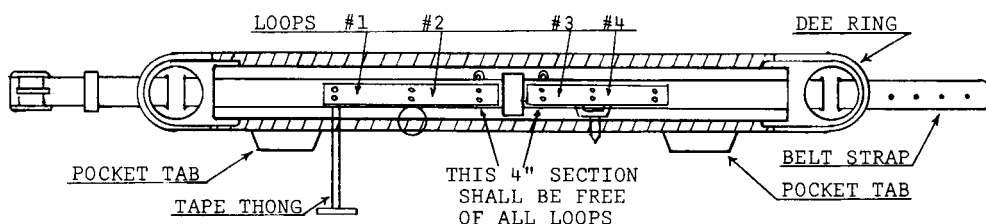


FIG. 12 Body Belt Nomenclature

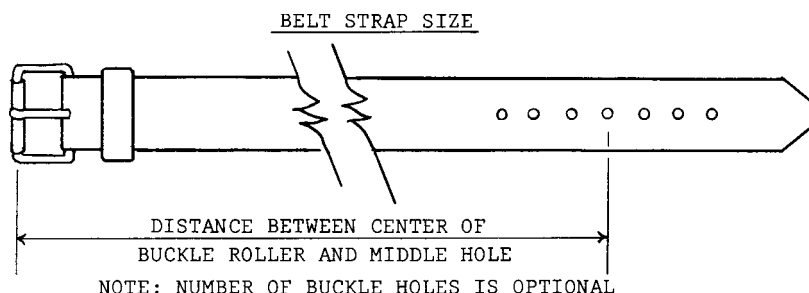


FIG. 13 Body Belt Strap Size

The material may be either leather or fabric $\frac{1}{8}$ in. (3.18 mm) thick, 1 in. (25.4 mm) nominal width, with the loops having a maximum diameter of $1\frac{3}{4}$ in. (44.4 mm) and a minimum diameter of $\frac{3}{4}$ in. (19.1 mm). If a hammer loop is desired, it should be ordered in the position nearest the belt buckle.

14.3.4 *Circle Dee-Rings*—The design of the dee-ring (see Fig. 1) shall be such that its minimum inside circle to outside circle opposite side dimension is $3\frac{1}{8}$ in. (79.4 mm), it is straight-sided and it shall not have any obstructions, protrusions, or a configuration that can allow pressure to be put on the snaphook keeper. The dee-ring strap and the body strap shall not pass through or attach to that part of the dee-ring to which the positioning strap snaphooks are engaged. The dee-rings shall be installed in the body belt in such a manner that vertical travel in the assembly is prevented.

14.3.5 *Liners for Dee-Rings*—Suitable copper, steel, or equivalent liners shall be used around the bar of dee rings to prevent wear.

14.3.6 *Stitching and Thread*—All stitching shall be of nylon or equivalent thread and shall be lock stitched, not less than three nor more than seven stitches to the inch. The thread shall have a minimum breaking strength of 42 lbf (186.83 N). Stitching parallel to an edge shall be approximately $\frac{3}{16}$ in. (4.8 mm) from the edge of the narrowest member caught by the thread.

14.4 Materials Test Method:

14.4.1 *Tension Test*—A sample of new fabric used in a load bearing part shall be soaked in water for 24 h. It shall then be placed in a freezer at $-40 \pm 5^\circ\text{F}$ ($-40 \pm 2.8^\circ\text{C}$) for 4 h. At $-40 \pm 5^\circ\text{F}$ ($-40 \pm 2.8^\circ\text{C}$) it shall be bent over a $\frac{5}{8}$ in. (15.9 mm)

diameter mandrel and reverse bent over the same mandrel through 180° . The sample shall then be stabilized at room temperature and the tensile strength determined. The breaking strength shall be at least 80 % of that of new material or not less than 3600 lbf (16.02 kN) for a section free from buckle holes, and not less than 2800 lbf (12.5 kN) for a section containing buckle holes. The tension test to determine the breaking strength shall be made in a straight pull with a dynamometer, or equivalent.

14.5 Inspection, Marking, and Testing:

14.5.1 All body belts shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the body belts meet all requirements set forth in these specifications.

14.5.2 Completed body belts shall be permanently marked by the manufacturer with this ASTM standard, manufacturer's name, "dee" size, and the year of manufacture.

15. Positioning Devices

15.1 Sizes:

15.1.1 Positioning straps can be made to whatever length the user specifies, measured from inside snaphook to inside snaphook (see Fig. 14). The positioning strap shall have a nominal width of $1\frac{3}{4}$ in. (4.5 cm).

15.1.2 Adjustable positioning lanyards can be made to whatever length the user specifies and are measured from inside snaphook to the terminated end of the lanyard. See Fig. 15.

15.2 Materials:

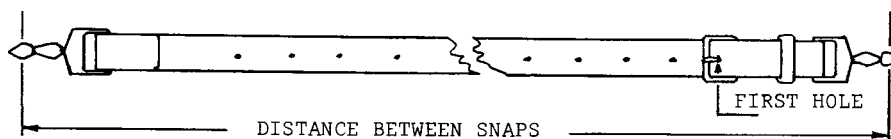


FIG. 14 Positioning Strap Measurement

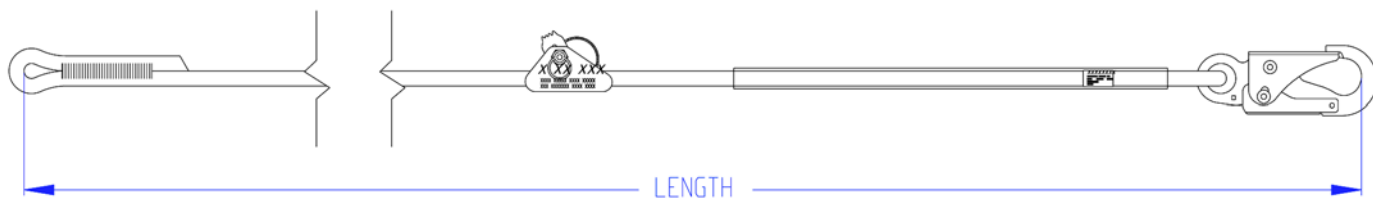


FIG. 15 Adjustable Positioning Lanyard Measurement

15.2.1 Positioning Straps:

15.2.1.1 *Leather*—Top grain leather or leather substitute may be used in the manufacture of straps and accessories but shall not be used alone as a load bearing component of the assembly.

15.2.1.2 *Fabric*—All fabric used in the manufacture of positioning straps shall consist of a minimum of six-ply folded nylon, or of woven nylon, or equivalent material constructed in such a way that no raw edges are exposed. Folded fabric shall be impregnated with neoprene or its equivalent so that the plies are not readily separable except by chemical means. Folded material shall have two center plies of contrasting color. Woven material shall have center threads of contrasting color (red is the suggested wear indicator in both instances).

15.2.2 Adjustable Positioning Lanyards:

15.2.2.1 *Rope*—All rope used in the manufacture of the APL shall be made from synthetic materials of continuous filament yarns, made from light and heat-resistant fibers having strength, aging, and abrasion resistance characteristics equivalent or superior to polyamides. Also, all rope shall have a contrasting color to act as a wear indicator (red is suggested wear indicator) and meet the requirements of 15.3.2.2.

15.3 Materials Test Methods:

15.3.1 *Leakage Current Test*—All fabric, rope and leather used shall be tested for leakage current. The leakage current shall not exceed 1 mA when a potential of 3000 V ac is applied to the electrodes positioned 12 in. (30.5 cm) apart.

NOTE 2—Direct current tests may be used in place of alternating current tests by mutual agreement between the manufacturer and purchaser. All fabric used for pole straps shall withstand an a-c dielectric test of not less than 25 000 V/ft, in a dry condition, for 3 min without visible deterioration.

15.3.2 Tension Test:

15.3.2.1 A sample of new fabric to be used in a load bearing part shall be soaked in water for 24 h. It shall then be placed in a freezer at $-40 \pm 5^\circ\text{F}$ ($-40 \pm 2.8^\circ\text{C}$) for 4 h. At $-40 \pm 5^\circ\text{F}$ ($-40 \pm 2.8^\circ\text{C}$), it shall be bent over a $5/8$ in. (15.9 mm) diameter mandrel and reverse bent over the same mandrel through 180° . The sample shall then be stabilized at room temperature and the tensile strength determined. The breaking strength shall be at least 80 % of that of new material or not less than 3600 lbf (16.02 kN) for a section free from buckle holes and not less than 2800 lbf (12.5 kN) for a section containing buckle holes. Tension tests shall be made in a straight pull with a dynamometer or equivalent.

15.3.2.2 All rope used in the manufacture of the APL shall have a minimum tensile requirement of 5400 lbf (24.02 kN).

15.3.3 *Tongue Buckle Tear Test*—When tested for buckle holding strength, the strap shall withstand a load of 1000 lbf

(4.45 kN) in a straight line pull, snap to snap, without visual evidence of failure. The strap shall be considered failed if the buckle tongue tears through the strap for at least 1 in. (25.4 mm) in the direction parallel to the longitudinal axis of the strap.

15.3.4 Flammability Test:

15.3.4.1 Vertically suspend a section of strapping or rope to which a 220 lb (100 kg) mass has been attached. The length of strapping or rope shall provide 19.7 in. (50 cm) of strapping or rope above the point to which the flame is directed.

15.3.4.2 Adjust a butane or propane burner to a clean-burning blue flame approximately 3 in. (7.6 cm) in height.

15.3.4.3 Direct the flame to an edge of the strapping or rope for a period of 5 s. The top of the burner shall be maintained at 1 in. (25.5 mm) from the strapping or rope edge.

15.3.4.4 Permit any flames generated to continue burning until they self-extinguish.

15.3.4.5 The strap material or rope shall continue to support the 220 lb (100 kg) mass.

15.4 Body Belt / Positioning Devices/WPFRD Hardware, and General Design / Requirements:

15.4.1 Design:

15.4.1.1 Hardware for body belts, and positioning straps shall be drop-forged steel, and shall have a corrosion-resistant finish tested to meet the requirements of Practice B117 (50-h test). Surfaces shall be smooth and free of sharp edges.

15.4.1.2 Hardware for WPFRD and APL shall be aluminum or high tensile alloy steel produced by forging, stamping, forming, casting or machining. Materials other than high tensile alloy steel and processed other than those stated herein are permitted for connectors (hardware) only when it can be demonstrated by testing that all requirements of this standard are met and, additionally, that the durability, reliability and other properties pertinent to the intended uses have been evaluated and determined suitable by testing. Any restrictions on the use of such connectors (hardware) shall be marked on the connectors (hardware) or components, subsystems, and systems of which they are an integral part.

15.4.2 Hardware Requirements:

15.4.2.1 *Locking Snaphook*—As assembled, shall consist of a body, keeper, lock mechanism, spring(s), 'D' shaped stirrup section for attachment of strap material and may include a roller. The snaphook shall snap over the curved portion of the dee-ring from any angle, without interference or tendency to bind at any point. The nose of the snaphook shall be rounded with an indentation(s), contain the keeper and overlap the keeper latch by $3/16$ in. (4.75 mm) minimum. The keeper, with locking mechanism released, shall be attached such that side movement at the snaphook nose is no greater than $3/32$ in. (2.38

mm). Also, the keeper shall be capable of withstanding a minimum side-load of 750 lbf (3.34 kN) applied to a point midway between the nose and the keeper rivet. The keeper shall remain engaged within the nose and shall not break or have permanent deformation greater than $\frac{3}{16}$ in. (4.75 mm) (see Fig. 16). The keeper spring tension shall be such that the keeper shall begin to open with a force between 2.5 lbf (11.2 N) and 4 lbf (17.8 N). The force shall be applied on the keeper and against the face of the snaphook nose with the upper surface of the keeper held horizontally (see Fig. 17). A force in the range of 1.5 lbf (6.7 N) to 4 lbf (17.8 N) shall be required to properly activate and release the locking mechanism. This requirement applies regardless of the design of the locking mechanism (see Fig. 18). Snaphooks shall withstand a minimum 5000 lbf (22.2 kN) tensile test without distortion of the snaphook sufficient to release the keeper (See Fig. 19).

15.4.2.2 Locking Snaphook (with Eye)/Carabiner—Snaphooks and carabiners shall be self-closing and self-locking and shall be capable of being opened only by at least two consecutive deliberate actions. Snaphooks and carabiners shall be capable of withstanding a 5000 lb (22.2 kN) tensile load without breaking or distortion sufficient to release the gate (see Fig. 19). The gate of a snaphook or carabiner shall be capable of withstanding a minimum load of 220 lb (978.6 N) without the gate separating from the nose of the snaphook or carabiner body by more than $\frac{1}{8}$ in. (3.1 mm). The gate of the snaphook or carabiner shall be capable of withstanding a minimum side load of 350 lb (1556.9 N) applied to a point midway between the nose and gate hinge without breaking, permanent deformation greater than $\frac{1}{8}$ in. (3.1 mm), or separating from the nose of the snaphook or carabiner body by more than $\frac{1}{8}$ in. (3.1 mm).

15.4.2.3 All buckles shall withstand a 2000 lbf (8.9 kN) tension test with a maximum permanent deformation no greater than $\frac{1}{64}$ in. (0.39 mm) (see Fig. 20).

15.4.2.4 The load bearing parts of the dee-rings shall withstand a 5 000 lbf (22.25 kN) tension test without cracking or breaking (see Fig. 21).

15.4.2.5 Hardware when manufactured from steel and heat treated shall be in the range from 35 to 42 measured on the Rockwell C scale.

15.4.2.6 Hardware shall have a corrosion-resistant finish tested to meet the requirements of Practice B117 (50-h test). Surfaces shall be smooth and free of sharp edges.

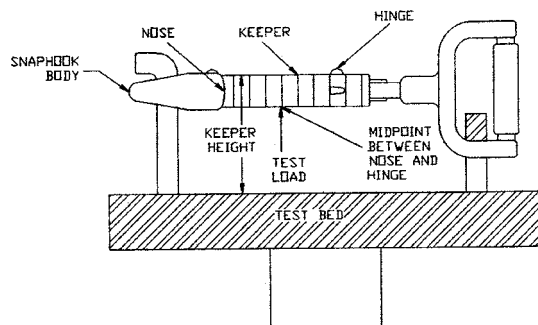


FIG. 16 Side Load Testing of Snaphook

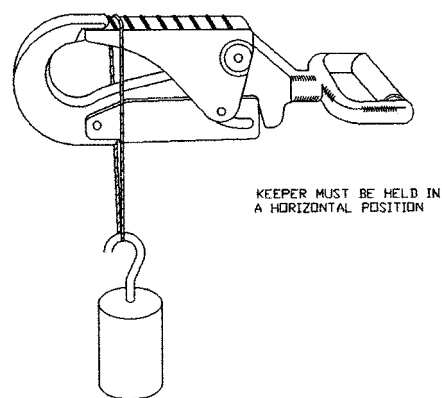


FIG. 17 Latch Test Method

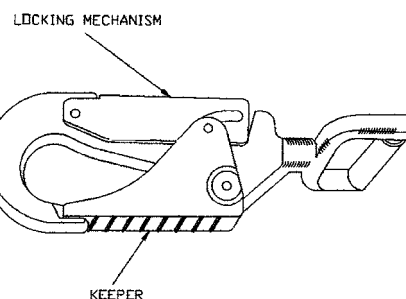


FIG. 18 Typical Locking Snaphook

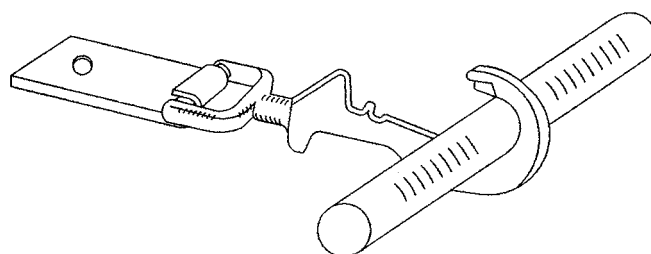


FIG. 19 Snaphook Test

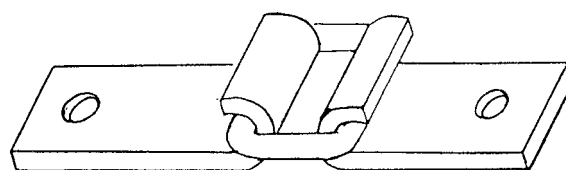


FIG. 20 Maximum Permanent Buckle Deformation Test

15.4.2.7 Finish—Hardware shall have a smooth finish and rivets shall be set with no rough ends. The fabric shall be cleanly cut and punched.

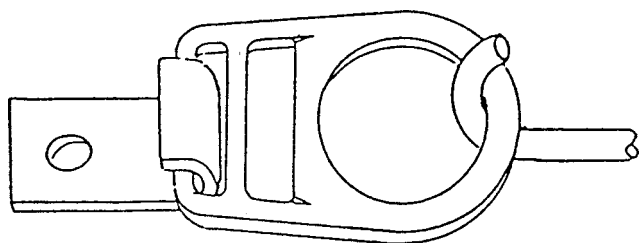
15.5 Design:

15.5.1 Standard Positioning Straps:

15.5.1.1 Shall be so constructed that the snaphooks will be keeper side up when the strap is laid out flat with buckle tongue side up (see Fig. 2 and Fig. 14).

15.5.1.2 Snaphooks shall move freely within their rollers.

15.5.1.3 A leather or fabric keeper shall be supplied on the loop or double end.



NOTE 1—Apply force to bar used to attach dee-ring to belt.

FIG. 21 Dee-Ring Test

15.5.1.4 Stitching and thread, if any, shall be as specified in 14.3.6.

15.5.1.5 The buckle holes shall not exceed $\frac{1}{4}$ in. (6.3 mm) in diameter if round, or $\frac{1}{4}$ by $\frac{3}{8}$ in. (6.3 by 9.5 mm) if oval, the greater dimension to be in the direction of the length of the strap.

15.5.1.6 Clip configuration and number of rivets used for attachment of positioning strap components is at the discretion of the manufacturer as long as the completed product complies with the testing outlined in Section 25 (see Fig. 22).

15.5.2 Adjustable Positioning Lanyards:

15.5.2.1 *Design*—Standard APL shall be so constructed that the snaphooks/carabiners will be keeper/gate side out when properly attached to the body belt dee-rings.

15.5.2.2 Stitching and thread, if any, shall be as specified in 14.3.6.

15.5.2.3 The APL may be equipped with a wear covering to protect rope. This wear cover is only intended to protect the fibers of the material and will not affect function or tensile strength in any way.

15.5.2.4 The Length Adjusting Device (LAD) shall be automatic in its locking function. The possibility of overriding the self-locking feature of the Length Adjusting Device shall be guarded against. Length Adjusting Devices which rely solely on the lever principle for locking, shall be designed such that locking will become effective before the lever becomes perpendicular to the lanyard.

15.5.2.5 Length Adjusting Devices shall have an ultimate strength of not less than 3 600 lbf (16 kN) when pulled end to end (or frame to eye) in a tensile testing machine. (see Fig. 23) LAD must show no signs of binding, fracture, cracking or significant deformation that would render the device non-useable.

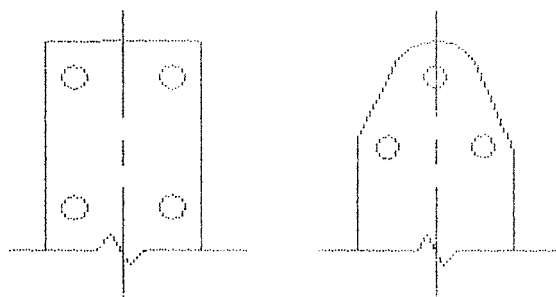


FIG. 22 Pole Strap Metal Clip

LENGTH ADJUSTING DEVICE

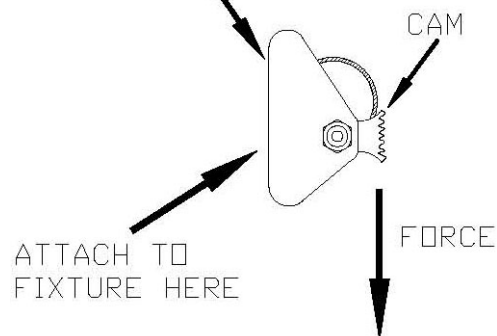


FIG. 23 Length Adjusting Device Tensile Test

15.5.2.6 All Formed eye terminations shall be either spliced or stitched. Spliced eye terminations shall be made in accordance with the rope manufacturer's recommendation subject to the following requirements. Eye splices in twisted rope having three or more strands shall have a minimum of four tucks. A properly sized thimble shall be part of the formed eye termination. Knots shall not be used to form APL end terminations. Terminations (including cut ends) and splices shall be seized, whipped or otherwise integrally finished to prevent the termination or splice from unraveling or unsplicing. Stitched eye terminations shall be manufactured to ensure compliance with the performance requirements of 24.4.

15.5.2.7 Assembly must maintain a minimum tensile of 1000 lbf with a maximum of 3 in. (76.2 mm) of rope/strap slippage through the adjustment assembly. The assembly shall be pull-tested in a straight-line pull with a dynamometer or equivalent. Mark the position of the adjustment assembly on the rope or webbing. Load to 1000 lbf (8.8 kN). Mark the new position of the adjustment assembly. Measure the slippage of the adjustment assembly from the original mark (disregard elongation of the rope or webbing by unloading the set-up prior to making the slippage measurement). Slippage greater than 3 in. (76 mm) constitutes a failure.

15.6 Inspection, Marking, and Testing:

15.6.1 All positioning devices shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the positioning devices meet all requirements set forth in these specifications.

15.6.2 Completed positioning devices shall be permanently marked by the manufacturer with the manufacturer's name, this ASTM standard, model number, and date of manufacture (see Fig. 24).

15.6.3 Length Adjusting Devices that are unidirectional (can only lock in one direction of travel) and which could be installed incorrectly on the lanyard shall be clearly marked showing proper orientation of use.

16. Wood Pole Fall Restriction Device (WPRD)

16.1 *Sizes*—WPRD shall be manufactured to accommodate pole circumference (Distribution or Transmission).

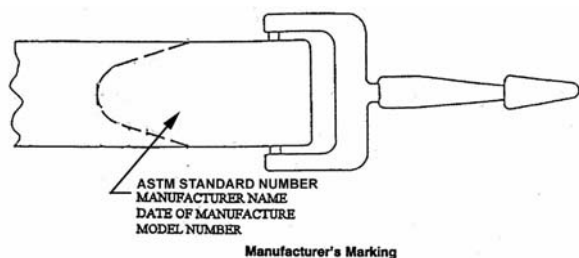


FIG. 24 Manufacturer's Marking

16.2 Materials and Properties:

16.2.1 Leather—Reference 15.2.1.1.

16.2.2 *Fabric*—All fabric used in the manufacture of the WPFRD shall consist of a minimum of six-ply folded nylon, or of woven nylon, or equivalent material constructed in such a way that no raw edges are exposed. Cut edges shall be heat sealed or otherwise protected to prevent fraying. Folded fabric shall be impregnated with neoprene or its equivalent so that the plies are not readily separable except by chemical means. Folded material shall have two center plies of contrasting color. Woven material shall have center threads of contrasting color (red is the suggested wear indicator in both instances). It is required that a wear indicator be incorporated when using equivalent materials.

16.3 *Design*—Standard WPFRD shall be so constructed that the snaphooks will be keeper side out when properly attached to the body belt dee-rings. Stitching and thread, if any, shall be as specified in 14.3.6.

16.3.1 Clip configuration and number of rivets if used for attachment of components is at the discretion of the manufacturer as long as the completed product complies with the testing outlined in Section 25 (see Fig. 22).

16.4 Hardware for WPFRD:

16.4.1 *Locking Snaphook with Eye/Carabiner*—Reference 15.4.2.2 (see Fig. 25).

16.4.2 *Locking Snaphook with Stirrup*—Reference 15.4.2.1.

16.4.3 *Strap Adjustment Assembly*—Assembly must maintain a minimum tensile of 1000 lbf with a maximum of 3 in. of strap slippage through strap adjustment assembly. The assembly shall be pull-tested in a straight-line pull with a dynamometer or equivalent. Mark the position of the adjustment assembly on the rope or webbing. Load to 1000 lbf (8.8 kN). Mark the new position of the adjustment assembly. Measure the slippage of the adjustment assembly from the original mark (disregard elongation of the rope or webbing by unloading the set-up prior to making the slippage measurement). Slippage greater than 3 in. (76 mm) constitutes a failure.

16.5 Test Methods:

16.5.1 *Leakage Current Test*—Reference 15.3.1

16.5.2 *Tension Test*—Reference 15.3.2.

16.6 Inspection, Marking, and Testing:

16.6.1 WPFRDs shall be subjected to careful inspection by the manufacturer. When requested, the manufacturer shall provide certification that the WPFRD meets all requirements set forth in these specifications.

16.6.2 Completed WPFRDs shall be permanently marked by the manufacturer with the manufacturer's name, model number, date of manufacture and ASTM standard number and specifying Type A or AB.

HARNESSES

17. Classification

17.1 Harnesses (see Fig. 26) covered under these specifications shall be designated as Type A or B as follows:

17.1.1 *Type A*—Full body harness.

17.1.2 *Type B*—Full body harness with body belt attachment.

18. Ordering Information

18.1 Orders for equipment under these specifications should include the following information:

18.1.1 Nomenclature,

18.1.2 Type,

18.1.3 Material, and

18.1.4 Size. (See Table 4.)

18.2 The listing of equipment, type, and sizes is not intended to mean that all shall necessarily be available from the manufacturer; the listing signifies only that, if made, the equipment, types, and sizes shall conform to the details of these specifications. Additional designs or modifications of equipment or hardware may be specified by the user for a particular application providing equipment or hardware meets the performance requirements of this standard.

19. Harnesses

19.1 *Sizes*—Harnesses may be manufactured and designated by the sizes small, medium, large, X-large, and XX-large. The manufacturer's harness design shall accommodate the height and chest sizes shown in Table 4.

19.2 Harnesses manufactured under these specifications shall be labeled as meeting this standard and shall meet the specifications, tests and requirements of ANSI Z359.1 – Year

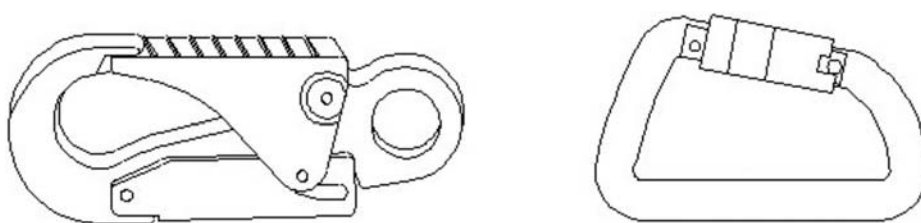
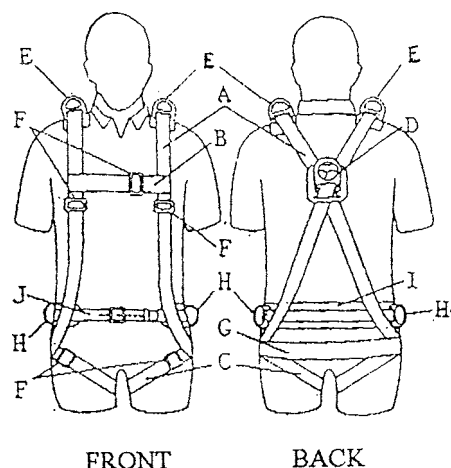


FIG. 25 Locking Snaphook with Eye/Carabiner



Legend:
A—Shoulder straps
B—Chest strap
C—Thigh strap
D—Fall arrest attachment
E—Retrieval dee-rings
F—Adjustment points
G—Sub-pelvis strap
H—Work positioning attachment
I—Body pad
J—Waist strap

NOTE 1—Adjust harness to a snug fit at adjustment points. Attach to “E” for retrieval only. Attach lanyard/energy absorber to point “D”. Point “D” may be used for retrieval purposes when harness does not include shoulder dee-rings (“E”).

FIG. 26 Typical Harness Arrangement

TABLE 4 Harness Sizes

Height	Chest Sizes (Wearing Winter Clothing), in.				
	34–36	38–40	42–44	46–48	50–54
Short (5 ft 4 in. – 5 ft 7 in.)	small	small	medium	large	X-large
Reg. (5 ft 8 in. – 5 ft 11 in.)	small	medium	large	X-large	XX-large
Tall (6 ft 0 in. – 6 ft 3 in.)	medium	medium	large	X-large	XX-large
Extra tall (6 ft 3 in. +)	large	large	X-large	X-large	XX-large

with the exception that the webbing used in the construction of harnesses shall have a minimum breaking strength of 7000 lb (31.14 kN).

NOTE 3—Year code following the Z359 standard designation marked on product dictates the applicable standards specification, tests and requirements.

SHOCK ABSORBING LANYARDS

20. Classification

20.1 Shock absorbing lanyards (see Fig. 27 and Fig. 28) covered under these specifications shall be designated as Type A or Type B as follows:

20.1.1 *Type A*—Deceleration force reduction by separation of woven material.

20.1.2 *Type B*—Deceleration force reduction by stretch of woven material.

20.2 Additional designs or modifications of equipment or hardware may be specified by the user for a particular application providing equipment or hardware meets the performance requirements of this standard.

21. Ordering Information

21.1 Orders for equipment under these specifications should include the following information:

21.1.1 Nomenclature,

21.1.2 Type,

21.1.3 Material,

21.1.4 Size, and

21.1.5 Connectors (snap hooks, loops, carabineers, etc) (see Fig. 18, Fig. 25, Fig. 29 and Fig. 30).

21.2 The listing of equipment, type, and sizes is not intended to mean that all shall necessarily be available from the manufacturer; the listing signifies only that, if made, the equipment, types, and sizes shall conform to the details of these specifications. Additional designs or modifications of equipment or hardware may be specified by the user for a particular application providing equipment or hardware meets the performance requirements of this standard.

22. Shock Absorbing Lanyards

22.1 *Sizes*—Shock absorbing lanyards can be made to whatever length the user specifies (measured from inside connector to inside connector), with the minimum being as follows:

22.1.1 *Type A*—18 in. (45.7 cm) (Pack with one connector, See Fig. 27.)

22.1.2 *Type B*—48 in. (121.9 cm). See Fig. 28.

22.2 Shock absorbing lanyards manufactured under these specifications shall be labeled as meeting this standard and shall meet the specifications, tests and requirements of ANSI Z359.1 or ANSI Z359.13 as applicable. (See Note 3.)

23. Electric Arc Performance

23.1 *Electric Arc Test*—Harnesses and shock absorbing lanyards shall be electric arc tested using the Test Method F1958/F1958M mannequin test set up.

23.2 *Harnesses*—Six test specimens shall be placed on mannequins as normally worn and exposed to a 40 cal/cm² ± 5 cal/cm² arc. Three of the test specimens shall be exposed on the front and three of the test specimens shall be exposed on the back. The arc shall be centered on the chest in the case of a harness front exposure or on the fall arrest attachment in the case of a back exposure.

23.2.1 *Harness Accessories, Loops, etc*—Three test specimens of each accessory, loop, etc., shall be exposed to a 40

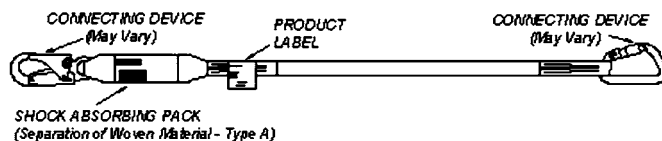


FIG. 27 Type “A” Shock Absorbing Lanyard



FIG. 28 Type "B" Shock Absorbing Lanyard

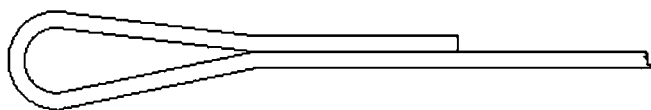


FIG. 29 Webbing Connector

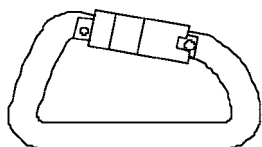


FIG. 30 Typical Carabiner

cal/cm² $\pm$ 5 cal/cm² arc. The accessory, loop, etc., need not be attached to a complete harness but may simply be attached to a piece of the approved harness webbing and placed over the shoulder of the mannequin so that the accessory, loop, etc., is on the chest of the mannequin approximately 12 in. (30.5 cm) from the center of the arc. When performing this test, two accessories, loops, etc., (maximum) may be placed on a mannequin at any one time, one over each shoulder.

23.3 Shock Absorbing Lanyards—Three test specimens (see Note 4) shall be placed over the shoulder of the mannequin so that the shock absorbing material is on the chest of the mannequin approximately 12 in. (30.5 cm) from the center of the arc as shown in Fig. 31 and exposed to a 40 cal/cm² $\pm$ 5 cal/cm² arc. When performing this test, six lanyards (maximum) may be placed on a mannequin at any one time, three over each shoulder separated by a minimum of 1 in. (25.4 mm).

NOTE 4—Three test specimens are required for this test unless there is a difference between the front and back of the specimen in which case six test specimens will be required such that three of the test specimens shall be exposed on the front and three of the test specimens exposed on the back.

23.4 This is a design test and need not be retested unless components change. Specimens shall be chosen to represent load bearing materials and any permanently attached options or accessories.

23.5 The arc material response characteristics for personal climbing device materials, including afterflame time, electric arc ignition, and dripping, shall be reported for all exposures.

23.6 When arc testing according to Test Method F1958/F1958M, dripping shall be determined by observing all arc test specimen exposures. There shall be no dripping for arc test specimen exposures.

23.7 The exposed test specimens shall be exposed to the required drop test (reference ANSI Z359.1 or ANSI Z359.13 as applicable (See Note 3)), after the arc exposure as soon as is practically possible.

23.8 To meet these specifications, exposed test specimens shall pass the following criteria in addition to the other test criteria in the standard:

23.8.1 No electric arc ignition as defined by Specification F1891.

23.8.2 No melting and dripping as defined by Specification F1891.

23.8.3 Pass specified drop test after electric arc exposure defined above.

23.8.4 No greater than 5 s of afterflame as defined by Specification F1891.

24. Qualification Testing

24.1 The tests described in 24.3 and 24.4 are destructive tests. Components so tested shall not be returned to service, but shall be destroyed.

24.2 Test Equipment:

24.2.1 Structure:

24.2.1.1 Body Belts/Positioning Straps—The test frame shall be a structure of sufficient rigidity to prevent significant deflection under the drop test and of sufficient height to accommodate the longest positioning strap to be tested (including stretch), and shall be provided with an eye-bolt anchorage point positioned vertically downward.

24.2.1.2 Test Pole (WPFrd)—The test pole (TP) shall consist of the following parameters:

TP length for tests (cut from full length pole of approximately 45 ft.)
 15-20 ft (4.6-6 m)
Diameter, Top
 8.00-10.50 in. (20.3-26.7 cm)
Diameter, Bottom
 10.75-13.25 in. (27.3-33.7 cm)
Wood Type
 Pine (as per CSA Standard CAN/CSA O15/ANSI 05.1)
Class
 4
Treatment
 CCA-PEG (Chromated Copper-Arsenate – Polyethylene Glycol)
Hardness^A
 15 $\pm$ 5 Pilodyn

^AThe hardness shall be measured on a dry pole before the conditioning.

NOTE 5—For safety reasons, the structure should have ample stability to accommodate the possible lateral loading under rebound.

24.2.1.3 The test pole:

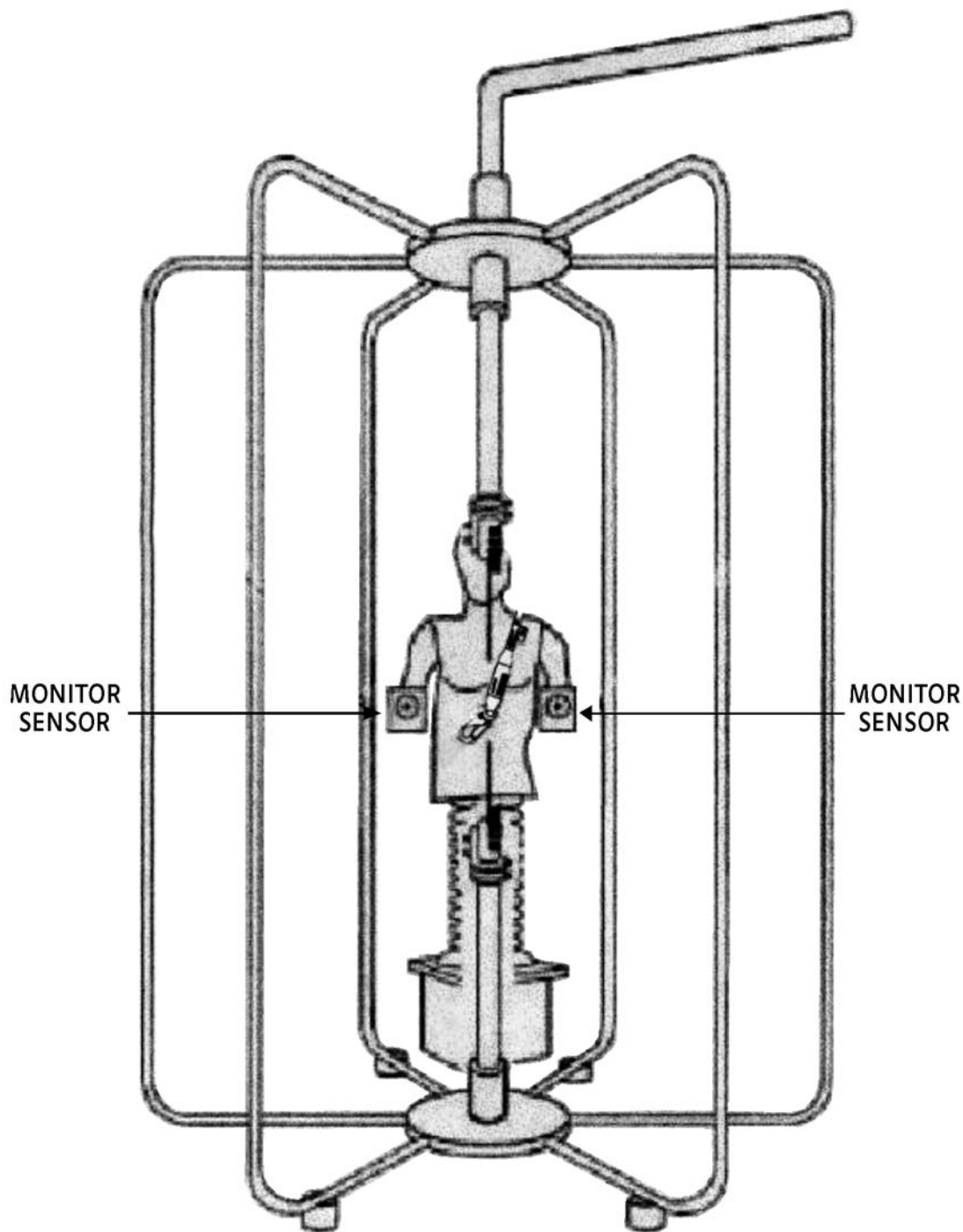


FIG. 31 Shock Absorbing Lanyard Placement for Electric Arc Testing

- shall be distribution-line sized and have minimal taper.
- demonstrates a worst-case condition (normally provides less effective fall restriction results than a transmission pole of larger diameter and significant taper).
- shall be securely mounted and plumb within $\pm 1^\circ$.

24.2.2 Test Mass:

24.2.2.1 *Body Belts/Positioning Straps*—The test mass shall have a mass of 220 ± 2 lb (100 ± 1 kg) and shall be rigidly constructed of steel in accordance with Fig. 32. The test mass

shall include the mass of the instrumentation load cell when used to test positioning straps or an equivalent supplementary mass.

24.2.2.2 *WPRFD*—The torso shaped test weight used for testing the WPRFD shall be constructed of rigid material with hardwood surfaces in accordance with the dimensions set forth in Fig. 33 and shall weigh 220 ± 2.2 lb (100 ± 1 kg). Two side dee-rings shall be provided on the torso by attaching a lineman's body belt, dee size 20 (51 cm), dee-ring to dee-ring

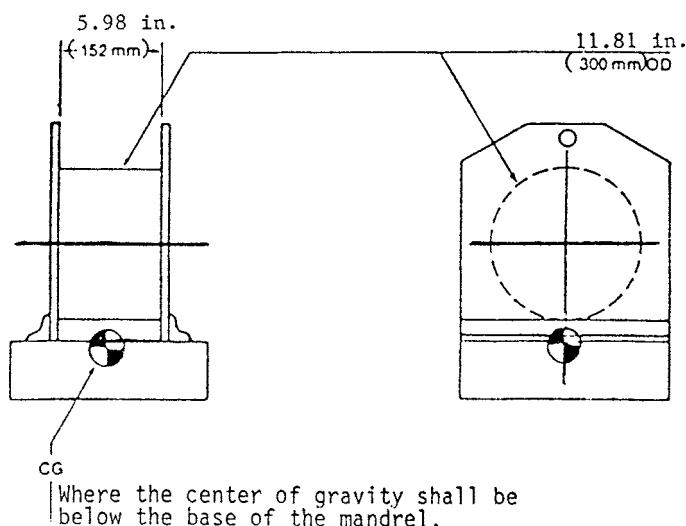


FIG. 32 Test Mass

in accordance with 14.1. The dee-rings shall be positioned at waist level. The total weight of the torso, harness/belt, and steel bands shall not exceed 231 lb (105 kg).

24.2.3 Wire Rope:

24.2.3.1 Body Belts—A wire rope lanyard equipped with snaphooks shall be provided for the body belt tests. The lanyard must be of sufficient length to ensure a 39.4 in. (1-m) vertical drop, but in no case shall it exceed a length of 96 in. (243.8 cm) when measured from snaphook to snaphook. The lanyard shall be fabricated from Type 302 stainless steel in a $\frac{3}{8}$ in. (9.5 mm) diameter, 7 × 9 aircraft-cable construction. To prevent slippage, the lanyard eyes shall be formed by flemish splices and secured with mechanical sleeves.

24.2.3.2 WPF RD—Two wire rope lanyards equipped with snaphooks at each end shall be provided for the WPF RD tests. The lanyard shall be 24 in. (61 cm) long, from snaphook to snaphook, under a tension of 10 lbf (44.5 N) fabricated from Type 302 stainless steel in a $\frac{3}{8}$ in. (9.5 mm) diameter 7 × 9 aircraft cable construction. To prevent slippage, the lanyard eyes shall be formed by flemish splices and secured with mechanical sleeves.

24.2.4 Quick Release Mechanism—This mechanism which is required for all drop tests is remotely operated and shall release the test mass without imparting any motion to it.

24.2.5 Load Measuring Instrumentation—A load cell or equivalent device capable of measuring and permanently recording the arrest force. This instrument shall be used during all positioning strap drop tests. The load cell, or the equivalent measuring device, shall be capable of withstanding a shock force of at least 8000 lbf (35.6 kN) and shall have a frequency of 300 to 1000 cycles per s (0.3-1kHz) with an accuracy of $\pm 2\%$.

24.2.6 Test Leg, Leg Support Bracket (WPF RD)—Completion of the off the pole tests requires the addition of the test leg to the test torso. The test leg is shown in Fig. 34. Prior to initiating this test, the leg support bracket must be attached to the pole. The bracket is shown in Fig. 35.

24.2.7 Tensile Test Equipment—The tensile test equipment shall pull at a uniform rate of not greater than 2 in./min (51mm/min) and shall measure force within an accuracy $\pm 3\%$ of the specified load.

24.2.8 The test fixtures of the testing apparatus used in the above tensile tests shall closely represent their mating hardware components.

24.2.9 Pilodyn Wood Pole Tester—The Pilodyn 6J tester or equivalent is used to determine the density (hardness) and quality of a wood pole. The test consists of injecting a spring-loaded steel striker pin into the wood. A scale on the Pilodyn gives the depth of the pin penetration; the greater the penetration, the softer the wood. The dimensions of the tester are as follows:

- spring injection force = 4.43 ft-lb (6J)
- striker pin total length = 3.16 in. (80.2 mm)
- striker pin diameter = 0.098 in. (2.5 mm)
- tool diameter = 1.97 in. (50 mm)
- total length = 13.19 in. (335 mm)
- total weight = 3.53 lb (1.6 kg)

24.3 Qualification Testing (Body Belts):

24.3.1 Drop Test Samples—Samples of body belts of each specific design and construction shall be tested. Samples shall be supplied without positioning straps but shall include all hardware and fittings intended to be attached to the commercial product.

24.3.2 Drop Test Procedures—The belt shall be snugly secured around the mandrel of the test mass. The belt shall be positioned such that the dee-ring closest to the buckle is pointing upward. One end of the wire rope shall be hooked into the dee-ring. The quick-release mechanism shall be hooked into the same point. Raise the mass until the opposite end of the wire rope can be snapped into the test-structure anchorage point. Note the level of the dee-ring attachment point and raise the test mass until the dee-ring attachment point has been raised a distance of 39.4 in. (1 m) (see Fig. 36). Release the test mass by means of the quick-release mechanism.

24.3.3 Drop Test Requirements—Examine belt for damage such as broken stitching, slipped grommets in buckle holes, and bent buckle tongue. Any such damage shall be recorded for the manufacturer's information. Body belts shall successfully arrest the fall of the test mass and shall be capable of supporting the mass after the test. When tested at any buckle hole adjustment, the tongue may rip 2.95 in. (74.9 mm) maximum along the belt. The circumference of the belt in its buckled condition, shall not increase more than 3.94 in. (10 cm), including the ripping, as a result of the test.

24.4 Qualification Testing (Positioning Devices):

24.4.1 Positioning Straps:

24.4.1.1 Drop Test Samples—When a positioning strap of a specific material, type, size, and range design is intended to be manufactured in a range of sizes, the range shall be specified by the manufacturer. Samples shall be tested at the shortest length adjustment that permits a 39.4 in. (1 m) drop. All positioning straps provided as samples shall be separate from the body belts but shall include all hardware and fittings intended to be attached to the commercial product.

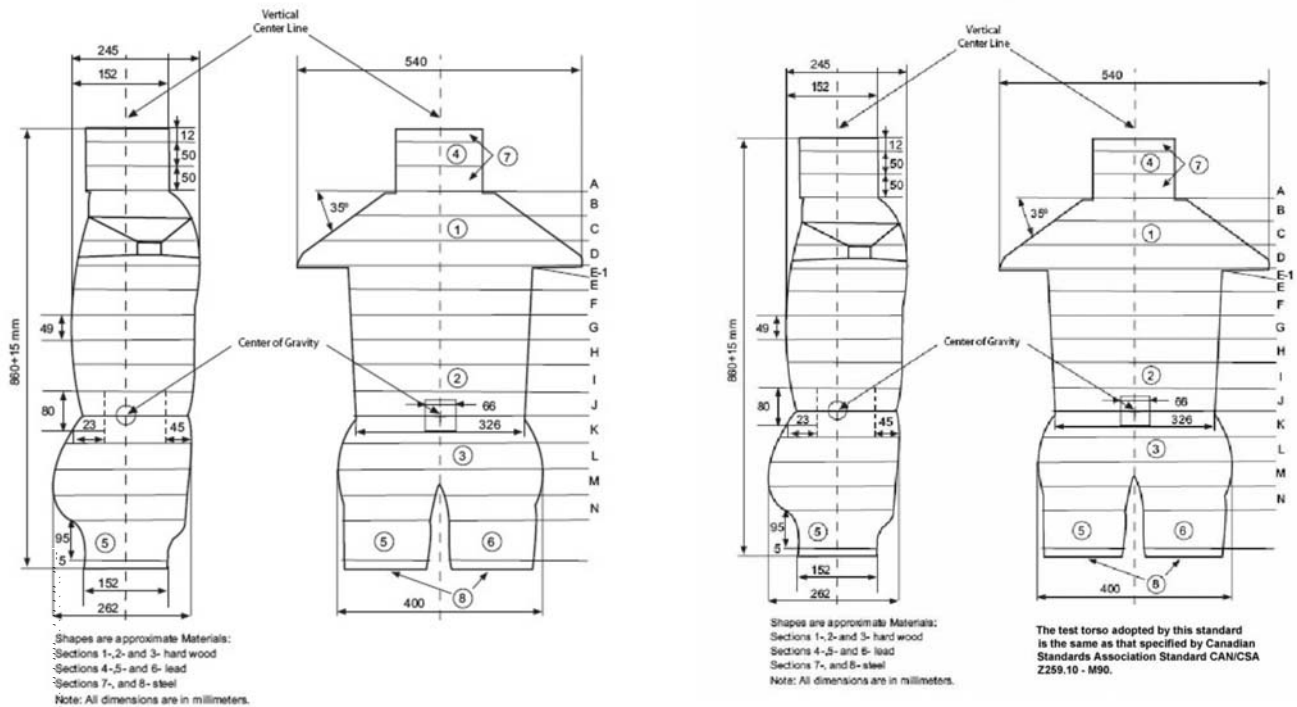


FIG. 33 Test Torso

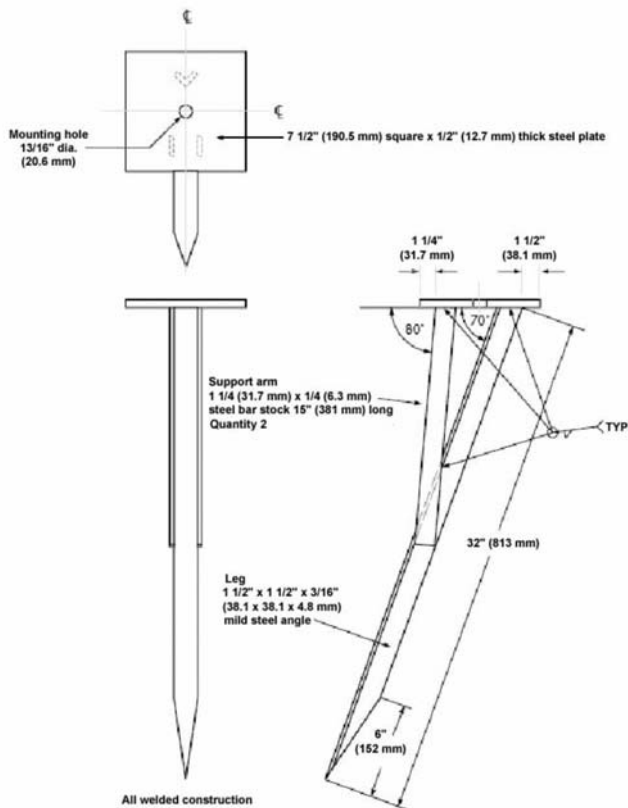


FIG. 34 Test Leg

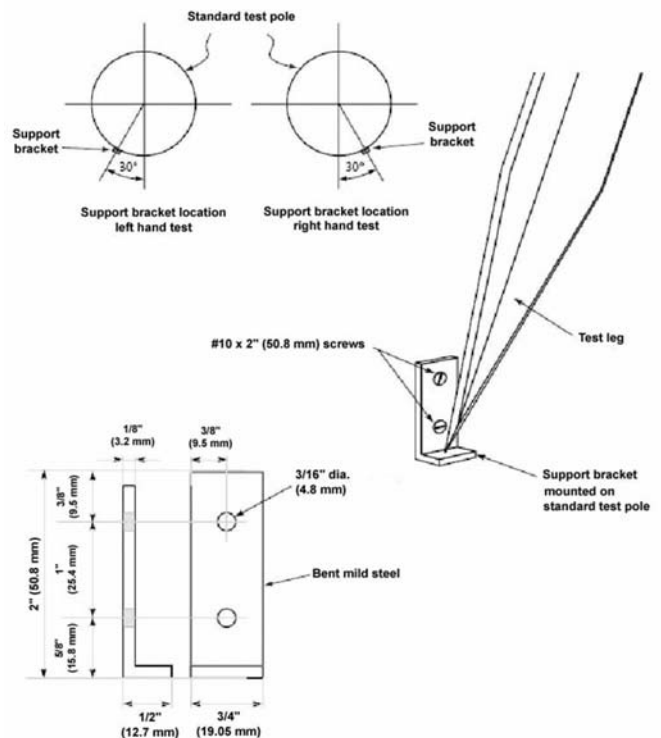


FIG. 35 Test Leg Bracket

24.4.1.2 *Drop Test Procedures*—The positioning strap shall be attached to the test-structure anchorage point. The opposite

end shall be attached to the test mass as shown in Fig. 37. The quick-release mechanism shall be hooked into the same point as the lower end of the positioning strap. Lower the test mass until its full mass is being supported by the positioning strap. Note the level of the test mass attachment point. Raise the test

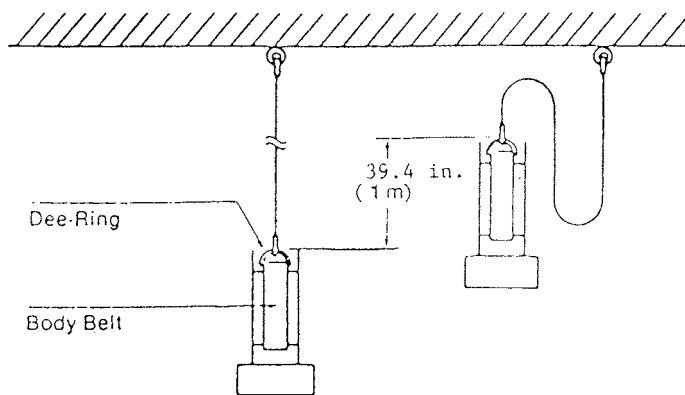


FIG. 36 Body-Belt Drop Test

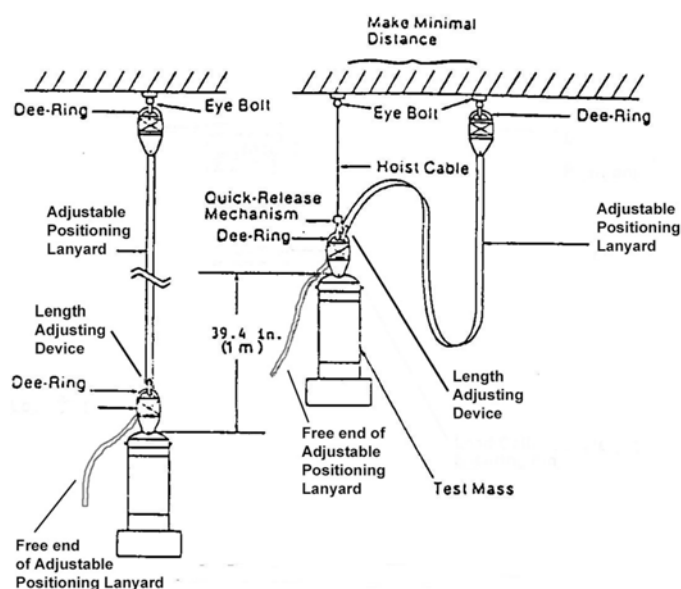


FIG. 38 Adjustable Positioning Lanyard Drop Testing

24.4.2.2 *Drop Test Requirements*—Adjustable positioning lanyards shall successfully arrest the fall of the test mass without breaking. In addition, the snaphook or carabiner on the Adjustable Positioning Device shall not have distorted sufficiently to allow the keeper to be released.

25. Qualification Testing (WPRD)

25.1 Types A and AB devices shall be designed to pass the tests summarized in Table 5. In addition, fabric used as a load bearing part shall pass three static strength tests in accordance with 16.5.2.

25.2 *WPRD Test Samples*—WPRD shall be provided for each type and pole conditions outlined in Table 5. Each test requires a separate device. Cause for rejection is failure of any one of the three units. Any one device that has passed the first test may be used for unlimited additional tests. Should that device fail during any subsequent tests, the test results may be disregarded if the test is repeated successfully on a second, new device.

25.3 Conditioning Procedures:

25.3.1 *Pole Conditioning*—All protruding splinters on the wood pole in the drop zone shall be removed prior to each drop test.

25.3.2 Conditioning for Wet Test:

25.3.2.1 Spray the wood pole with water for a minimum period of 1 h to soak the pole. The water flow shall be approximately 1.3 gal/min (5 L/min) to 4 gal/min (15 L/min). Wet the full circumference of the pole for a distance of at least 78.75 in. (2 m) below the location of the test.

25.3.2.2 Attach the WPRD within 15 min.

25.3.2.3 Spray the pole and the WPRD for one additional minute.

25.3.2.4 The test shall be conducted within 1 min thereafter. No additional spraying is required for the duration of the test.

25.3.2.5 Each additional test to be conducted requires the pole be sprayed for 2 min and the procedure in 25.3.2.2 be repeated.

mass until the lower attachment point has been raised a distance of 39.4 in. (1 m). Release the test mass by means of the quick release mechanism.

24.4.1.3 *Drop Test Requirements*: Positioning straps shall successfully arrest the fall of the test mass without breaking. In addition, the snaphooks on the positioning strap shall not have distorted sufficiently to allow the keeper to be released.

24.4.2 (*Adjustable Positioning Lanyards*) *Drop Test Samples*—All Adjustable Positioning Lanyards provided as samples shall be separate from the body belts but shall include all hardware and fittings intended to be attached to the commercial product.

24.4.2.1 *Drop Test Procedures*—The Fixed end of the Adjustable Positioning Device shall be attached to the test-structure anchorage point. The Length Adjusting Device shall be adjusted 39.4 in. (1 m) away from the fixed end hardware and attached to the test mass as shown in Fig. 38. The quick-release mechanism shall be hooked into the same point as the Length Adjusting Device. Lower the test mass until its full mass is being supported by the adjustable positioning lanyard. Note the level of the test mass attachment point. Raise the test mass until the lower attachment point has been raised a distance of 39.4 in. (1 m). Release the test mass by means of the quick release mechanism.

TABLE 5 Qualification Testing (WPFRD)

Test/Type	Dry Pole	Wet Pole	Wet Pole with Conduit	Iced Pole	Reference Clause Test Requirements	Reference Clause Test Procedure
Type A	X	X	X	NA	NA	NA
Type AB	X	X	X	X	NA	NA
Down the Pole Test with Torso above WPFRD	3 tests	3 tests	3 tests Bare side 3 tests Conduit side	3 tests Bare side 3 tests Icy side	25.3.5.1	25.3.5.1 (a)-(i)
Down the Pole Test with Torso below SPFRD	3 tests	3 tests	3 tests Bare side 3 tests Conduit side	NA	25.3.5.2	25.3.5.2 (a)-(i)
Off the Pole Test Right	3 tests	NA	NA	NA	25.3.6	25.3.6.2 (a)-(k)
Off the Pole Test Left	3 tests	NA	NA	NA	25.3.6	25.3.6.2 (a)-(k)
Dynamic Strength Drop Test	3 tests	NA	NA	NA	25.3.7	25.3.7.1 (a)-(m)

25.3.3 *Conduit Condition*—The conduit condition is intended to simulate both conduit and U-shaped guard situations. The conduit condition is to be achieved by attaching a single $3\frac{1}{8} \pm \frac{5}{8}$ in. (80 ± 15 mm) U-shaped aluminum or galvanized steel guard on the pole as shown in Fig. 39. The length of the U-shaped guard shall be suitable to cover the fall restriction

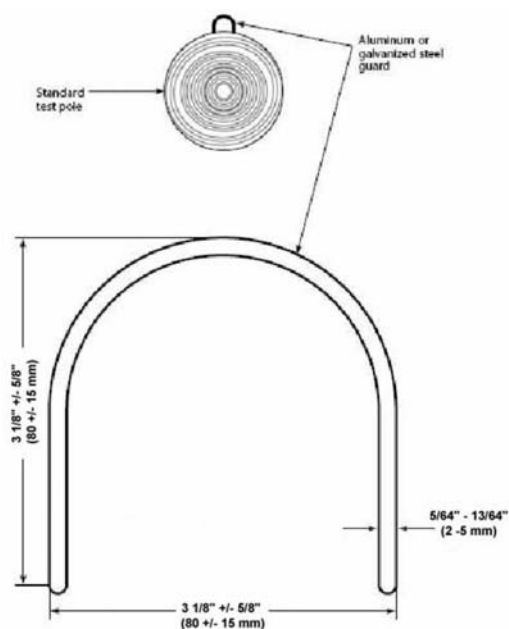


FIG. 39 Conduit Condition

zone. Clamps securing the guard to the pole shall be kept clear of the fall restriction zone.

25.3.4 Ice Pole Conditioning:

25.3.4.1 *Introduction*—Formation of ice may produce difficulties in the operation of fall restriction equipment. A deposit of ice on a pole can build up to a thickness that may make the fall restriction equipment difficult to use. Clear ice generally results from rain falling through air somewhat below the freezing point of water. This standard requires a clear ice coating that compares with that encountered in nature so that reproducible tests can be made. The thickness of ice shall be 0.5 ± 0.08 in. ($10.7 - 14.7$ mm) on a minimum 78.75 in. (2 m) length (see Fig. 40).

25.3.4.2 *Applicability*—The tests as defined in 25.3.4 apply only to Type AB devices.

25.3.4.3 *Principle*—Ice conditioning of the test pole shall be achieved by spraying water from a series of nozzles onto the test pole. Spraying shall be done on one side of the pole only and until ice forms on the pole to a thickness of 0.5 ± 0.08 in. ($10.7 - 14.7$ mm). The ice thickness shall taper off toward each side of the pole, for approximately $\frac{1}{2}$ to $\frac{2}{3}$ of the pole circumference in total. The back $\frac{1}{2}$ to $\frac{1}{3}$ circumference of the pole (side opposite the water source) shall have no ice buildup. (See Fig. 40.) Environmental temperature of 27°F (−3°C) maximum is recommended during the test.

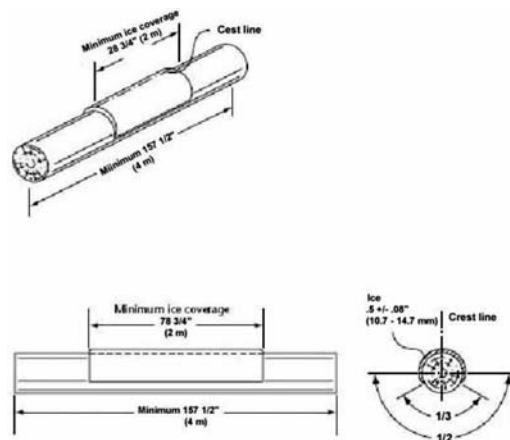
25.3.4.4 Test Arrangements:

(a) The minimum length of the pole used in testing shall be 157.5 in. (4 m). Uneven spots that may be on a pole shall be removed from its surface.

(b) Ice surface imperfections may be scraped off during and after the formation of the ice.

NOTE 6—It has been noted that between 0.5–2 gal per hour per ft² (20 and 80 L per hour per m²) of area sprayed will be required to cause ice to be deposited at a rate of approximately $\frac{1}{4}$ in./h (6 mm/h).

25.3.4.5 *Formation of Ice Deposit*—A coating of solid, clear ice 0.5 ± 0.08 in. ($10.7 - 14.7$ mm) thickness shall be produced 78.75 in. (2 m) length minimum. Outlined below is a typical ice formation procedure.



Ice Coverage on a Wood Pole

FIG. 40 Iced Pole Condition

(a) Protect one-third to one-half of the poles circumference to avoid ice formation in that area.

(b) Spray pole until the specified thickness of ice can be measured on the crest of the wood pole surface.

(c) Water should be controlled to cause ice to build up over the wood pole at the rate of approximately ¼ (6 mm) thickness per hour (see Fig. 40).

(d) Measure the ice thickness on a 78.75 in. (2 m) line at the crest of the pole at intervals of 0, 19½, 39, 58½ and 78 in. (0, 0.5, 1.0, 1.5 and 2 m). This 78.75 in. (2 m) section is located on the central part of the pole. Ice thickness should be measured by making a hole from the surface of the ice to the wood, a diameter small enough to allow the passage of the depth measuring blade of a caliper.

(e) When the thickness of the ice is reached on the crest line of the surface (see Fig. 40), discontinue the spray.

(f) Rotate the wood pole in a vertical position in such a way that the 78.75 in. (2 m) long section uniform thickness of ice is at the top of the set-up, therefore allowing adequate clearance to perform the drop test.

(g) To ensure that all parts of the test pole and ice coating have assumed a constant temperature, it is recommended that an environmental temperature of 27°F (−3°C) maximum be maintained for a period of at least 2 h.

(h) Following this period, perform the test.

(i) The ice-conditioning procedure shall be repeated for each test.

PERFORMANCE TESTS

25.3.5 *Down-the-Pole Tests*—Two separate down-the-pole tests shall be required: (1) Down-the-pole with torso above WPFRD and (2) Down-the-pole with torso below WPFRD.

25.3.5.1 *Down-the-Pole with Torso above WPFRD*—This test is to represent a lineman, using WPFRD, ascending or descending the pole and having a gaff kick out or becoming immobile. The device shall arrest the fall when tested in accordance with the procedure outlined below.

Maximum permissible slippage of the WPFRD is as follows:

Dry pole – no conduit 39 in. (99 cm)

Wet pole – no conduit 49 in. (124.5 cm)

Wet pole – with conduit 49 in. (124.5 cm)

Icy pole – no conduit 59 in. (150 cm)

The procedure for this test shall be as follows:

(a) Initially position the torso at a height sufficient to prevent it from striking the floor during the drop test.

(b) Place the WPFRD on the pole and adjust it, in accordance with the manufacturer's instructions, to fit the pole diameter.

(c) Attach the WPFRD snap hooks to the dee rings of the torso.

(d) Ensure the torso is correctly positioned and the WPFRD is correctly adjusted. (see Fig. 41):

(1) Move the torso away from the pole so that slight tension, adequate to remove the slack in the connecting hardware, is applied to the WPFRD. The gap between the pole surface and torso, which is represented by dimension X (Fig.

41) and measured to the torso where the Body Belt dee rings are attached, should be 11¼ – 12¼ in. (28.6 – 31.1 cm) or the minimum distance allowed by the WPFRD, whichever is greater.

(2) Position the torso until the centerlines of the WPFRD and the Body Belt dee rings are at the same elevation.

(3) Hold the WPFRD in a climbing position in accordance with manufacturer's instructions.

(e) Mark the position of the WPFRD on the back of the pole.

(f) Raise the torso 11¼ – 12¼ in. (28.6 – 31.1 cm) while ensuring that the back of the WPFRD does not slide up the pole. Note that the torso moves closer to the pole as it is raised. The range of the new gap, X, shall be 3¼ – 4¾ in. (8.3 – 12.1 cm).

(g) Ensure setup is correct.

(h) Release the torso.

(i) Measure and record the total WPFRD slippage on the back of the pole.

25.3.5.2 *Down-the-Pole with Torso below WPFRD*—This test is to represent a lineman, using WPFRD, ascending or descending the pole and having a gaff kick out or becoming immobile. The device shall arrest the fall when tested in accordance with the procedure outlined below.

Maximum permissible slippage of the WPFRD is as follows:

Dry pole – no conduit 39 in. (99 cm)

Wet pole – no conduit 49 in. (124.5 cm)

Wet pole – with conduit 49 in. (124.5 cm)

Icy pole – no conduit 59 in. (150 cm)

The procedure for this test shall be as follows:

(a) Initially position the torso at a height sufficient to prevent it from striking the floor during the drop test.

(b) Place the WPFRD on the pole and adjust it, in accordance with the manufacturer's instructions, to fit the pole diameter.

(c) Attach the WPFRD snap hooks to the Body Belt dee-rings on the torso.

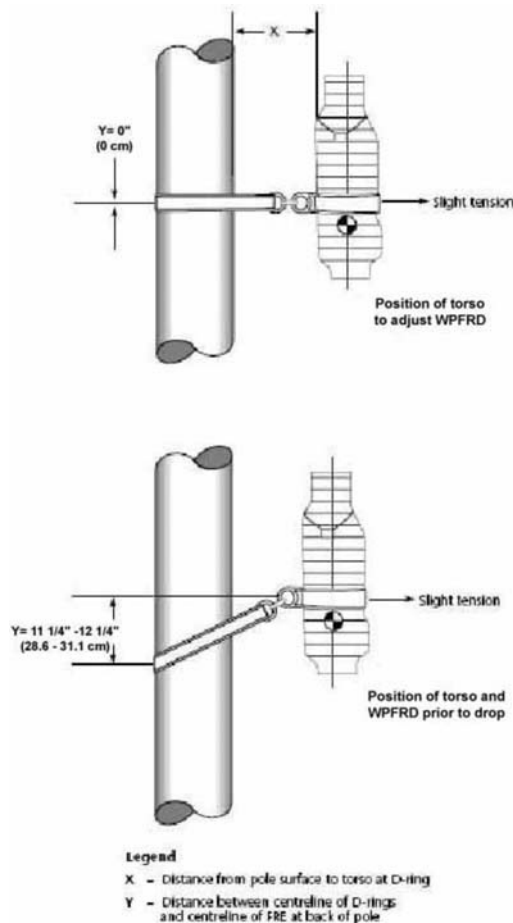
(d) Ensure the torso is correctly positioned and the WPFRD is correctly adjusted. (see Fig. 42):

(1) Move the torso away from the pole so that slight tension, adequate to remove the slack in the connecting hardware, is applied to the WPFRD. The gap between the pole surface and torso, which is represented by dimension X (Fig. 42) and measured to the torso where the Body Belt dee-rings are attached, should be 11¼ – 12¼ in. (28.6 – 31.1 cm) or the minimum distance allowed by the WPFRD, whichever is greater.

(2) Position the torso until the center lines of the WPFRD and the Body Belt dee-rings are at the same elevation.

(3) Hold the WPFRD in a climbing position in accordance with the manufacturer's instructions.

(e) Lower the torso 11¼ – 12¼ in. (28.6 – 31.1 cm) while ensuring that the back of the WPFRD does not slide down the pole. Note that the torso moves closer to the pole as it is lowered. The range of the new gap, X, shall be 3¼ – 4¾ in. (8.3 – 12.1 cm).



Down-the-Pole with Torso above WPFRD

FIG. 41 Down the Pole with Torso Above WPFRD

(f) Mark the position of the WPFRD on the back of the pole. Ensure a slight tension between the WPFRD snap hooks and the Body Belt's dee-rings.

(g) Ensure setup is correct.

(h) Release the torso.

(i) Measure and record the total WPFRD slippage on the back of the pole.

25.3.6 Off-the-Pole Test—This test is to represent a lineman, using, ascending or descending the pole and having a gaff kick out, causing him or her to fall towards one side. The device shall arrest the fall when tested in accordance with the procedure outlined below.

25.3.6.1 Maximum permissible slippage of the WPRFD along the test pole is 39 in. (99 cm).

25.3.6.2 The procedure for this test shall be as follow:

(a) Torso modification: For symmetrical devices, attach the test leg (Fig. 34) to either leg stump of the wooden torso. For asymmetrical devices, attach the test leg to the torso's left leg stump for the left-hand test and to the right leg stump for the right-hand test.

(b) Attach the leg support bracket (Fig. 35) to the standard test pole at a height sufficient to prevent test torso from striking the floor during the drop test, and at 30° from the pole-torso center line.

(c) Initially position the torso at a height where the tip of the steel leg is no more than 3/16 in. (4.5 mm) directly above the leg-bearing surface of the steel bracket.

(d) Place the WPFRD on the pole. Adjust it, in accordance with the manufacturer's instructions, to the pole diameter.

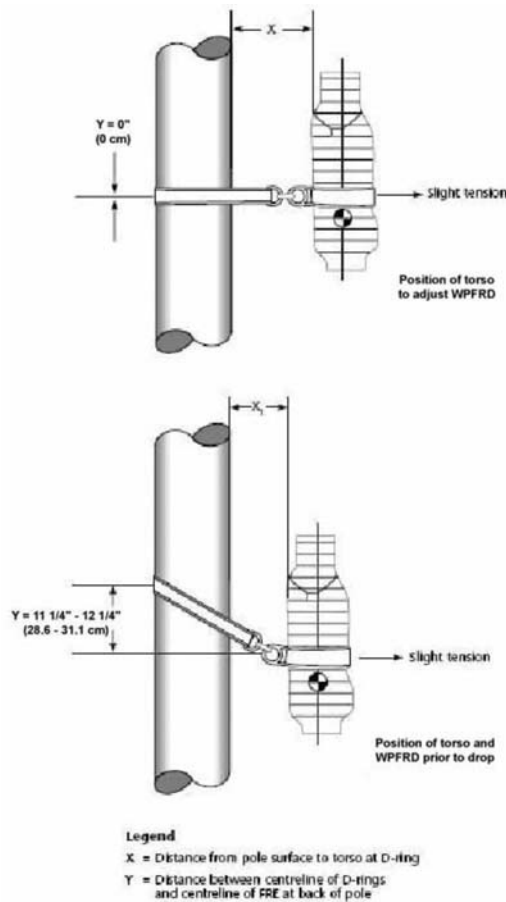
(e) Attach the WPFRD snap hooks to the dee rings on the torso.

(f) Ensure the torso is correctly positioned and the WPFRD is correctly adjusted. (see Fig. 43):

(1) Move the torso away from the pole so that slight tension, adequate to remove the slack in the connecting hardware, is applied to the WPFRD. The gap between the pole surface and the torso, which is represented by dimension X (Fig. 43) and measured to the torso where the Body Belt dee-rings are attached, should be 11 1/4 – 12 1/4 in. (28.6 – 31.1 cm) or the minimum distance allowed by the WPFRD, whichever is greater.

(2) Position the WPFRD (not the torso) until the center lines of the WPFRD and the Body Belt dee-rings are at the same elevation.

(g) Move the torso toward the pole until the tip of the leg is directly above the steel bracket. The WPFRD will become slack during this step and will fall down at the back of the pole, or, if applicable, may "hang" by the release cords.



Down-the-Pole with Torso below WPFRD

FIG. 42 Down the Pole with Torso Below WPFRD

(h) Lower the torso until the tip of the leg contacts the bracket, then lower the torso by an additional $\frac{3}{16}$ in. (4.5 mm). Through this procedure, the torso will tilt back from the pole surface slightly.

(i) Mark the position of the WPFRD on the back of the pole, verify and record that it is adjusted in accordance with Items (a) to (i).

(j) Release the torso. During the test, the leg will slide outwards off the bracket and the torso will fall off the vertical in the opposite direction.

(k) Measure and the record the total WPFRD slippage on the back of the pole.

25.3.7 WPFRD Dynamic Strength Drop Test—Complete device when tested in accordance with the procedure outlined below, shall arrest the fall. The test torso shall remain suspended after the arrest for a minimum of 10 min.

25.3.7.1 The following procedure shall be followed during this test:

(a) Condition the WPFRD by placing it in a freezer at $-31 \pm 5^\circ\text{F}$ ($-35 \pm 2.8^\circ\text{C}$) for 4 h. Perform the test within 10 min of removal from freezer. Do not allow the ambient temperature to exceed 72°F (22°C).

(b) Position the torso initially to a height sufficient to prevent it from striking the floor during the drop test.

(c) Place the WPFRD on the pole. Adjust it, in accordance with the manufacturer's instructions, to fit the pole diameter.

(d) Attach the WPFRD snap hooks to the dee-rings on the torso.

(e) Ensure the torso is correctly positioned and the WPFRD is correctly adjusted (as outlined below):

(1) Move the torso away from the pole so that slight tension, adequate to remove the slack in the connecting hardware, is applied to the WPFRD. The gap between the pole surface and the torso, which is represented by dimension X and measured to the torso where the Body Belt dee-rings are attached, should be $11\frac{1}{4} - 12\frac{1}{4}$ in. (28.6 – 31.1 cm) or the minimum distance allowed by the WPFRD, whichever is greater. Place the WPFRD as much as possible in contact with the pole, ie, in a closed position.

(2) Position the torso until the center lines of the WPFRD and the Body Belt dee-rings are at the same elevation (see Fig. 43):

(f) Mark the position of the WPFRD on the back of the pole.

(g) Insert test lanyards on both sides between the snap hooks of the WPFRD and the dee-rings.

(h) Lower the torso until it is fully suspended by the WPFRD.

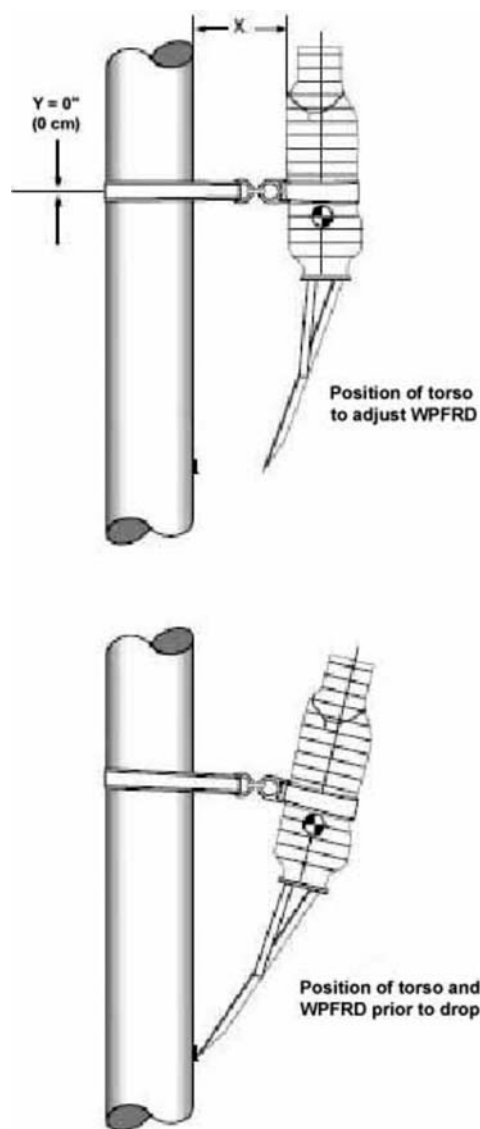


FIG. 43 Off the Pole Test

- (i) Measure the height of the torso.
- (j) Raise the torso 47 in. (1.2 m) and maintain the dimension X as described in 25.3.7.1(e)(1).
- (k) Ensure set up is correct.
- (l) Release the torso.
- (m) Leave the torso suspended by the WPFRD for 10 min.

26. Instructions

26.1 Instructions shall be provided to the user and printed in English and included with the equipment at the time of shipment from the manufacturer.

26.2 Instructions shall contain at least the following information:

- 26.2.1 A statement that the manufacturer's instructions shall be provided to users.
- 26.2.2 Manufacturer's name, address, and telephone number.
- 26.2.3 Manufacturer's part number and model designation.
- 26.2.4 Purpose and intended use of the equipment.

26.2.5 Proper method of use and limitations on use of the equipment.

26.2.6 Proper location to cut device for a pole top rescue (i.e. WPFRD).

26.2.7 Inspection procedures required to ensure the equipment is in serviceable condition and operating correctly.

26.2.8 Criteria for discarding equipment that fails inspection.

26.2.9 Procedures for cleaning, maintenance and storage.

26.2.10 Requirements for the user to remove equipment from field service if it has been subjected to the forces of arresting a fall.

26.2.11 Requirements that only the equipment manufacturer or persons or entities authorized in writing by the manufacture, shall make repairs to the equipment.

26.2.12 Reference to ASTM F887 standard.

26.3 Instructions shall provide warnings regarding at least:

26.3.1 Altering the equipment.

26.3.2 Misusing the equipment.

26.3.3 Using combinations of components or subsystems, or both, which may affect or interfere with the safe function of each other.

26.3.4 Exposing the equipment to chemicals which may produce a harmful effect and consulting the manufacturer in cases of doubt.

26.3.5 Using the equipment around moving machinery and electrical hazards.

26.3.6 Using the equipment around sharp edges or abrasive surfaces.

27. Guarantee and Rejection

27.1 This specification covers the minimum electrical, mechanical, and physical properties to be guaranteed by the manufacturer and the detailed procedures by which such properties are to be determined. The purchaser may, at his option, perform or have performed any of these tests in order to verify the guarantee. Claims for failure to meet this specification are subject to verification by the manufacturer.

27.2 The manufacturer or supplier shall replace, without charge to the purchaser, unused equipment purchased under this specification which upon examination or test within six months of initial delivery of the shipment fail to meet any of the criteria of these specifications.

27.3 If 5 % or more, but not less than two items in a lot or shipment, fail to meet the criteria of these specifications, the entire lot or shipment may be rejected.

27.4 If there is rejection of 5 % or more, but not less than two items in a lot or shipment, the testing shall be discontinued and the manufacturer notified. The manufacturer or supplier may request that his representative witness the testing of additional samples.

27.5 All rejected material shall be returned as directed by the manufacturer, at his or the supplier's request, without defacement beyond that already created by testing. Rejected material shall be tagged with an indication of the cause for rejection.

28. Keywords

28.1 adjustable positioning lanyard; body belts; climber; climbing equipment; dee-rings; harnesses; keeper; lanyards; length adjusting device; locking snaphook; positioning strap; stirrup ; shock absorbing lanyard; wood pole fall restriction device

SUMMARY OF CHANGES

Subcommittee Electrical Protective Equipment for Workers has identified the location of selected changes to this standard since the last issue (F887–11) that may impact the use of this standard. (Approved Oct. 15, 2012.)

(1) Added new language to **7.2** to allow for leg irons to be made from additional materials

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